Hardware Maintenance Service for Service Level I

Machine Types 2144 and 2168
and IBM Monitors
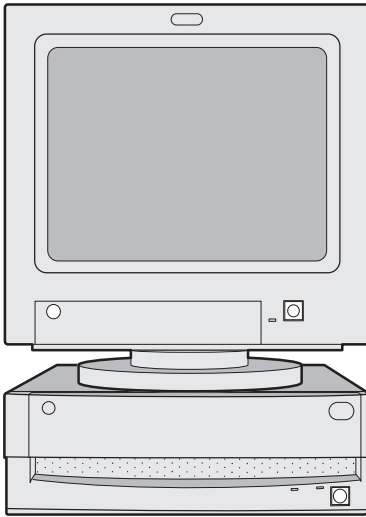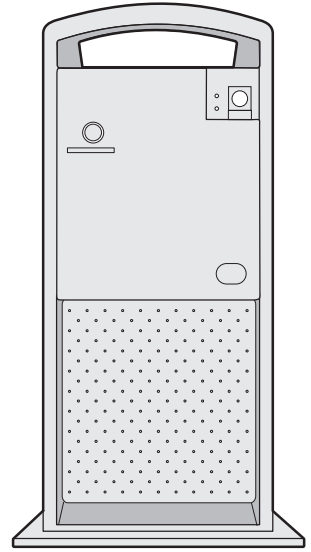
IBM

2168

2144

Aptiva

Hardware Maintenance Service for Service Level I
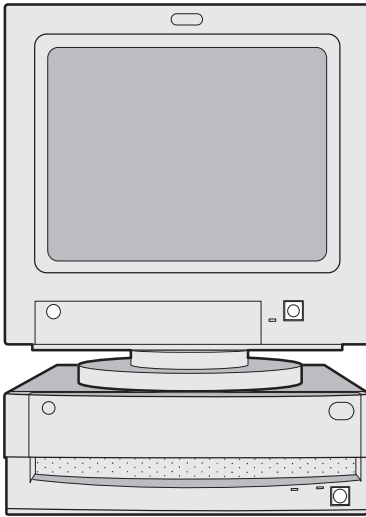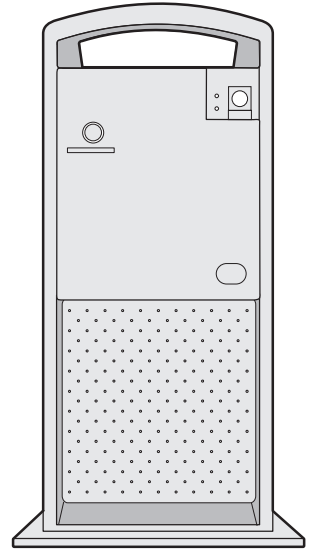
Machine Types 2144 and 2168
and IBM Monitors

2168

2144

Aptiva

First Edition (December 1995)

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Voltage Supply Switch Settings

Your IBM Aptiva Personal Computer *may* have voltage switches, which must be set correctly for your voltage supply. If your monitor or system unit has a voltage switch, complete these steps to make sure each switch is set correctly:

1. Determine the correct voltage switch setting for your area:

Voltage Supply Range	Voltage Switch Setting
100–127 V	115 V or 115
200–240 V	230 V or 230

2. Locate the voltage switch on the back of your monitor or system unit. If the setting shown on the switch is:

   - Correct, start setting up your IBM Aptiva computer.

   - Incorrect, change the voltage switch setting. (You may need a small screwdriver.)

Positionnement du sélecteur de tension

Votre Aptiva IBM **peut** comporter des sélecteurs de tension qui doivent être positionnés correctement en fonction de la tension adéquate. Si votre écran ou votre unité centrale sont équipés d'un sélecteur de tension, vérifiez-en le positionnement en procédant de la manière suivante :

1. Le tableau ci-dessous permet de déterminer le positionnement correct du ou des sélecteurs de tension :

Tensions	Positionnement du sélecteur de tension
100–127 V	115 V ou 115
200–240 V	230 V ou 230

2. Repérez le ou les sélecteurs de tension situés à l'arrière de votre écran ou de votre unité centrale. S'ils sont positionnés de façon :

   - Correcte, démarrez la configuration de votre Aptiva IBM.

   - Incorrecte, modifiez leur position. (Vous pouvez vous aider d'un petit tournevis.)

Safety Information

The construction of the IBM Aptiva Personal Computer provides extra protection against the risk of electrical shock. This computer has a power cord with a three-prong plug that is required to ground metal parts. It is the responsibility of the person installing the computer to connect it to a properly grounded electrical outlet. Seek professional assistance before using an adapter or extension cord; these devices could interrupt the grounding circuit.

If the computer is connected to an electrical outlet that is incorrectly connected to the building wiring, serious electrical shock could result.

For continued protection against the risk of electrical shock:

- Connect your computer only to an electrical outlet of the correct voltage. If you are unsure about the voltage of the electrical outlet you are using, contact your local power company.
- If your computer has cables other than the power cords, you must connect them before plugging the power cord into an electrical outlet. Before removing these cables, you must first unplug the power cords from the outlet.
- If your computer has a telephone connection, do not touch the telephone cords when there is lightning in the area.
- Do not use or store the computer in an area where it can become wet.
- Make sure all replacement parts have characteristics identical or equivalent to the original parts. Other parts may not have the same safety features.
- Personal injury or electrical shock may result if you undertake actions other than those specifically described in this book. This is particularly true if you try to service or repair the power supply, monitor, or built-in modem. Always refer service or repairs to qualified service personnel.

Attention

If your computer uses lithium batteries, there may be a risk of fire, explosion, or burns if the batteries are handled incorrectly. To ensure safety:

- Do not recharge, disassemble, heat, or incinerate a lithium battery.
- Replace the battery with an identical or equivalent type of lithium battery.
- Discard used lithium batteries according to local country dispositions.

Consignes de sécurité

Cet ordinateur est muni d'un cordon d'alimentation avec prise tripolaire. Il incombe au responsable de l'installation de vérifier le branchement de l'ordinateur sur une prise de courant correctement mise à la terre. Si vous devez installer un adaptateur ou une rallonge, faites appel à un professionnel pour ne pas risquer de créer une rupture dans le circuit de mise à la terre.

Une prise de courant incorrectement reliée au câblage du bâtiment peut être à l'origine d'une électrocution.

Pour vous prémunir contre les risques d'électrocution, respectez les consignes suivantes:

- Branchez l'ordinateur sur une prise de courant présentant la tension adéquate.
- Si votre ordinateur est muni d'autres câbles que le cordon d'alimentation, ne branchez celui-ci sur la prise de courant qu'après avoir connecté tous les autres câbles. Inversement, débranchez le cordon d'alimentation de la prise de courant avant de déconnecter tout autre câble.
- Si votre ordinateur est muni d'une connexion téléphonique, ne touchez pas aux câbles du téléphone pendant un orage.
- N'installez pas l'ordinateur dans un endroit humide.
- Il est impératif de ne remplacer une pièce que par une pièce identique ou de caractéristiques équivalentes. Les autres pièces peuvent ne pas présenter les mêmes caractéristiques de sécurité.
- Confiez l'entretien et la réparation de l'ordinateur au personnel qualifié.

Attention

Si le système utilise des piles au lithium, il peut exister des risques d'incendie, d'explosion ou de brûlure si les piles sont manipulées de façon inadéquate. Par mesure de sécurité :

- Ne rechargez pas, ne démontez pas, n'exposez pas à une température élevée et ne jetez pas au feu une pile au lithium.
- Remplacez la pile par un modèle au lithium identique ou équivalent.
- Conformez-vous aux dispositions d'usage dans votre pays concernant le rejet des piles usées.

Federal Communications Commission (FCC) Notice

The following statement applies to this IBM product. The statement for other IBM products intended for use with this product will appear in their accompanying manuals.

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. 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.

Canadian Department of Communications Compliance Statement

This equipment does not exceed Class B limits per radio noise emissions for digital apparatus, set out in the Radio Interference Regulation of the Canadian Department of Communications.

Avis de conformité aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe B d'émission de bruits radioélectriques pour les appareils numériques, telles que prescrites par le Règlement sur le brouillage radioélectrique établi par le ministère des Communications du Canada.

Canadian Department of Communications Certification Label

Notice: The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

> **Attention**
>
> Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

Étiquette d'homologation du ministère des Communications du Canada

AVIS : L'étiquette du ministère des Communications du Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme à certaines normes de protection, d'exploitation et de sécurité des réseaux de télécommunications. Le ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunications. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêchent pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être effectuées par un centre d'entretien canadien autorisé désigné par le fournisseur. La compagnie de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause d'un mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

> **Attention**
>
> L'utilisateur ne doit pas tenter de faire ces raccordements lui-même, il doit avoir recours à un service d'inspection des installations électriques ou à un électricien, selon le cas.

Load Number (LN): The load number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the load of all the devices does not exceed 100. The load number of the built-in modem is 10.

Indice de charge (IC): L'INDICE DE CHARGE (IC) assigné à chaque dispositif terminal indique, pour éviter toute surcharge, le pourcentage de la charge totale qui peut être raccordé à un circuit téléphonique bouclé utilisé par ce dispositif. L'extrémité du circuit bouclé peut consister en n'importe quelle combinaison de dispositifs pourvu que la somme des INDICES DE CHARGE de l'ensemble des dispositifs ne dépasse pas 100. L'indice de charge du modem intégré est de 10.

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Preface

This manual is intended to be used as a stand-alone document to service this product. It is divided into the following chapters:

"General Information" contains a brief description of this manual.

"Check Procedures" provides step-by-step instructions that aid in locating the failing Field Replaceable Unit (FRU).

"Diagnostic Aids" explains the diagnostic aids that are available for troubleshooting problems on the system unit.

"Repair Information" contains the procedures for removing FRUs.

"Parts/Test Point Locations" contains illustrations of the locations of the major parts and connectors.

"Safety Inspection Guide" contains information about inspecting a machine for safety problems before putting the machine under a Maintenance Agreement.

"Parts Catalog" contains descriptions, illustrations, and part numbers for individual FRUs.

"Part Number Index" contains part numbers listed in numerical order.

Appendix, "Model/Monitor Configurations and FRU Part Numbers" contains models and FRUs listed by part number for all countries.

General Information

Chapter Description

This chapter contains general information about the contents of this manual, product descriptions, and other information useful when servicing the product.

Diagnostic Information

The diagnostic information contains the check procedures you use to diagnose and isolate product failures. Diagnostic information consists of:

Start:

> This is the starting point for any diagnostic action. Based on high-level symptoms, the information in this check procedure directs you to more detailed procedures to help you resolve the machine failure.

Symptoms, Messages, Error Codes, and Beeps:

> The Index of Symptoms, Messages, Error Codes, or Beeps lists symptoms and their probable causes, and directs you to the applicable check procedures to help you resolve the machine failure. The index also lists which FRU is the likely cause of the problem.

Check Procedures:

> When the Start check procedure sends you to a specific check procedure or the Index of Symptoms, Messages, Error Codes, or Beeps, turn to that section and perform the steps as instructed. If there are any notes or instructions at the top of the page, read them before you start the procedure.
>
> Carefully read each step of the check procedure and perform the appropriate action as instructed. If you do not remember the location of a specific part or test point, or if you do not remember an adjustment or removal procedure, see the chapter with that information. Always return to the check procedure after you do this. In some cases, you are sent to other check procedures to find the failure.

Diagnostic Aids:

> The Diagnostic Aids chapter contains additional information to help you diagnose a failure of a specific part.

Using the Check Procedures

Failing Parts or Assemblies: The check procedures generally help you trace a problem to one part or assembly. The last step of the specific check procedure you are using indicates that a part or assembly is failing. You should inspect the part or assembly before you decide to replace it. It might be loose, dirty, or in need of a small repair. The check procedures might lead you to two, or even three, possible failing parts or assemblies. The parts that might be failing are listed in order of the most probable failure.

Measuring Voltages: Many check procedure steps instruct you to measure voltages on cable plugs and electronic board connectors. If you are asked to measure voltage at several places on a plug or connector, a chart next to or near the instruction indicates the number of the plug or connector, the pin numbers you should measure, the signal name, and the correct voltage for the condition you are measuring. Measure the voltage only at the pins listed in the chart. Remember to set the meter on the correct scale and to put the meter leads in the correct position for the voltage you are asked to measure.

Note: Use frame ground for the ground reference. Attach the black meter (ground) lead to frame ground, except where specified otherwise.

Diagnostic Aids

This chapter contains information outside the check procedures to help you diagnose a failure of a specific part. Some diagnostic aids are resident in the machine, such as the Power-On Self Test (POST). The machine performs the POST each time it is powered on. Use this information throughout the diagnostic procedures. You should become familiar with the POST and be able to determine if the machine performed all the steps.

POST: The normal POST is initiated automatically each time the system unit is powered on (when Rapid Resume is enabled, a shorter version of POST is initiated—see "Rapid Resume" on page 1-20). The POST is a series of system checks and initializations that verify the correct operation of the base system. Two classifications of malfunctions might be detected during the POST: critical and noncritical.

Critical malfunctions prevent the system from operating at all, or could cause incorrect results that are apparent to the user. Examples of critical errors include processor or interrupt controller malfunctions. If a critical error is detected during the POST, an attempt is made to indicate the error, and all testing halts.

Noncritical malfunctions cause incorrect results that might not be apparent to the user. An example of a noncritical error is a memory module failure. If a noncritical error occurs, an error code is displayed, and the testing is stopped. Testing can be continued on a noncritical error by pressing the **Esc** key.

After a successful POST (one in which no critical errors were detected), a single short beep is generated. The system attempts to load an operating system. The system can be customized for different start (boot) methods.

The system's default startup sequence automatically looks for the operating system files on the hard disk if the files are not found on diskette.

Note: Remember that the POST does not test all areas, but only those that allow the system to operate well enough to run the Advanced Diagnostics program.

Repair Information

This chapter contains removal and replacement instructions.

Parts/Test Point Locations

This chapter contains system board layouts and jumper settings. It is useful when you are asked to measure voltages. Use this information to help you locate parts such as electronic boards, connectors, pin numbers, and test points. This chapter also contains jumper and dual in-line package (DIP) switch settings for modems, and jumper settings for the hard disk drive, CD-ROM (compact disc–read-only memory) drive, and sound adapter card.

Safety Inspection Guide

This chapter contains guidelines to help you identify possible safety concerns. Use this information to inspect a machine for safety problems before putting the machine under a Maintenance Agreement.

Parts Catalog

This catalog includes figures, part numbers, and part names. It also contains detailed system board descriptions.

Part Number Index

This chapter contains part numbers listed in numerical order.

Appendix: Model Configurations and FRU Part Numbers

This appendix contains tables, listed by country, of models and FRU part numbers. Refer to this when ordering FRUs or to determine the part number of the system board or SIMM installed in the machine you are servicing.

Product Description

This manual contains service information for the **Service Level** I (**SL-**I) model of the IBM Aptiva Personal Computer, worldwide.

- The Machine Type 2144 contains bays for four input/output devices (drives) and slots for four adapter cards.
- The Machine Type 2168 contains bays for six input/output devices (drives) and slots for eight adapter cards.

For FRU parts information, see the Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1.

VESA Local Bus Note: The VESA local bus connector generally conforms to the Video Electronics Standards Association (VESA) VL-Bus Specification 2.0 (32 bit). Local bus adapter cards vary in degree of adherence to this standard. Therefore, IBM cannot guarantee that all available local bus option cards will perform according to manufacturer's claims.

Security: Power-on password. See "Power-On Password Reset" on page 1-14.

System Boards: Two system boards are available: Type I-1 and Type I-2. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for system board jumper and connector locations.

The Type I-1 system board supports Intel 80486-type processors and has the following features:

- 237-pin upgrade processor socket. You must remove the old processor to install an upgrade processor.

- 16KB internal cache memory, and also supports up to 128KB external cache.

- 1MB Video DRAM soldered on the system board.

- Three gold-contact 72-pin system memory module sockets support either parity or non-parity memory SIMMs. Memory speed is 70 nanoseconds (ns). Depending on model, either 4MB, 8MB, or 16MB of system memory is supplied, and maximum system board memory is 96MB. Refer to "System Memory" on page 1-27 and to "SIMM Configurations—Type I-1" on page 5-18.

- Ports: serial (two), parallel, keyboard, mouse, and video.

- Connectors for:

  - AT riser card (120-pin)
  - VESA local bus riser card[1]
  - Input power (12-pin)
  - AT diskette drives (34-pin)
  - Two 40-pin IDE drive controllers: a primary local bus IDE that supports two hard disk drives and a secondary IDE that supports a CD-ROM drive and one hard disk drive, or two hard disk drives.
  - Power light-emitting diode (LED)/hard disk LED (4-pin)

- Power-on switch 2-wire connector and a power supply auxiliary control 3-wire connector for Rapid Resume features.

- Wake Up on Ring connector for Rapid Resume automatic wake-up features.

- Lithium battery.

The Type I-2 system board supports Pentium processors and has the following features:

- P54C socket 7-ZIF connector. You must remove the old processor to install an upgrade processor.

- 16KB internal cache memory, and also supports an optional 512KB external cache modules.

- 1MB Video DRAM soldered on the system board, and also supports up to 1MB of video DRAM.

- Four gold-contact 72-pin system memory module sockets support either parity or non-parity memory SIMMs. Memory speed is 70 nanoseconds (ns). Depending on model, either 4MB, 8MB, or 16MB of system memory is supplied, and maximum system board memory is 128MB. Refer to "System Memory" on page 1-27 and to "SIMM Configurations—Type I-2" on page 5-20.

- Ports: serial (two), parallel, keyboard, mouse, and video.

- Connectors for:

  - AT riser card (120-pin)
  - VESA local bus riser card
  - Input power (12-pin)
  - AT diskette drives (34-pin)

---

[1] See "VESA Local Bus Note" on page 1-6.

- Two 40-pin IDE drive controllers: a primary local bus IDE that supports two hard disk drives and a secondary IDE that supports a CD-ROM drive and one hard disk drive, or two hard disk drives.
- Power light-emitting diode (LED)/hard disk LED (4-pin)

• Power-on switch 2-wire connector and a power supply auxiliary control 3-wire connector for Rapid Resume features.

• Wake Up on Ring connector for Rapid Resume automatic wake-up features.

• Lithium battery.

Processors

One of the following processors can be installed:

- AMD 486DX4-100MHz
- Cyrix/IMD 486DX4-100MHz
- Cyrix 5x86C-100MHz
- Pentium P24T
- Pentium P24CT
- Pentium P54C-75MHz
- Pentium P54C-100MHz
- Pentium P54C-120MHz
- Pentium P54C-133MHz
- Pentium P54C-150MHz
- Pentium P54C-166MHz

Modem Adapter Card

The following Data/FAX/Voice/Speech modem support is available:

- 14400 bps data / 14400 bps send and receive data/FAX/Voice
- 28800 bps data / 14400 bps send and receive data/FAX/Voice

- The Machine Type 2144 and Machine Type 2168 are shipped with one of the above modems installed in most U.S. and Canadian models. Features include pulse and touchtone dial, autodial, autoanswer, built-in speaker, and two phone jacks. Voice modem software (for answering machine features) is also supported.
- DIP switches and any external serial ports supported are preset at the factory. Port addresses can be changed by resetting the DIP switches or jumpers on the modem adapter card.
- Refer to "Factory-Installed Modem Jumper and Switch Settings" on page 5-10 for switch settings and jumper positions.

Power Supplies (with Rapid Resume Features)

- The power supply is a 145-W switchable high/low voltage power supply with a variable fan speed and a connector for a detachable grounded 3-wire power cord. The power cable has four DASD connectors: one mini power connector and three standard 4-pin connectors. The power supply also has a non-switched appliance outlet connector.

- For some countries outside the United States, the power supply might have five standard 4-pin connectors and one mini power connector, for a total of six DASD connectors.

- To support the Rapid Resume feature, all power supplies have a 3-wire auxiliary control cable that connects on the system board. There is no on/off switch cable assembly for the power supplies.

Cables

All models contain one cable for hard disk drives and one cable for diskette drives. A momentary power switch and cable assembly that connects to the system board, a Wake Up on Ring modem cable, and a voice modem cable are also included.

Diskette Drive—AT-type

All models contain a 3.5-in. 1.44MB Slimline diskette drive.

Multimedia Models

Multimedia models feature the following components.
- 5.25-in. high-performance, quad-speed (4X), quad-speed (4X) changer, or six-speed (6X) CD-ROM IDE/AT drive that can read data and play audio from standard and mini CD-ROM and audio compact discs (audio CDs). It is compatible with industry-standard multimedia requirements.
- An audio cable (MM3 or MM4).
- Sound adapter card (MM3, MM4, or MM5) that is compatible with and runs many of the latest software applications designed for multimedia computers.
- MWave card with fax send/receive, telephone answering, speakerphone, wavetable audio, voice-over-data, and 3D sound features.
- A CD-ROM drive system interface cable.
- One pair of external speakers (MM3, MM4, or MM5).
- Speaker power supply.
- Microphone.
- Joystick (on some models).

Hard Disk Drive

The hard disk drive is a 3.5-in. Slimline IDE AT drive with "look-ahead" cache memory and 14 ms average access time.

Monitors

- SVGA (Super Video Graphics Array) Tri-Synch Monitors include:

    - .28-mm or .39-mm dot pitch tri-synch, non-interlaced VGA and 800x600 modes, and interlaced 1024x768 (i) modes.
    - Power switch.
    - Up to seven user controls: horizontal position, vertical position, brightness, contrast, horizontal size, and vertical size. Side pincushion control on some models.
    - Connector for a detachable grounded 3-wire power cord.
    - 1.5-m (4.9-ft) attached signal cable (detachable on some models).
    - Most models have auto-sensing power input for 100 V ac to 240 V ac. Some models are single voltage input or have manual switches to select power input (110 V ac or 220 V ac).

- SVGA Multi-Scanning Monitors include:

    - .28-mm dot pitch multi-scanning, non-interlaced VGA, 800x600 and 1024x768 modes.
    - Power switch. Some models are rated as Power Saver monitors that reduce power consumption when Rapid Resume is enabled. See "Parts Catalog" on page 7-1 for FRU part numbers.
    - Up to seven user controls: horizontal position, vertical position, brightness, contrast, horizontal size, and vertical size. Side pincushion and trapezoidal control on some models.
    - Connector for a detachable grounded 3-wire power cord.
    - 1.5-m (4.9-ft) attached signal cable (detachable on some models).
    - Single voltage input.

Keyboard

101-key, 102-key, or 104-key rubber dome or buckling-spring enhanced keyboard with 1.8-m (6-foot) cable.

Mouse

Mouse with 1.8-m (6-foot) cable

Hardware Interfaces

The following peripheral interfaces for adapters, options, and drives are supported in the system unit.

Table 1-1. Hardware Interfaces			
Item	**Interface**		
Hard disk drives	AT IDE local bus interface (American National Standards Institute–ANSI)		
Input/output (I/O) adapter cards	Adapters that are IBM AT compatible and operate at 8MHz. VESA local bus adapter cards and Plug and Play adapter cards are supported.		
Diskette drives	AT diskette interface		
Math coprocessor	Intel or equivalent		
Video	**Resolution**	**Colors**	**Video Memory**
For refresh rates and monitor frequency settings, see "Refresh Rates and Monitor Frequencies" on page 1-12.	640x480 640x480 640x480 640x480	16 256 65,535 16,777,216	512KB 512KB 1024KB 1024KB
	800x600 800x600 800x600	16 256 65,535	512KB 512KB 1024KB
Physical interface is compatible with the IBM Personal System/2 (PS/2) VGA interface.	1024x768 1024x768	16 256	512KB 1024KB
	1280x1024	16	1024KB
Serial	9-pin connector with RS232D electrical interface		
Parallel	Bidirectional. ECP bidirectional and EPP bidirectional interfaces are supported.		
Pointing device	IBM PS/2-compatible mouse		
Keyboard device	IBM PS/2-compatible enhanced keyboard		
CD-ROM drive	AT IDE, extended architecture (XA) enabled drive		
Sound adapter card	MM3: Sound Blaster (Creative Labs, Inc.) MM4: Aria 16 (Prometheus Products, Inc.) MWave: Combination Modem/Sound Card		
Joystick	Industry-standard device		

Refresh Rates and Monitor Frequencies

This section provides the refresh rates and monitor frequencies for Type I-1 and Type I-2 system boards.

Refresh Rates and Monitor Frequencies—Type I-1

The following table lists the vertical refresh rates for the Type I-1 system board that contains a Cirrus video chip.

Table 1-2. Vertical Refresh Rates (Hz)				
Type I-1 System Board with a 5434 Video Chip				
Resolution	640x480	800x600	1024x768	1280x1024
Allowed Colors	16 to 16,000,000	16 to 64,000	16 to 256	16
Monitor Frequency (Maximum Horizontal Frequency) - Hz				
31.5 KHz	60	—	—	—
35.5 KHz	60	56	87(i)	—
37.9 KHz	72 [1]	60	87(i)	—
48 KHz	72 [1]	75 [2]	60	—
56 KHz	72 [1]	72 [2]	70	87(i)
62 KHz	72 [1]	75 [2]	75	87(i)
[1] **16,000,000 colors uses 60 Hz.** [2] **64,000 colors uses 60 Hz.** **(i) Interlaced**				

Refresh Rates and Monitor Frequencies—Type I-2

The following table lists the vertical refresh rates for the Type I-2 system board that contains a Trident 9680XGi video chip.

Table 1-3. Vertical Refresh Rates (Hz)				
Type I-2 System Board with a Trident 9680XGi Video Chip				
Resolution	640x480	800x600	1024x768	1280x1024
Allowed Colors	16 to 16,000,000	16 to 64,000	16 to 256	16
Monitor Frequency (Maximum Horizontal Frequency) - Hz				
31.5 KHz	60	—	—	—
31.5-36.9 KHz	60	60	87(i)	—
37.0-37.9 KHz	72 [1]	60	87(i)	—
38.0-48.9 KHz	85 [1]	75 [3]	60	—
49.0-59.9 KHz	85 [1]	85 [2,3]	70 [4]	87(i)
60.0-67.9 KHz	85 [1]	85 [2,3]	75	87(i)
68.0+	85 [1]	85 [2,3]	75	60, 96(i)
[1] **60 Hz at 16,000,000 colors with 1MB DRAM.** [2] **75 Hz at 64,000 colors with 1MB DRAM.** [3] **60 Hz at 16,000,000 colors with 2MB DRAM.** [4] **60 Hz at 64,000 colors with 2MB DRAM.** **(i) Interlaced**				

Power-On Password Reset

A power-on password denies access to the system by an unauthorized user when the system is powered on. When a power-on password is active, the password prompt appears on the screen each time the system is powered on. The system unit starts after the proper password is entered.

In some cases, you might be required to service a system with an active and unknown power-on password. To clear a password from the system, first identify the system board power-on jumper by referring to "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5, then follow these steps.

1. Power off the system unit.

2. Unplug the power cable from the electrical outlet.

   Warning: Do not attempt these steps with the power cord plugged into the electrical outlet. The power supply maintains +5 V dc of auxiliary power when the power switch is powered off. System damage might result if the power cord is not unplugged during testing.

3. Locate the power-on password jumper on the system board.

System Board Type	Jumper
System Board Type I-1	Password Jumper JP14
System Board Type I-2	Password Jumper JP12

4. Move the jumper from pins 1-2 to pins 2-3 to erase the password.

5. The system detects the change and the password, time, and date are erased from memory. Rapid Resume settings are also deleted. (See "Rapid Resume" on page 1-20.)

6. Move the jumper from pins 2-3 to pins 1-2 for normal operation.

7. Plug the power cable into the electrical outlet and power on the system unit.

8. Run the Setup Utility to restore the configuration settings. Press **Esc** to save with the password disabled.

9. When you are finished servicing the machine, run the Setup Utility to restore the configuration settings. (You must reset the time, date, and any Rapid Resume settings. See "Rapid Resume" on page 1-20.)

Notes:

1. To reinstall the password, the user must enter a password in the Setup Utility.

2. Disabling the power-on password reconfigures the system. Run the Setup Utility to clear any 16X errors.

3. To determine if the machine you are servicing has the Rapid Resume feature enabled, run the Setup Utility and check to see if Rapid Resume is enabled on the third screen (Page 3).

Flash (BIOS) Update Procedure

```
┌─ Attention ──────────────────────────────────────────────┐
│                                                          │
│  The system board Flash Enable jumper default position is set to │
│  enabled.  If the following flash procedure does not work, verify that the │
│  Flash Enable jumper is set to the enabled position.     │
│                                                          │
│  Also, check the Flash diskette for a README file and if present, review │
│  it for any model-specific information.                  │
│                                                          │
└──────────────────────────────────────────────────────────┘
```

1. Power-off the computer.
2. Insert the Flash diskette into diskette drive A.
3. Power-on the computer.
4. Follow the instructions on the screen to complete the flash (BIOS) update procedure.

Setup Utility

The Setup Utility lets you view and change important information about the computer and its hardware.

Using the Setup Utility

You might need to use the Setup Utility in the following situations:

• If you add or replace a hardware option (such as a diskette drive, memory module, math coprocessor, or monitor), and you want to verify or make a change.

• To verify a change after removing a hardware option.

• If you get an error code and message.

You can also use the Setup Utility to:

• Check the computer's hardware features. For example, you can use this program to check the amount of memory or the size of the hard disk in the computer.

• Change the computer's serial and parallel port settings, and the parallel port mode.

• Set up or change a password on the computer.

• Change the date and time on the computer.

• Reduce the amount of energy the computer uses by setting up the computer's Rapid Resume features.

• Determine which Plug and Play adapter cards you want configured by system BIOS.

Starting the Setup Utility

The Setup Utility displays screens that let you view information about how the computer is set up (called the configuration), or change certain information on the computer. There are two ways to display the Setup Utility screen:

• When you power the computer on, this symbol appears:
Press **F1** while the symbol is displayed to get the Setup Utility screen.

- If you have an error, the computer shows a popup window with an error code and description. Press **Enter** to get the Setup Utility screen (see Figure 1-1 on page 1-18).

The Setup Utility screens display the type of information shown here. The actual screens on the computer might look slightly different, but they operate the same way.

Here are the keys you use to move through and make changes to the Setup Utility screens.

Keys	Function
↑ ↓	Use these arrow keys to highlight an option.
← →	Use these arrow keys to make a selection and change an option.
F1	Help. Press this key if you want more information about an option or using the screen.
F2	General Help. Press this key if you want general information about the computer features.
Page Down	Press this key to see the next page (screen).
Page Up	Press this key to go to the previous page (screen).

- Brackets [ ] show you which options can be changed on the screen.
- The * symbol on the screen shows you that an option has been changed.

Now that you know how to work with the Setup Utility screens, read on to learn about the options you can change on the screen.
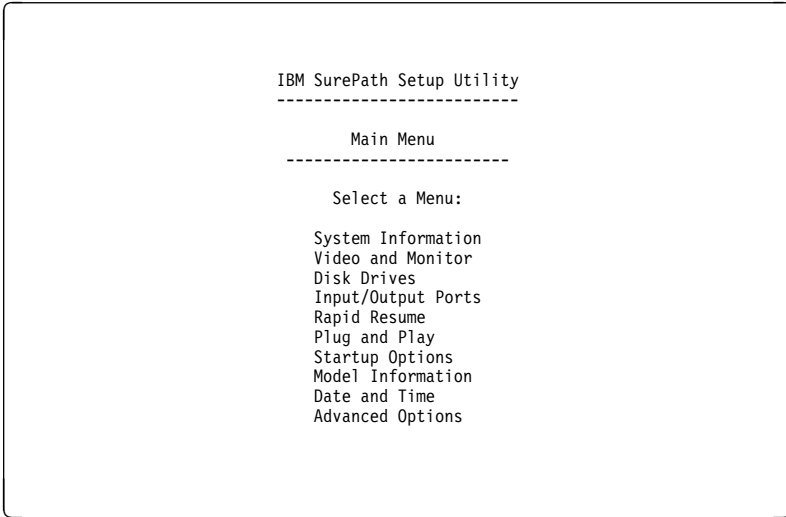
```
┌─────────────────────────────────────────────────────────────┐
│                                                             │
│              IBM SurePath Setup Utility                     │
│              -------------------------                      │
│                                                             │
│                      Main Menu                              │
│              ------------------------                       │
│                                                             │
│                   Select a Menu:                            │
│                                                             │
│                 System Information                          │
│                 Video and Monitor                           │
│                 Disk Drives                                 │
│                 Input/Output Ports                          │
│                 Rapid Resume                                │
│                 Plug and Play                               │
│                 Startup Options                             │
│                 Model Information                           │
│                 Date and Time                               │
│                 Advanced Options                            │
│                                                             │
│                                                             │
│                                                             │
└─────────────────────────────────────────────────────────────┘
```

Figure   1-1. Setup Utility Screen

Making Changes with the Setup Utility

You can change only some of the information that appears on the Setup
Utility screen. The information you can change is always enclosed in
brackets like this: [**Disabled**]. The entries on the screen that you cannot
change provide useful information about the computer and its hardware. For
example, if the mouse is not working or installed incorrectly, the entry will
show if it is disabled or not installed.

Here are the options available on the Setup Utility screens:

System Information: This screen provides a summary of the computer
features. (This is an *information only* screen and cannot be changed.)

Video and Monitor: This screen provides information about the installed
video controller and video memory. It also allows you to change the monitor
frequency and refresh rates, if necessary. The monitor frequency setting
affects the monitor's refresh rate; that is, the rate at which the monitor
redraws the image on the screen. Super VGA (SVGA) and multi-scanning
monitors can refresh text and images faster than other types of monitors.
For more information on monitors and setting the monitor frequency, see
"Hardware Interfaces" on page 1-11.

Disk Drives: This screen provides information about the installed diskette drives, hard disk drives, and CD-ROM installed in the computer. Hard Disk Drive 1 on this screen is the hard disk that came with the computer.

If you add or change a drive, you must select the correct drive type on this screen. If you are adding a hard disk or CD-ROM to the computer, see "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5. If both a CD-ROM drive and a hard disk drive are installed, the jumpers on the hard disk drive must be set to master for the hard drive to appear as Drive 3 on the Setup Utility screen. The CD-ROM must be set as the slave device. It will appear as Drive 4 on the screen.

If a hard disk is the only drive attached to the secondary hard disk drive connector, it appears as Drive 3 on the Setup Utility screen. If two hard disks are attached to this connector, they appear as Drives 3 and 4 on the screen.

Input/Output Ports: This screen allows you to you change the serial and parallel port addresses. Mouse and keyboard information is also provided on this screen.

The computer has two serial ports and one parallel port. Each port has a special address (identifying location) assigned to it. If you add any additional serial or parallel port adapters, make sure that each port has a different address.

- The serial port A default address is 3F8-IRQ4.
- The serial port B default address is 2F8-IRQ3.
- The parallel port default address is 3BCh.

Other serial and parallel port addresses are available. However, if you change an address on this screen, you might also need to make changes to the software. For instructions on changing the software, see the user's guide or online information supplied with the software.

The Parallel Port Mode allows you to change the mode of the parallel port. The standard mode for the parallel port is the Compatible mode. You can increase the efficiency of the parallel port by using Enhanced modes with supporting hardware.

Note: The Enhanced modes use recent technology and are only supported by newer hardware (such as a printer).

If you change the mode of the parallel port, you might need to make changes to the supported hardware and its software.

Rapid Resume: This screen provides information about the Rapid Resume features. Rapid Resume is an exclusive IBM energy-saving feature with many useful options. See "Using Rapid Resume Manager" on page 1-24 for more information.

Rapid Resume can:

- Save the current state of the computer when you power it off. Any applications or programs open when the computer is powered off will be open when the computer is powered back on.
- Automatically power off the computer when you have not used the mouse, keyboard, or hard disk for an amount of time you select. If you have an energy-saving monitor, it will also power off.
- Put the computer in a Standby mode to conserve energy when you have not used the mouse, keyboard, or hard disk for an amount of time you select.
- Reduce the time the computer takes to start up.
- Automatically power on the computer when the phone rings so that the computer can receive a fax (Wake Up on Ring).
- Automatically power on the computer at a date and time you choose (Wake Up on Alarm).

The following are the Rapid Resume options you can change:

APM BIOS Mode: The Basic Input/Output System (BIOS) is the machine language that runs the computer. The APM BIOS Mode option shows you the advanced power management (APM) mode that the operating system's APM driver should use when it communicates with BIOS. For Microsoft Windows, APM BIOS Mode should be set to 32-Bit Protected.

Note: If you are using the OS/2 operating system, select 16-Bit Protected for the APM BIOS Mode.

Rapid Resume: This screen lets you turn Rapid Resume on (`Enabled`) or off (`Disabled`).

Automatic Power Off is the option that allows you to set the amount of time that will pass before the computer powers off automatically. For example: `30 minutes` means that if the mouse, keyboard, or hard disk are not used for 30 minutes, the computer powers off automatically. Only energy-saving monitors will power off automatically with Rapid Resume.

The current state of the computer is saved before the computer powers off. Any applications or programs open when the computer powers off will be open when you power the computer back on.

Initialize Adapter Cards is the option that indicates whether the adapter cards are restarted (initialized) when you power on the computer.

Standby Timer is the option that allows you to set the amount of time that will pass before the computer starts conserving energy. For example: `15 minutes` means that if the mouse, keyboard, and hard disk drive are not used for 15 minutes, the monitor goes blank and the hard disk drive in the computer starts using less power.

Note: Only energy-saving monitors power down during standby.

If you are using the Automatic Power Off feature, the time you set for Standby must be less than the time you set for Automatic Power Off. Otherwise, the computer will power off before it enters Standby.

Standby Snapshot is the option that allows you to have the state of the computer saved when it enters Standby. If the electricity goes out or the computer is powered off while in Standby, the computer resumes at the saved state when you power it back on. Any applications or programs open when the computer shut down will be open when the power returns.

Monitor mode is an option might or might not appear depending on the type of processor installed in the computer. If you see this option, you can change the power mode used to blank the monitor during Standby. If you have an energy-saving monitor, the VESA DPMS setting powers the monitor back on fastest.

Note: Only energy-saving monitors will power down during Standby.

Halt CPU when Idle is the option that allows you to halt the CPU during Standby. This conserves power without affecting the operation of the computer.

Wake Up on Ring is the option that allows you to have the computer power on automatically when the phone rings. This is useful if you have a fax modem and use the computer to receive faxes. To use this feature, you must have an internal modem that supports Wake Up on Ring, or an external modem connected to serial port A on the back of the computer.

Note: With Wake Up on Ring, the computer might power on automatically when you dial out on a rotary or pulse telephone. If this occurs, disable the Wake Up on Ring feature and use it only when you know you will have incoming fax communications.

Indicator is a Wake Up on Ring feature that makes the power light blink at a constant rate to indicate that the computer answered the phone one or more times. The Indicator resets when you power the computer on.

Wake Up on Alarm is the option that allows you to have the computer power on automatically at a date and time you specify. Choose the date and time in the Alarm Date and Alarm Time fields. If you select Daily Event, you can set the Alarm Time, but not the Date.

Alarm Date and Time are options that allow you to set the date and time you want the computer to power on automatically. Enter the date in the format shown on the screen.

Type the time in 24-hour format. For example:

12 midnight is	**00:00**
12 noon is	**12:00**
1 p.m. is	**13:00**

Plug and Play: This screen provides information about the Plug and Play features. The screen includes the Auto Configure Cards option, and a list of all Plug and Play adapter cards installed in the computer.

Auto Configure Cards is an option that allows you the choice of:

• All Plug and Play adapter cards configured by system BIOS
• Only Plug and Play adapter cards required to boot the system configured by system BIOS

If you have a Plug and Play operating system, the computer might function better if only the Plug and Play adapter cards required to boot the system are configured by system BIOS. If you choose to have only the adapter cards required to boot the system configured by system BIOS, use the operating system's Plug and Play utilities to configure the other Plug and Play cards.

Plug and Play Adapter Cards is the option that lists all the Plug and Play cards you have installed in the system unit.

Note: Only the newest operating systems support Plug and Play adapter cards. See the documentation supplied with the operating system to determine if it supports Plug and Play adapter cards.

Startup Options: This screen provides information about the computer power on (startup) sequence. When you power the computer on, it looks for the operating system files. Use the Startup Sequence option to tell the

computer where to look for these files. The computer can search for these files on a diskette, an adapter card, a network, or a hard disk.

The system's startup sequence automatically looks for the operating system files on the hard disk if the files are not found on diskette.

Model Information: This screen provides model number, serial number, BIOS version level number, and BIOS manufacturing date.

Date and Time: This screen allows you to change the date and time on the computer. The changes take effect immediately. Type the date in the format shown on the screen.

Type the time in 24-hour format. For example:

12 midnight is   **00:00**
12 noon is   **12:00**
1 p.m. is   **13:00**

Advanced Options: This screen provides the following features that the computer supports.

- Security options (power-on password, diskette drive, keyboard)

  Power-On Password is the option that allows you to create a power-on password to restrict the use of the computer. Each time the computer is powered on, you must enter this password before you can use the computer. A password can be up to seven characters long (letters, numbers, or both). Once you create the password, be sure to write it down and put it in a secure place.

  Diskette Drive Access allows you to enable or disable the diskette drive access.

  Operate without Keyboard allows you the enable or disable the keyboard.

  Operate without Diskette Drive(s) allows you to enable or disable the diskette drive.

- Cache options (cache size, cache state)

  This option shows the amount of internal cache memory in the computer's processor. You cannot add internal cache memory to the computer.

  Cache memory is special buffer storage that holds frequently used instructions and data, and works faster than main storage. With cache memory installed, the applications and programs run faster. You can disable cache memory to slow down the computer.

- ROM shadowing

  This feature provides memory boundary information.
- Memory options

  This feature provides standard and EDO feature information.
- PCI card options

  This feature allows you to enable or disable card bus mastering.

Using Rapid Resume Manager

The IBM Aptiva is supplied with special software called Rapid Resume Manager that makes using the computer easier and more economical.

Rapid Resume Manager Features

The Rapid Resume Manager has the following features:

Rapid Resume: Remembers all open or running applications when you power off the computer. The next time you power on the computer, the programs and files will open just as you left them. The Automatic Power Off option saves energy by turning the computer off after it has not been used for a period of time that you set.

Standby: Lets the computer use less energy after it has been inactive for a period of time that you set.

Scheduler: Turns on the computer for an activity that you specify, such as sending a fax.

Wake Up on Ring: Turns on the computer when the phone rings to let you receive a fax.

The following table describes the way the computer will normally operate when one of the Rapid Resume Manager features is enabled. See the online Aptiva Index for step-by-step instructions for enabling Rapid Resume Manager features.

Table 1-4. Rapid Resume Manager Normal Operation	
What Happens	**Explanation**
Task List appears after turning on the computer.	This is a normal feature of Rapid Resume. Use the Task List to return to an application or disable the Task List in the Rapid Resume options window.
Delay before mouse works.	This is normal for the Standby feature of Rapid Resume. It might take a few seconds.
Computer waits before turning off.	This is normal. In some cases, it can take up to several seconds before Rapid Resume saves the data and turns off the machine.
Can't start the computer from diskette if Rapid Resume is enabled.	After you power on the computer, press **Ctrl+Alt+Del** when you see the Rapid Resume screen. There might be a slight delay before the computer restarts.
Computer comes on when the phone rings.	This is a normal feature of Wake Up on Ring. Disable Wake Up on Ring in Rapid Resume Manager or in the Setup Utility.
Computer comes on when you haven't pushed the on/off button.	This is a normal feature of Scheduler. If you don't want this to happen, disable Scheduler in Rapid Resume Manager or Wake Up on Alarm in the Setup Utility.
System unit power indicator light is blinking, but system unit is turned off.	This is a normal feature of Wake Up on Ring enabled with the Ring Indicator option selected. A fax might be waiting.

Rapid Resume Connectors

The Rapid Resume feature connectors on the system board are one 3-pin latched connector for the power supply and one 2-pin latched connector for the power switch and cable assembly. To remove the latched connector, press in the latch using the tip of a screwdriver to release the connector. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for connector locations.

Warning: Do not attempt repairs with the power cord plugged into the electrical outlet. The power supply maintains +5 V dc of auxiliary power when the power switch is turned off. System damage might result if the power cord is not unplugged during testing.

POST Error History

The computer automatically keeps a history of the last three POST errors.
You can access the POST Error History by pressing **F9** while the POST

Configuration icon appears. The POST Error History shows the last
three error codes in a list, with the most recent error code added to the
bottom of the list, as shown in Figure 1-2.

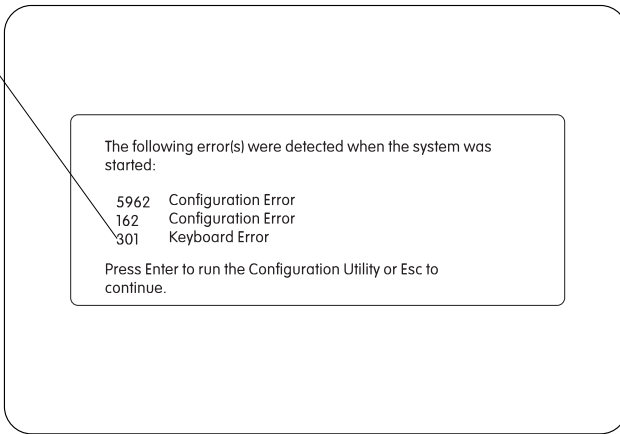Most recent error
code is listed
at bottom

The following error(s) were detected when the system was
started:

5962   Configuration Error
162   Configuration Error
301   Keyboard Error

Press Enter to run the Configuration Utility or Esc to
continue.

Figure   1-2. POST Error History

Note: The POST Error History is emptied whenever the password is reset
from the system board or the battery runs out of power. If Rapid Resume is
enabled, press **F9** when the memory count and POST Configuration icon
appear.

System Memory

The system board supports gold-contact socketed 72-pin single in-line memory modules (SIMMs). SIMMs supported are 70 ns and can be either 32 bits or 36 bits wide. See "SIMM Configurations—Type I-1" on page 5-18 and "SIMM Configurations—Type I-2" on page 5-20 for installation information.

SIMM Identification

72-pin memory SIMMs are usually marked with a label that shows the size and speed (for example, `1Mx36, 70 ns`). SIMMs that are not clearly labeled cannot be identified other than by part number. Consult the SIMM manufacturer documentation to identify SIMMs.

Specifications

Size:

- Machine Type 2144 system unit
    - Width: 360 mm (14.2 in.)
    - Depth: 443 mm (17.4 in.)
    - Height: 130 mm (5.1 in.)
- Machine Type 2168 system unit
    - Width: 242 mm (9.5 in.)
    - Depth: 416 mm (16.4 in.)
    - Height: 427 mm (16.8 in.)
- Monitor
    - Width: 378 mm (14.9 in.)
    - Depth: 403 mm (15.9 in.)
    - Height: 418 mm (16.5 in.) with tilt/swivel stand

Weight:

- Machine Type 2144 system unit
    - 9 kg (20 lb)
    - If CD-ROM drive installed, 10 kg (22 lb)
- Machine Type 2168 system unit
    - 10.9 kg (24 lb)
    - If CD-ROM drive installed, 11.8 kg (26 lb)
- Monitor
    - 14.5 kg (32 lb)

Environment:

- Temperature, system unit and monitor
  - Power on: 10° to 35°C (50° to 95°F)
  - Power off: 10° to 40°C (50° to 104°F)
- Humidity, system unit and monitor
  - Power on: 8% to 80%
  - Power off: 8% to 80%
- Maximum altitude: 2134 m (7000 ft)

Heat output:

- Machine Type 2144 system unit
  Typical (as shipped): 136 Btu/hr
  Maximum load: 272 Btu/hr
- Machine Type 2168 system unit
  Typical (as shipped):   136 Btu/hr
  Maximum load: 445 Btu/hr
- Monitors
  - Typical: 323 Btu/hr
  - Maximum Load: 375 Btu/hr

Electrical:

- Input voltage for system unit and monitor (sinewave input is required)

  Low Range

  Nominal: 100 V ac to 127 V ac
  Maximum: 90 V ac to 132 V ac

  High Range

  Nominal: 200 V ac to 240 V ac
  Maximum: 180 V ac to 259 V ac

Operating Requirements

All machines have two power-on switches: one on the system unit and one on the display (if the display was shipped with the model). Some high voltage machines (180–259 V ac) might have a power cord from the display to the system unit and a non-switched appliance connector.

High voltage Northern and Southern Hemisphere SVGA displays might come with a voltage selector switch, allowing selection of voltage of either 110 V ac or 220 V ac. This switch must be in the 220 V ac position when the machine is plugged into a 220 V ac electrical outlet.

When the system unit is powered off for 10 seconds or more and then powered on, the power supply generates a "power good" signal that resets the system logic.

Note: Whether or not Rapid Resume is enabled, the on/off switch on the system unit **does not** completely power off the power supply. Also, the appliance outlet connector is always powered on when the system unit is plugged into an electrical outlet. See "Rapid Resume" on page 1-20 for more information.

A Note About Energy Saver Monitors

- Monitors rated as "Energy Saver" models use less than 30 W when operating in the energy-saving mode or when the system unit is powered off.
- To extend monitor life, the monitor should be powered off at the end of each day.

Special Tools

The following special tools are required to service this system:

- A meter similar to the Triplett Model 310 (P/N 9900167)
- Wrap plug, P/N 72X8546
- Video memory removal tool, P/N 9900764

Check Procedures

Start

This is the entry point for all check procedures. The check procedures use failure symptoms, POST error codes, or beeps to help determine the failing field replaceable unit (FRU). Follow the suggested check procedures or use the Advanced Diagnostics diskettes to determine the problem FRU.

The Advanced Diagnostics program comes on one diskette supplied with this book. Use only this diskette for all **Service Level** I IBM Aptiva Personal Computers.

The Advanced Diagnostics program is intended to test only IBM products. Non-IBM products, prototype cards, or modified options can give false errors and invalid system responses.

All voltages in the check procedures are positive unless otherwise shown. And, use frame ground for all voltage checks unless otherwise specified.

Note: If the check procedures instruct you to replace a FRU and the error message remains the same, an option adapter card may be causing the failure. Remove all option adapter cards, one at a time, until the error changes or the problem is no longer apparent. Replace the last option adapter card removed.

The hard disk drive contains preloaded software. Refer to "Software Installation Procedure" on page 4-42 to reinstall the original software. Be sure to reload the software on the primary hard disk drive (drive C) when replacing it.

Note: The drives in the system you are servicing might have been re-arranged or the drive startup sequence changed. Be extremely careful during write operations, such as copying, saving, or formatting. Data or programs can be overwritten if you select an incorrect drive.

   Ask the customer to back up any additional software from the hard disk drive before you take any action.

How to Diagnose Combined FRUs: If an adapter or device consists of more than one FRU, any of the FRUs may cause an error code. Before replacing the device or adapter, remove the FRUs, one by one, to see if the symptoms change.

If you have been directed here from another check procedure and were instructed to replace the system board, and that does not correct the problem, reinstall the original system board and go through "Start" again.

POST Error Codes: A POST error code can occur in three ways:

1. Under the System Memory count at the upper-left corner of the screen.

   Note: A memory error can appear without the memory count as a 203 address error.

2. After two beeps, followed by an error code and/or explanatory message.

3. As a sequence of beeps with no other messages or error codes displayed.

   Note: It may take a minute or more for the system to respond with error messages or beeps.

If you have an XX62 error with no other error codes, run the Setup Utility (see "Starting the Setup Utility" on page 1-16) and note any flagged options. Note the XX62 error or flagged option and try to add it from the Configuration Utility screen. If the option cannot be added, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10 for additional help.

If you want to print a copy of a Setup Utility screen on an attached printer, press **Print Screen** while the screen is displayed.

How to Use Error Messages: Use the messages, error codes, and beep combinations that occur to diagnose failures. If more than one failure occurs, diagnose the first failure first. The cause of the first failure can result in false messages, error codes, or beeps. If you did not receive any messages, error codes, or beeps, see if the symptom is listed in "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

| 001 |

To begin this check, note the following:
– To disable or reset the power-on password, see "Power-On Password Reset" on page 1-14.
– Refer to "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for the correct jumper positions.
– Disconnect all external cables and devices from the system unit, except for the keyboard, mouse, and monitor.
– Power off the system unit whenever removing or replacing FRUs.
– Remove all adapter cards from the riser card, except for the factory-installed FAX/modem adapter card (if installed) and any IBM Aptiva factory-installed adapter cards. Some riser cards have a VESA local bus connector.
(Step **001** continues)

001 (continued)
– Remove all telephone cables from the modem (if installed).
– Disconnect any drives except:

  • 3.5-in. diskette drive
  • Hard disk drive (some machines may have up to 4 hard disk drives installed.)
  • IBM Aptiva factory-installed devices (such as a CD-ROM drive).

– Ensure all power cords and cables are connected properly.
– Ensure the monitor brightness and contrast controls are not turned down.
– Ensure the sound volume control is not turned down and the speakers are powered on.
– Power on the system unit.

  Note: Some monitors have a detachable system I/O signal cable between the monitor and the system unit. In either case, check the power cord or cable before replacing the unit. See "Detachable Monitor I/O Signal Cable Connector Test Points" on page 5-21 for pin identification.

  High voltage Northern and Southern Hemisphere monitors may come with a voltage selector (110 V–220 V) switch. The 145-W power supply may have a voltage selector (110 V–220 V) switch. Match the switch to the line voltage.

– Ensure the correct monitor frequency is set in the Setup Utility for the monitor used with the system (see "Using the Setup Utility" on page 1-16). If the monitor frequency is set incorrectly, the monitor may not be readable in certain modes. To determine the correct monitor frequency, look on the monitor for the part number, or see the product information shipped with the monitor. Set the monitor frequency equal to or less than the monitor's maximum horizontal frequency (also known as the horizontal scan rate). See "Refresh Rates and Monitor Frequencies" on page 1-12.
– Note any symptoms, messages, error codes, or beeps.
– Make sure there are no diskettes or CDs in the drives.
DOES THE SYSTEM COMPLETE POST WITH ONE SHORT BEEP AND DOES AN IBM Aptiva SOFTWARE SCREEN APPEAR?

Note: If you see the words "Rapid Resume" appear at the bottom of the screen following the POST icon screen, answer this question "No."

Yes No

> **002**
>
> – If Rapid Resume is enabled, you must disable Rapid Resume in the Setup Utility, and enable it again upon completion of service.

To disable Rapid Resume without changing the customer settings:

1. Make sure the customer saves and closes any open files.
2. Press **Ctrl+Alt+Del** while the words "Rapid Resume" appear at the bottom of the screen following the POST icon screen.
3. When the system reboots, press **F1** while the POST icon is displayed.
4. In the Setup Utility, select the Rapid Resume option from the main menu.
5. Write down the present setting for the `APM BIOS Mode` (top line of screen) and press the ↓ key to select `Disable` in the **APM BIOS Mode** field.
6. Press **Esc**, select **Yes**, and press **Enter** to save the changes.
7. The Rapid Resume feature is now disabled.

When service is complete, restore the setting you wrote down in Step 5 (the original customer settings). The factory setting for the **APM BIOS Mode** field is 32-Bit Protected mode.

1. Power on the system unit.
2. Press **F1** while the memory count is running.
3. In the Setup Utility, select the Rapid Resume option from the main menu.
4. Press the ↑ key to select the previous customer setting (that you wrote down in Step 5 in the **APM BIOS Mode** field.
5. Press **Esc**, select **Yes**, and press **Enter** to save the changes.

   The system is now returned to the Rapid Resume customer settings.

   – Go to Step 005.

| 003 |

Insert the Advanced Diagnostics diskette **Service Level** I in drive A.
DOES THE SYSTEM LOAD THE ADVANCED DIAGNOSTIC PROGRAM FROM THE 3.5-IN. DISKETTE DRIVE (DRIVE A) WHEN POWERED OFF AND THEN ON?
Yes No

| 004 |

– Go to "Factory-Installed Drive Devices" on page 2-38.

| 005 |

(From step 002)
(Step **005** continues)

(continued)

005 (continued)
DO ANY MESSAGES, ERROR CODES, OR SYMPTOMS APPEAR?
Yes   No

> **006**
>
> – Go to Step 008.

007

– Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on
  page 2-10.

008

(From step 006)
– Power off the system unit.
– If not already inserted, place the Advanced Diagnostics diskette in drive A.
– Power on the system unit, and check for the following responses:

1. One short beep
2. Diagnostic screen

DID THE SYSTEM PRODUCE THE BEEP AND DIAGNOSTIC SCREEN?
Yes   No

> **009**
>
> – Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on
>   page 2-10.

010

• If the keyboard responds incorrectly, go to "Keyboard" on page 2-32.
• If the monitor shows problems, such as jittering, shifting, or being out of
  focus, go to "Monitor" on page 2-54 and run the Advanced Diagnostics
  tests.
• If a message or error code is displayed, go to "Index of Symptoms,
  Messages, Error Codes, or Beeps" on page 2-10.

– Select **0 (SYSTEM CHECKOUT)** on the diagnostic screen.
– Press **Enter**.
Compare the Installed Devices list with the actual options installed in the
system unit.
(Step **010** continues)

010 (continued)
DOES THE INSTALLED DEVICES LIST CORRECTLY IDENTIFY THE DEVICES INSTALLED IN THE SYSTEM UNIT?

Note: If necessary, remove the cover and visually compare the devices installed in the system unit to those shown in the installed devices list.

Yes No

> **011**

– Press **N**, then press **Enter**.

Note: A 199 error at this point indicates you answered "No" to the question above. Disregard the error.
– Select **0** to add items. Press **Enter**.
– Select the number of the item you want to add and then press **Enter**.
– Press **Y**, then press **Enter**.
– Select the **0 (RUN TESTS ONE TIME)** option, then press **Enter**.
– Select only the item that you added to test, then press **Enter**.

Note: The Installed Devices list shows only those devices supported by the Advanced Diagnostics diskette and only factory-installed devices for the model you are servicing. If a device is missing from the list and is not factory installed, refer to the service manual provided for that device. (Refer to the Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 to determine the factory-installed devices in the model you are servicing.)

If a factory-installed drive device or adapter card is not listed in the Installed Devices list, go to either "Diagnostics for Factory-Installed Drive Devices Not Supported by Advanced Diagnostics" on page 2-40 or "Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43.

WERE YOU ABLE TO CORRECT THE INSTALLED DEVICES LIST TO MATCH THE DEVICES INSTALLED IN THE SYSTEM UNIT, WITHOUT RECEIVING AN ERROR CODE OR MESSAGE?
Yes No

> **012**

(Step **012** continues)

(continued)

012 (continued)
– If you receive any messages, error codes, or beeps while running a diagnostic test, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.
– If you are told to replace a failing device, first make sure all switches, power connectors, cables, and jumpers are set correctly and show the correct voltages. Go to "Power Supply" on page 2-26 and "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5.
– Power off the system unit and wait 10 seconds.   ds.
– Power on the system unit.
– Run the Advanced Diagnostics again to ensure there are no other system failures. If you return to this point a second time, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

013

– Run the System Checkout test again to ensure the system is operating normally.

014

– Press **Y**, then press **Enter**. Follow the instructions on the screen.
– Select the number of times to run the test.
– Press **Enter**.
– Select the option you want to test, or press **Enter** to select all options.

  Note: If you receive a 199 error, or if you have an undetermined problem, run all tests.

DOES THE DIAGNOSTIC TEST FINISH WITHOUT ERROR CODES?
Yes No

015

– If the last test stops and you cannot continue, first make sure all switches, power connectors, cables, and jumpers are set correctly and show the correct voltages and continuity.
– Make note of any messages, error codes, beeps, or new symptoms. Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

016

(Step **016** continues)

016 (continued)
– The Advanced Diagnostics did not detect a failure. If the system still
  displays a failure:

  • Check all adapter card jumper settings.

  • Check all adapter card switch settings.

  • Check all adapter card cables and connectors for proper installation.

  • Make sure all of the above are set correctly and show the correct
    voltages and continuity. Replace any defective cables or adapter
    cards. See "Power Supply" on page 2-26 and "System Board
    Layout—Type I-1" on page 5-2 and "System Board Layout—Type
    I-2" on page 5-5.

– Run the Advanced Diagnostics for All Devices with the **0 (RUN TESTS
  ONE TIME)** option.
– If an error or other symptom is displayed, go to "Index of Symptoms,
  Messages, Error Codes, or Beeps" on page 2-10.
– If no error can be detected or the symptom is intermittent, start an error
  log. See "Error Log for Intermittent Problems" on page 3-10.

Index of Symptoms, Messages, Error Codes, or Beeps

Table 2-1 on page 2-11 lists failure symptoms and possible causes. The most likely cause is listed first. When servicing a system, always begin with "Start" on page 2-2. This index can also be used to help you decide which FRUs to have available when servicing a system.

If you are unable to correct the problem using this index, go to "Undetermined Problem" on page 2-62.

Notes:

1. If an error message and incorrect audio response occur, diagnose the error message first.

2. If you cannot run the Advanced Diagnostics tests but did receive a POST error code, diagnose the POST error message.

3. If you did not receive any error message, look for a description of your error symptoms in the first part of this index.

4. Check all power supply voltages and jumper settings before you replace the system board. Also check the power supply voltages if you have a system no-power condition. See "Power Supply" on page 2-26 and "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5.

In Table 2-1 on page 2-11, an **X** in an error code may be any number. If you are unable to correct the problem using this index, go to "Undetermined Problem" on page 2-62.

If you observe:	Go to:
Symptoms that are not beeps or error codes	Page 2-11
Beeps in any combination	Page 2-19
Error codes displayed on the screen	Page 2-20

Table 2-1 (Page 1 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps

Symptoms, Messages, Error Codes, or Beeps	Action/FRU
Note: To diagnose a problem, first find the symptom, message, error code, or beeps in column 1. If directed to a check procedure, replace the FRU indicated in the check procedure. If no check procedure is indicated, the first Action/FRU listed in column 2 is the most likely cause.	
Symptoms	
No beeps, power supply running, no other symptoms.	System is working normally.
No system power, or fan not running.	"Power Supply" on page 2-26 Power switch assembly Power supply System board
Processor speed seems slower.	"Memory" on page 2-30 Cache memory System board
System unit does not turn off with power switch. (System unit must be unplugged from electrical outlet to completely turn off.)	"Power Supply" on page 2-26 Power switch assembly System board
Machine works but fails to go into Rapid Resume mode when configuration is set with Standby mode enabled or Rapid Resume mode enabled.	Software application was fully activated before on/off switch was pushed. Try operating Rapid Resume from Microsoft Windows Program Manager panel.
When you try to enable or disable Rapid Resume, the Rapid Resume configuration screen is not available from the Setup Utility screen.	System board
Wake Up on Ring feature fails to power on system when enabled in Setup Utility.	"FAX/Modem Adapter" on page 2-49 Modem Wake Up on Ring jumper connection/cable System board

Table 2-1 (Page 2 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
Communication problem. Modem does not work properly.	"FAX/Modem Adapter" on page 2-49 Modem connection/switch settings Modem Wake Up on Ring jumper connection/cable Riser card System board
FAX/voice modem has no sound output. (Data files are received normally; sound adapter card works correctly.)	Check sound adapter card and multiplexer software settings and FAX/voice modem sound cable to sound adapter card connections. FAX/voice modem sound cable FAX/voice modem card
FAX/voice modem does not receive data files.	"FAX/Modem Adapter" on page 2-49 Modem connection/switch settings Modem Riser card System board
FAX/voice modem has no sound output. (Data files are received normally; sound adapter card does not produce sound or cannot be activated in software.)	"Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43. Sound adapter card Riser card System board
Diskette drive indicator LED remains on or does not light when drive is active.	Diskette drive connection/cable Diskette drive System board

Symptoms, Messages, Error Codes, or Beeps	Action/FRU
Hard disk or power-on indicator LED does not light but machine functions normally otherwise.	Check J26 voltages with power on: **J26** **Hard Disk** **Pin** **Normal** **Running** 1 +5 V dc 0 V dc 2 +5 V dc +5 V dc 3 +5 V dc +5 V dc 4 0 V dc 0 V dc Pins 1, 2 = Hard Disk Drive Pins 3, 4 = Power-on LED LED connection/cable assembly System board
No beep during POST but computer works correctly.	As a quick check for the speaker or beeper: 1. Power off the system unit. 2. Disconnect the speaker cable assembly, if present. 3. Place a jumper on the speaker connector, pins 1, 2. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5. 4. Power on the system unit. 5. Listen for a beep from the system board beeper. Speaker cable assembly (if you hear a beep) System board
`Insert a Diskette` message icon appears when a known good Advanced Diagnostics diskette is inserted in the 3.5-in. diskette drive.	Ensure the hard disk drive and diskette drive are not disabled in the startup sequence in the Setup Utility. Hard disk drive preloaded software Hard disk drive connection/cable/jumpers Diskette drive connection/cable Diskette drive System board

Table 2-1 (Page 4 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps

Symptoms, Messages, Error Codes, or Beeps	Action/FRU
Program loads from the hard disk with a known-good diagnostics diskette in the first 3.5-inch diskette drive (and diskette drive is enabled in the Setup Utility).	"Factory-Installed Drive Devices" on page 2-38 Diskette drive System board Power supply
A `nonsystem disk or disk error` message appears with a known-good Advanced Diagnostics diskette.	Diskette drive connection/cable Diskette drive System board
An `Invalid Format - Bad Track` error message appears when trying to format a known-good diskette.	Diskette drive connection/cable Diskette drive System board
System fails to load the Advanced Diagnostic diskette. System preloaded software works correctly.	Make sure the Setup Utility has the startup sequence set with `Diskette` enabled. "Factory-Installed Drive Devices" on page 2-38 Diskette drive connection/cable Diskette drive System board
Incorrect memory size shown or repeated during POST.	"Memory" on page 2-30
Some or all keys on keyboard do not work.	"Keyboard" on page 2-32 Keyboard Keyboard connection/cable System board
Real-time clock is inaccurate.	Time set incorrectly by user. CMOS clock/battery (if less than 2.8 V dc) System board
Cannot finish diagnostic test.	"Advanced Diagnostics Device Presence Test" on page 2-34
3.5-in. diskette drive or 5.25-in. diskette drive does not work.	"Factory-Installed Drive Devices" on page 2-38 Diskette drive connection/cable Diskette drive System board

Symptoms, Messages, Error Codes, or Beeps	Action/FRU
Blinking cursor only and machine not working normally.	"Factory-Installed Drive Devices" on page 2-38 Diskette drive connection/cable Diskette drive System board
Serial or parallel port device failure (adapter port).	"Factory-Installed Drive Devices" on page 2-38 Test using a wrap plug while running Advanced Diagnostics. Device Cable/connections Alternate adapter System board Riser card
Parallel port or serial port failure (system board port).	"Advanced Diagnostics Device Presence Test" on page 2-34 Test using a wrap plug while running Advanced Diagnostics. Cable/connections System board
Monitor problem: • Incorrect colors • No high intensity • Missing, broken, or incorrect characters • Blank monitor (dark) • Blank monitor (bright) • Distorted image • Unreadable monitor • Other monitor problems	"Monitor" on page 2-54 I/O monitor signal connection/cable Monitor System board
Intensity or color varies from left to right of characters and color bars.	"Monitor" on page 2-54 System board
Other monitor problem not listed above (including blank or illegible monitor).	"Monitor" on page 2-54 System board
Changing colors.	"Monitor" on page 2-54

Table 2-1 (Page 6 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
Sound adapter card or factory-installed adapter card software gives a Microsoft Windows error message after POST configuration. Hardware problem occurred.	"Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43 Sound or adapter card connection/cable Sound or adapter card jumper settings Sound or adapter card
Audio software program invoked but no sound comes out of speakers.	"Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43 Sound adapter card connection/cable/jumpers Sound adapter card volume control Speakers Sound adapter card
Audio software program does not initiate in software but CD-ROM drive works normally.	"Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43 Sound adapter card jumper settings Sound adapter card
CD-ROM drive LED came on and stayed on more than 20 seconds before shutting off. Software asks to install disc. Software displays a `Reading CD error`.	CD is not inserted properly. CD is damaged. CD has dirt or foreign material on it.
CD-ROM drive LED comes on when inserting a disc but no CD-ROM drive icon appears in the File Manager as Drive D.	"Factory-Installed Drive Devices" on page 2-38 CD-ROM drive connections/cables/jumpers CD-ROM drive
CD-ROM drive LED does not come on when inserting a disc in the drive when the system is powered on and the CD-ROM drive power connector has the correct voltage.	"Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43 CD-ROM drive

Table 2-1 (Page 7 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps

Symptoms, Messages, Error Codes, or Beeps	Action/FRU
CD-ROM drive LED does not come on but CD-ROM drive works normally.	CD-ROM drive
CD-ROM drive does not load or eject when the system is powered on, the LED light is off, and the eject button is pressed and held.	"Factory-Installed Drive Devices" on page 2-38 CD-ROM drive system connection/cable CD-ROM drive Power supply
CD-ROM drive does not read data files and no error codes or messages are displayed. `Cannot read from Drive E. Retry loading CD` message is displayed with disc loaded in CD-ROM drive. Sound adapter card works properly.	"Diagnostics for Factory-Installed Drive Devices Not Supported by Advanced Diagnostics" on page 2-40 Check with a known good disc and correct level of software. CD-ROM drive
CD-ROM drive does not play an audio disc. Sound adapter card works properly. CD-ROM drive reads data files.	"Diagnostics for Factory-Installed Drive Devices Not Supported by Advanced Diagnostics" on page 2-40 Audio cable on CD-ROM drive is not connected to sound adapter card. If music can be heard through headphones plugged into the sound adapter card jack, replace the CD-ROM drive.

Table 2-1 (Page 8 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
Joystick does not respond at all.	1. Ensure the joystick is plugged completely into the joystick/MIDI adapter plug on the sound adapter card and secured with the screws on the adapter plug. 2. Verify that the software application used with the joystick has joystick support. 3. Ensure the joystick is enabled in the software application. This may require entering keystrokes or a configuration utility in the software application. If the above steps find no problem, see the "Joystick does not work correctly" symptom below.
Joystick does not work correctly (installation is correct—see above symptom).	1. Disable the joystick in the software application. 2. Enable the mouse as the input device in the software application. 3. If the mouse works in the software application, replace the joystick. If the symptom remains, replace the sound adapter card. 4. If the mouse does not work, check the software application troubleshooting information provided by the manufacturer.
Printer problems.	Refer to the service manual for the printer.
Any other problem.	"Undetermined Problem" on page 2-62

Table 2-1 (Page 9 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps

Symptoms, Messages, Error Codes, or Beeps	Action/FRU
Beeps	
Note: The system has an error if you hear one or more beeps in a row before POST is completed.	
No beep and: • Blank or unreadable monitor • Blinking cursor	"Power Supply" on page 2-26
Repeating short beeps	"Keyboard" on page 2-32 Keyboard (sticking key) Keyboard connection/cable System board
One long beep, one short beep	"Memory" on page 2-30 Refer to "SIMM Configurations—Type I-1" on page 5-18 and "SIMM Configurations—Type I-2" on page 5-20 for correct installation. SIMM(s)
One long beep, two or three short beeps (Video POST error)	System board jumper settings. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5. Optional video memory System board
One long beep, three short beeps, one long beep	"Memory" on page 2-30 Refer to "SIMM Configurations—Type I-1" on page 5-18 and "SIMM Configurations—Type I-2" on page 5-20 for correct installation. SIMM(s)
Two short beeps and: • Blank or unreadable monitor • Distorted monitor image	CMOS clock/battery (if less than 2.8 V dc, or removed from system unit for some time, or with no AC power to system unit) Monitor I/O monitor signal connection/cable System board
Any other beeps	"Undetermined Problem" on page 2-62.

Table 2-1 (Page 10 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
Error Codes	
10X - System board error or continuous beep	System board
110 - System board parity error	"Memory" on page 2-30
	Set memory installed in Setup Utility for non-parity SIMMs; check parity jumper setting. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5.
	SIMMs System board
111 - I/O channel parity error	"Memory" on page 2-30
	I/O channel memory Riser card System board
114 - External ROM checksum error	"Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43
	Adapter card Riser card System board
12X - Processor error	Run the Setup Utility. See "POST Error Codes" on page 2-3.
	Processor System board
13X - System board error	Run the Setup Utility. See "POST Error Codes" on page 2-3.
	Processor System board
161 - Low CMOS battery	CMOS clock/battery (if less than 2.8 V dc)
	Run the Setup Utility. See "POST Error Codes" on page 2-3.
	System board

Table 2-1 (Page 11 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
162 - CMOS RAM error	CMOS clock/battery (if less than 2.8 V dc)
	Run the Setup Utility. See "POST Error Codes" on page 2-3.
	System board
163 - Real-time clock error	Set date and time
	Run the Setup Utility. See "POST Error Codes" on page 2-3.
	CMOS clock/battery (if less than 2.8 V dc) System board
164 - Memory size error	"Memory" on page 2-30
	Check SIMM installation and parity jumper settings. Run the Setup Utility. See "POST Error Codes" on page 2-3. See also "SIMM Configurations—Type I-1" on page 5-18 and "SIMM Configurations—Type I-2" on page 5-20.
	SIMMs I/O channel memory System board
1XX errors not listed above	System board
20X - Memory error	"Memory" on page 2-30
	SIMMs I/O channel memory System board
221 - Shadow RAM error	"Memory" on page 2-30
	SIMMs I/O channel memory System board
225 - SIMM installed in wrong socket	Refer to "SIMM Configurations—Type I-1" on page 5-18 and "SIMM Configurations—Type I-2" on page 5-20 for correct installation.
228 - External cache tag RAM error	Optional cache tag address module

Table 2-1 (Page 12 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
229 - External cache memory test error	"Memory" on page 2-30 Cache tag address module and RAM System board
262 - DRAM parity configuration error	"Memory" on page 2-30 Run the Setup Utility. See "POST Error Codes" on page 2-3. SIMMs System board
264 - External cache memory size error	"Memory" on page 2-30 Cache tag address module and RAM System board
305 - System board nonreplaceable fuse can be blown by a defective keyboard, keyboard cable, or mouse. If you suspect one of these FRUs, replace it when you replace the system board.	"Keyboard" on page 2-32 Keyboard Keyboard connection/cable Mouse System board
3XX - Keyboard error	"Keyboard" on page 2-32 Keyboard connection Keyboard System board
601 - Diskette drive controller error	System board
61X - Diskette drive test error	"Factory-Installed Drive Devices" on page 2-38 Diskette drive connection/cable Diskette drive System board
62X - Diskette drive test error	"Factory-Installed Drive Devices" on page 2-38 Reformat test diskette Diskette drive connection/cable Diskette drive System board

Table 2-1 (Page 13 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
662 - Diskette drive configuration error	"Factory-Installed Drive Devices" on page 2-38 Diskette drive connection/cable Diskette drive Power supply System board
7XX - Math coprocessor error	"Advanced Diagnostics Device Presence Test" on page 2-34 Upgrade coprocessor (Check Setup Utility and jumpers.) System board
962 - Parallel port conflict	Test using a wrap plug while running Advanced Diagnostics. "Advanced Diagnostics Device Presence Test" on page 2-34 Parallel port Parallel adapter card Riser card System board
90X - Parallel port test error	Test using a wrap plug while running Advanced Diagnostics. "Advanced Diagnostics Device Presence Test" on page 2-34 Parallel port System board
1162 - Serial port conflict	Test using a wrap plug while running Advanced Diagnostics. "Advanced Diagnostics Device Presence Test" on page 2-34 Serial adapter Riser card System board

Table 2-1 (Page 14 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
11XX - Serial port test errors not listed above	Test using a wrap plug while running Advanced Diagnostics.
	"Advanced Diagnostics Device Presence Test" on page 2-34
	Serial port System board

On the system board:
 	
1780/1790 - Hard Disk Drive 1
1781/1791 - Hard Disk Drive 2
1782/1792 - Hard Disk Drive 3 or
             CD-ROM drive
1783/1793 - Hard Disk Drive 4 or
             CD-ROM drive if
             Hard Disk Drive 3
             installed
	Hard disk drive connection/cable/jumpers

	If an upgrade processor is installed, check that the proper speed has been set (jumpers and Setup Utility). Speed should be a multiple of the original processor speed.
	Hard disk drive size set correctly in Setup Utility
	Hard disk drive System board
17XX - Hard disk drive error All 17XX errors not listed above.	"Factory-Installed Drive Devices" on page 2-38
	Hard disk drive jumpers Hard disk drive connection/cable Hard disk drive System board Power supply
2401 - Monitor changing colors	Monitor
2408 error	System board
2409 error	Monitor
2410 error	System board
24XX - Video/monitor error	"Monitor" on page 2-54
	Optional video memory System board Monitor

Table 2-1 (Page 15 of 15). POST and Advanced Diagnostics Index for Symptoms, Messages, Error Codes, or Beeps	
Symptoms, Messages, Error Codes, or Beeps	**Action/FRU**
5962 - CD-ROM configuration error (sound adapter card driver works correctly)	"Factory-Installed Drive Devices" on page 2-38 CD-ROM drive connections/cables/jumpers CD-ROM drive Power supply System board
86XX - Pointing device error or mouse does not work	"Mouse" on page 2-61 Pointing device connection/cable Pointing device System board
101XX - Modem test error	Check switch settings/reseat card. "FAX/Modem Adapter" on page 2-49 Modem adapter Riser card System board
Any other error codes	"Undetermined Problem" on page 2-62

Power Supply

| 001 |

– Check all drive and power supply connections for proper installation.
– Power off the system unit.
– Check the power cord for continuity. Replace if necessary.
– Check for the correct line voltage from the power outlet, and verify that the voltage selector switch (if present) is set for the correct voltage.
– Power on the system unit.
DOES THE POWER SUPPLY FAN RUN?
Yes No

| 002 |

– Go to Step 004.

| 003 |

– Go to Step 009 on page 2-28.

| 004 |

(From step 002)
– Disconnect the power cord from the back of the system unit.

  Note: The J29 and J30 power and switch connectors are latched. To remove a latched connector, press in the latch using the tip of a screwdriver to release the connector.

– Disconnect the power and switch cable connectors (J8, J29, and J30) from the system board.
– Disconnect the power connectors to all drives.

J8   J30   J29
Cable Connectors
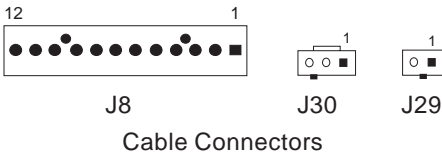
Figure 2-1. Power Connectors J8 and J30, Switch Connector J29 on System Board

– Make a connection between (jumper) pins 2 and 3 on the cable connector J30 (see "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for location).
(Step **004** continues)

004 (continued)

>**Note:** A paper clip may be used as a jumper.
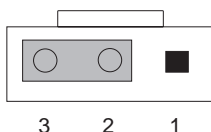
Figure 2-2. Connector J30 on System Board

– Reconnect the power cord.
DOES THE POWER SUPPLY FAN RUN?
Yes No

> **005**
>
> Replace the power supply.

006

(From step 010)
– With the system powered on and the fan running, disconnect the power
  and switch cables from the system board (J8, J29, and J30).
– Check the voltages at the power supply connectors for the system board
  and all drive connectors, as shown in the following figures.
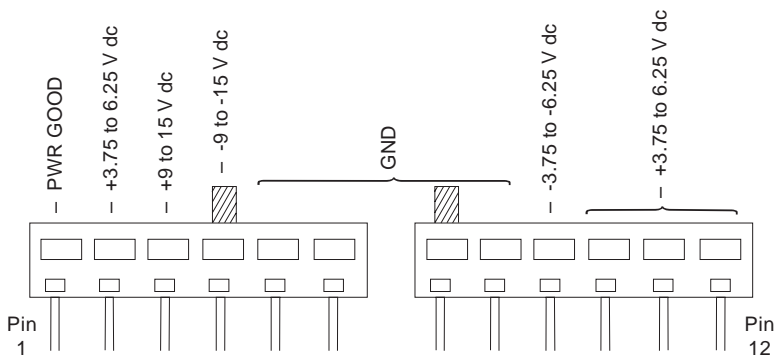
Figure 2-3. System Board Power Supply Connectors (J8 Bottom View)

5 V dc   12 V dc

4   **1**
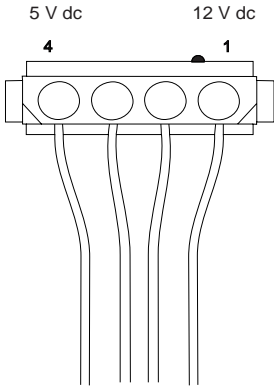
Figure   2-4. Hard Drive or CD-ROM Power Cable Connector

1   **4**

5 V dc   12 V dc
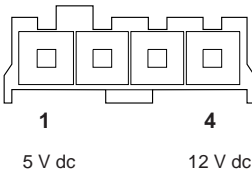
Figure   2-5. 3.5-In. Diskette Drive Power Cable Connector

ARE THE VOLTAGES CORRECT AND DOES THE FAN RUN?
Yes   No

007

Replace the power supply.

008

– The power supply is working normally. If the fan continues to run when
the J8 connector is plugged back in, go to "Undetermined Problem" on
page 2-62. If the fan stops running when a drive connector is plugged
back in, go to "Factory-Installed Drive Devices" on page 2-38.

009

(From step 003)
(Step **009** continues)

009 (continued)
DOES THE SYSTEM UNIT FAIL TO SHUT OFF WHEN THE ON/OFF SWITCH IS PRESSED?
Yes   No

> **010**
>
> Go to Step 006 on page 2-27.

011

– You may have a failing on/off switch cable assembly.

> **Note:** The J29 and J30 power and switch connectors are latched. To remove a latched connector, press in the latch using the tip of a screwdriver to release the connector.

– Disconnect the J29 switch connector on the system board and take an ohm reading between the two pins of connector J29.
DO YOU HAVE AN OHM READING WHEN THE SWITCH IS PRESSED AND AN OPEN READING WHEN THE SWITCH IS RELEASED?
Yes   No

> **012**
>
> – Replace the on/off switch cable assembly.

013

– Replace the system board.

Memory

Notes:

1. The system board requires gold-plated SIMMs.

2. SIMMs must be set in the Setup Utility for correct parity setting. When removing or installing a SIMM, run the Setup Utility (and set the date and time) to clear any XX62 errors. See "POST Error Codes" on page 2-3.

| 001 |

– Power off the system unit.
– Ensure all SIMMs are seated correctly.
– Insert the Advanced Diagnostics diskette into drive A.
– Power on the system unit.
– Note any messages, error codes, or symptoms. Disregard 164 errors (memory size).

DID YOU RECEIVE A 201 or 203 POST ERROR?
Yes No

> | 002 |
>
> **DID YOU RECEIVE A 229 ERROR?**
> **Yes No**
>
> > | 003 |
> >
> > Go to Step 006 on page 2-31.
>
> | 004 |
>
> **Note:** The system board has pluggable cache modules; continue with the following steps to determine whether to replace the cache memory modules or the system board.
>
> – Remove and replace the system board cache memory modules one bank at a time until the error goes away.

| 005 |

– Press **0 (SYSTEM CHECKOUT)**, then press **Enter**.
– Press **Y** when the Installed Devices list appears.
– Select the **0 (RUN TESTS ONE TIME)** option, then press **Enter**.
(Step **005** continues)

005 (continued)
– Follow the screen instructions to run the Memory tests.
– If you cannot run the memory test or the test does not find a problem, use
  the following procedure to find the failure.
– Replace each SIMM, one at a time, with a known-good SIMM of the same
  size.
– If the problem goes away, the last SIMM replaced is defective. If all
  SIMMs have been replaced and the problem remains, replace the system
  board.
– If you are unable to correct the problem, go to "Undetermined Problem" on
  page 2-62.

006

(From step 003)
– Press **0 (SYSTEM CHECKOUT)**, then press **Enter**.
– Press **Y** when the Installed Devices list appears.
– Select the **0 (RUN TESTS ONE TIME)** option, then press **Enter**.
– Follow the screen instructions to run the Memory tests.
DID THE MEMORY TESTS COMPLETE WITHOUT AN ERROR?
Yes No

> **007**
>
> – Replace each SIMM, one at a time, with a known-good SIMM of the
>   same size.
> – If the problem goes away, the last SIMM replaced is defective. If all
>   SIMMs have been replaced and the problem remains, replace the
>   system board.
> – If you are unable to correct the problem, go to "Undetermined
>   Problem" on page 2-62.

008

– The system memory is now functioning correctly. If you suspect an
  intermittent problem, run the Memory test multiple times.
– If you are unable to correct the problem, go to "Undetermined Problem" on
  page 2-62.

Keyboard

001

A failing mouse can show up as a keyboard failure.
– Power off the system unit.
– Disconnect the mouse from the system unit.
– Power on the system unit.
DID THE SYMPTOM REMAIN?
Yes No

> **002**
>
> Replace the failing mouse.

003

– Power off the system unit and wait 10 seconds.
– Reinstall the mouse.
– Ensure the keyboard cable is fully inserted into the system unit.
– Remove any foreign objects that may interfere with the mechanical operation of the keybuttons.
– Power on the system unit.
DID YOU RECEIVE A 3XX POST ERROR?
Yes No

> **004**
>
> Go to "Start" on page 2-2.

005

– Power off the system unit and wait 10 seconds.
– Disconnect the keyboard cable from the system unit.
– Power on the system unit.
– Check the voltage at the keyboard cable connector on the system board, shown in Figure 2-6 on page 2-33, after the POST.

> **Note:** Measure voltages with respect to Ground (Pin 3).

Pin	Voltage (Vdc)
1	KBD Data (+5.0)
2	Not Used
3	Ground
4	+5.0
5	Clock (+5.0)
6	Not Used
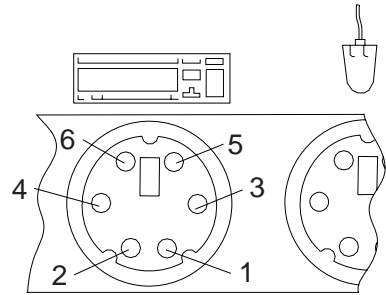
Figure   2-6. Keyboard Connector Voltage Check

ARE THE VOLTAGES CORRECT?
Yes   No

> **006**
>
> Replace the system board.

007

Replace the keyboard. If the symptom remains, replace the system board.

Advanced Diagnostics Device Presence Test

| 001 |

DO ANY MESSAGES, ERROR CODES, BEEPS, OR SYMPTOMS APPEAR?
Yes No

> | 002 |
>
> Go to Step 004.

| 003 |

Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10. If directed here from the Index, go to Step 006.

| 004 |

(From step 002)
– Power off the system unit.
– Insert the Advanced Diagnostics diskette into drive A.
– Power on the system unit, and check for the following responses:

  1. One short beep
  2. Diagnostic screen

DID THE SYSTEM PRODUCE THE BEEP AND DIAGNOSTIC SCREEN?
Yes No

> | 005 |
>
> – Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

| 006 |

(From page 2-38)
(From steps 003 and 007)
– Select **0 (SYSTEM CHECKOUT)** on the diagnostic screen.
– Press **Enter**.
Compare the Installed Devices list with the actual options installed in the system unit. (Remove the system unit cover if necessary to verify what devices are installed.)
(Step **006** continues)

006 (continued)
**DOES THE INSTALLED DEVICES LIST CORRECTLY IDENTIFY THE
DEVICES INSTALLED IN THE SYSTEM UNIT?**

Note: If necessary, remove the cover and visually compare the devices
installed in the system unit to those shown in the installed devices
list.

Yes No

> **007**
>
> – Press **N**, then press **Enter**.
>
>   **Note:** A 199 error at this point indicates you answered **No** to the
>   question above in Step 006 on page 2-34. Disregard the error.
> – Select **0** to add items. Press **Enter**.
> – Select the number of the item you want to add and then press
>   **Enter**.
> – Press **Y**, then press **Enter**.
> – Select the **0 (RUN TESTS ONE TIME)** option, then press **Enter**.
> – Select only the item that you added to test, then press **Enter**.
>
>   **Note:** The Installed Devices list shows only those devices
>   supported by this manual. If a device is missing from the list
>   and is not factory installed, refer to the service manual
>   provided for that device.
>
>   If a factory-installed drive device or adapter card is not listed
>   in the Installed Devices list, go to either "Diagnostics for
>   Factory-Installed Drive Devices Not Supported by Advanced
>   Diagnostics" on page 2-40 or "Diagnostics for
>   Factory-Installed Riser Card, Sound Card, or Adapter Cards
>   Not Supported by Advanced Diagnostics" on page 2-43.
>
> **WERE YOU ABLE TO CORRECT THE INSTALLED DEVICES LIST
> TO MATCH THE DEVICES INSTALLED IN THE SYSTEM UNIT,
> WITHOUT RECEIVING AN ERROR CODE OR MESSAGE?**
> **Yes No**
>
> > **008**
> >
> > – If you receive any messages, error codes, or beeps while
> >   running a diagnostic test, go to "Index of Symptoms,
> >   Messages, Error Codes, or Beeps" on page 2-10.
> > – If you are told to replace a failing device, do so only after
> >   ensuring all switches, power connectors, cables, and jumpers
> >   are set correctly and show the correct voltages. See "Power

(continued)

> Supply" on page 2-26 and "System Board Layout—Type I-1"
> on page 5-2 and "System Board Layout—Type I-2" on
> page 5-5.
> – Run the Advanced Diagnostics again to ensure there are no
>   other system failures. If you return to this point a second
>   time, go to "Index of Symptoms, Messages, Error Codes, or
>   Beeps" on page 2-10.

| **009** |

– Run the System Checkout test again to ensure the system is
  operating normally.

| **010** |

– Press **Y**, then press **Enter**. Follow the instructions on the screen.
– Select the number of times to run the test.
– Press **Enter**.
– Select the option you want to test, or press **Enter** to select all options.

   Note: If you receive a 199 error, or if you have an undetermined
   problem, run all tests.

DOES THE DIAGNOSTIC TEST FINISH WITHOUT ERROR CODES?
Yes No

> | **011** |
>
> – If the last test stops and you cannot continue, first make sure all
>   switches, power connectors, cables, and jumpers are set and
>   seated correctly and show the correct voltages. Then replace the
>   last device tested.
> – Make note of any messages, error codes, beeps, or new symptoms.
>   Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on
>   page 2-10.

| **012** |

– The Advanced Diagnostics did not detect a failure. If the system still
  displays a failure:

- Check all adapter card jumper settings.
- Check all adapter card switch settings.
- Check all adapter card cables and connectors for proper installation.
- Check all power connectors for correct voltages. See "Power Supply"
  on page 2-26 and "System Board Layout—Type I-1" on page 5-2
  and "System Board Layout—Type I-2" on page 5-5.

- Run the Advanced Diagnostics for All Devices with the **0 (RUN TESTS ONE TIME)** option.
- If a message indicates a failing device is still present and lists a FRU, replace with the FRU indicated.
- If an error code is displayed, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

Factory-Installed Drive Devices

Use this check procedure to test any factory-installed drives.

Attention

The customer may have customized settings in the Setup Utility (other than default settings) on the computer you are servicing. Running the Setup Utility might alter those settings. Note the current settings and verify that the customer settings are in place when service is complete.

Note: If you cannot access the hard disk drive or load a diskette from drive A, make sure the Setup Utility has the startup sequence set with **Hard Disk** and **Diskette** enabled.

Insert the Advanced Diagnostics diskette in drive A. Refer to Step 006 on page 2-34 for test instructions.

If the number of diskette drives shown in the Installed Devices list is not correct:

1. Check the installation of the drive ribbon cable to the system board.

2. Check the voltages to the diskette drive with the power on (see "Power Supply" on page 2-26).

3. Try to correct the drive setting in the Setup Utility.

4. Run the "Advanced Diagnostics Device Presence Test" on page 2-34.

If you can correct the Installed Devices list, but cannot complete the Advanced Diagnostics test for that device, replace FRUs, in the following order, until the problem goes away:

1. Diskette drive cable (if continuity check fails)
2. Diskette drive
3. System board

If the number of hard disk drives or CD-ROM drives shown in the Installed Devices list is not correct:

1. Check the installation of the drive ribbon cable to the system board. Be sure that Hard Disk Drive 1 and Hard Disk Drive 2 in the Setup Utility are connected to the primary hard disk drive connector.

2. Check the hard disk drive jumper settings (see "Parts/Test Point Locations" on page 5-1).

3. Check the voltages to the disk drive power connectors with the power on (see "Power Supply" on page 2-26).

4. Try to correct the drive setting in the Setup Utility.

5. Run the "Advanced Diagnostics Device Presence Test" on page 2-34 for hard disk drives. For factory-installed CD-ROM drives, go to "Diagnostics for Factory-Installed Drive Devices Not Supported by Advanced Diagnostics" on page 2-40.

6. Restart the system and check the Setup Utility.

7. In the Setup Utility, check that the correct drive size is set for the flagged drive shown in the Installed Devices list.

   - If any drive is flagged as **Not Installed**, check the connector and cable for that drive.
   - If the first drive is flagged as **Not Installed**, replace the primary drive.
   - If all drives are flagged as **Not Installed**, replace the primary drive.
   - If any drive (other than the first drive) is flagged as **Not Installed**, replace that drive.

     If the problem remains, check the continuity on the drive cable and replace the cable if necessary. If that does not fix the problem, replace the system board.

8. If an upgrade processor is installed, make sure that the processor speed shown is correct.

   Note: The CD-ROM must be the last device installed and jumpers set correctly to be listed in the Setup Utility. See "Hard Disk Drive Jumper Settings" on page 5-11 for factory-installed drive device jumper settings.

   Also ensure the CD-ROM cable is attached to the secondary drive connector.

If any other adapter or device is flagged as `Not Installed`, run the Setup program.

Check to see if any adapter or device is set to a conflicting address with any other adapter or device. Also be sure that any adapter or device missing from the list is not set to **Disabled**.

Note: If you cannot add a missing adapter or device to the list, the diagnostic code for the missing adapter or device is not on the diagnostic diskette. Run the diagnostics provided with that device.

Diagnostics for Factory-Installed Drive Devices Not Supported by Advanced Diagnostics

Use these procedures as a general check of any DOS-supported device not detected by the Advanced Diagnostics diskette, such as the CD-ROM drive.

Note: While performing this check, you may need to enter and exit Microsoft Windows several times. When instructed to select an icon or button, double-click on the item with the mouse.

For more information about using Microsoft Windows, see the user's guide provided with the computer.

| 001 |

(From step 003)
– Power off the system unit and wait 10 seconds.
– Remove the Advanced Diagnostics diskette from drive A.
– Power on the system unit.
– Wait until POST is completed.
IS `(CD-ROM) not ready--(A)bort or (R)etry` DISPLAYED WHILE DOS IS LOADING SOFTWARE?
Yes   No

> | 002 |
>
> Go to Step 010 on page 2-42.

| 003 |

(From step 011)
– If a `(CD-ROM) not ready--(A)bort or (R)etry` message appears, press **A** to cancel the message and continue.
– The Program Manager window should appear. (If you make the wrong selection in Microsoft Windows, return to Step 001 and try again.)

Note: If the system does not go directly to the Program Manager window, double-click on the Program Manager icon from the Microsoft Windows desktop or start Microsoft Windows from the Welcome screen.

– In Program Manager, double-click on the Main icon and then on the File Manager icon.
– With File Manager open, verify that the CD-ROM drive you wish to check is listed at the top of the window with the other drives.
(Step **003** continues)

2-40

003 (continued)
IS THE CD-ROM DRIVE LISTED AS ONE OF THE INSTALLED DRIVES?
Yes No

> **004**
>
> – Ensure all CD-ROM drive cables are connected properly.
> – Ensure the power connector has the correct voltage (see "Power
>   Supply" on page 2-26).
> – Check continuity of the CD-ROM drive system cable, and replace if
>   necessary.
> – Replace the CD-ROM drive.

005

– Install a known good CD-ROM disc (not an audio CD).
– Click on the CD-ROM drive icon (drive E, for example) at the top of the
  File Manager window.
**DOES THE FILE MANAGER PANEL CHANGE TO LIST THE CONTENTS
OF THE CD-ROM DISC?**
Yes No

> **006**
>
> **Note:** If the message `No files found` is displayed, you may have an
>   audio CD installed. Be sure you are using a CD-ROM disc,
>   not an audio CD.
>
> – Check continuity of the CD-ROM drive system cable, and replace if
>   necessary.
> – Replace the CD-ROM drive.

007

– Press and hold the CD-ROM drive **Eject** button after the Busy LED turns
  off until the disc is ejected.
**DID THE CD-ROM DRIVE EJECT THE DISC AND DID THE BUSY LED
GO OFF AFTER ABOUT 8 SECONDS?**
Yes No

> **008**
>
> Replace the CD-ROM drive.

009

(Step **009** continues)

(continued)

009 (continued)
– The CD-ROM drive should be operating normally.
– If any new symptom appears, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

010

(From step 002)
DOES THE CD-ROM DRIVE WORK CORRECTLY EXCEPT WITH AUDIO CDs?
Yes No

> | **011** |
> | --- |
>
> – Go to Step 003 on page 2-40.

012

– Ensure the CD-ROM drive 4-wire cable to the sound adapter card is properly seated and undamaged.
IS THE 4-WIRE CABLE PROPERLY SEATED AND UNDAMAGED?
Yes No

> | **013** |
> | --- |
>
> – Make sure the CD-ROM audio cable is not damaged and is properly seated, or replace the CD-ROM 4-wire audio cable.
> – Install a known good audio CD.
> **DID THE SYMPTOM REMAIN?**
> **Yes No**
>
> > | **014** |
> > | --- |
> >
> > – The system is working correctly.
>
> | **015** |
> | --- |
>
> – Go to Step 016.

016

(From step 015)
– Check the sound adapter card jumper settings.
– Go to "Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics" on page 2-43.

Diagnostics for Factory-Installed Riser Card, Sound Card, or Adapter Cards Not Supported by Advanced Diagnostics

Note: While performing this check, you may need to enter and exit Microsoft Windows several times. When instructed to select an icon or button, double-click on the item with the mouse.

For more information about using Microsoft Windows, see the user's guide provided with the computer.

This diagnostics test is intended to be used only with factory-installed adapter cards.

001

– Remove the Advanced Diagnostics diskette.
– Power off the system unit and wait 10 seconds.
– Power on the system unit.
IS A POST ERROR CODE DISPLAYED?
Yes No

> **002**
>
> Go to Step 004.

003

– Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

004

(From step 002)
ARE ANY ERROR CODES DISPLAYED AFTER POST COMPLETES BUT BEFORE MICROSOFT WINDOWS STARTS?
Yes No

> **005**
>
> Go to Step 007 on page 2-44.

006

Go to Step 011 on page 2-45.

(continued)

007

(From step 005)
– Power off the system unit.
– Disconnect the riser card and any adapter card cables or connectors from
  the system unit.

  Note: When removing adapter cards, be careful not to change any
          jumper or switch settings on the card.

– Power on the system unit.
DOES THE SYSTEM UNIT WORK CORRECTLY BY ITSELF?
Yes   No

  008

  Go to "Start" on page 2-2.

009

– Power off the system unit.
– Reconnect the riser card.
– Do not install any adapter cards on the riser card.
– Power on the system unit.
– Check the voltages at pins B3, B5, B7, and B9 on the top of the riser
  card.

  B3 = +5 V dc
  B5 = –5 V dc
  B7 = –12 V dc
  B9 = +12 V dc
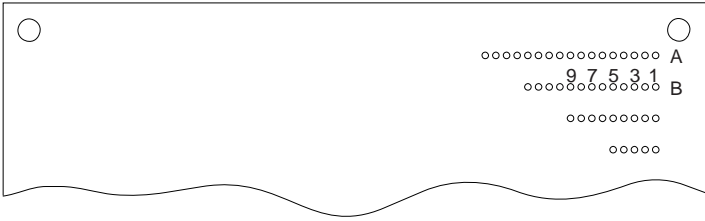
(Pin side)
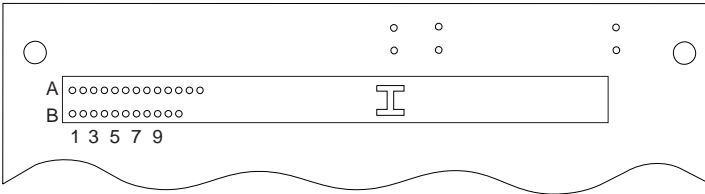
(Connector side)

Figure 2-7. Riser Cards - Machine Type 2144 and 2168

ARE THE VOLTAGES CORRECT?
Yes No

| **010** |

Replace the riser card.

| **011** |

(From step 006)

– Install the failing factory-installed adapter card in a different slot in the riser card than where originally installed.

DOES THE FEATURE FUNCTION NORMALLY?
Yes No

| **012** |

Go to Step 014 on page 2-46.

| **013** |

Replace the riser card.

| **014** |

(continued)

(From step 012)
- Power off the system unit.
- Check one adapter card at a time. To do this, install the failing adapter card in the riser card and power on the system unit.
- Repeat this with each adapter card if necessary.

IS A WINDOWS DRIVER ERROR DISPLAYED FOR THE INSTALLED ADAPTER CARD?

Yes No

> **015**
>
> Go to Step 017.

016

- Check for proper installation of the adapter card.
- Check all adapter card jumper positions. See "Power Supply" on page 2-26 and "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5.
- Check all cables and connectors on the adapter card for proper installation.
- Check continuity of any cable attached to the adapter card and replace if necessary.
- If the problem remains, replace the factory-installed adapter card.
- If the problem remains with a card that was not factory installed, consult the service information provided by the card manufacturer.

017

(From step 015)
- Power off the system unit.
- Reinstall the sound adapter card or adapter card and any cables.
- Power on the system unit without the Advanced Diagnostics diskette inserted.

> **Note:** This procedure can be used for most factory-installed adapter cards. However, you must select the correct window (see steps 3 and 4 below) to access the feature icon before any test or before testing any feature in step 6.

- Perform the following when the system is running:

  1. Open Microsoft Windows if not already opened by the system.
  2. Select the Program Manager icon if not already opened.
  3. Select Main Menu.

(Step **017** continues)

017 (continued)
4. Select Control Panel.
5. Select the Sound icon.
6. In the Sound window, select `chimes.wav`. (To test other adapter card software, select an action from a menu in that software.)

IS THE TEST BUTTON (OR ACTION IN OTHER SOFTWARE) SELECTABLE ON THE SCREEN (SHOWN IN BLACK AND NOT GRAY)?
Yes No

> **018**
>
> – Power off the system unit.
> – Check for proper installation.
> – Check the sound adapter card or adapter card jumper positions.
> – Replace the sound adapter card or adapter card.

019

– Select the Test button from the Sound window.
DO YOU HEAR ANY SOUND FROM THE SYSTEM?
Yes No

> **020**
>
> – Make sure the speaker power supply is plugged into an electrical outlet and properly connected to the speakers.
> – Make sure the volume control on the sound adapter card (if any) is not turned low.
> – Make sure the speaker sound cable is plugged into the sound adapter card Audio Output jack.
> – Check the sound adapter card jumper positions. Refer to "CD-ROM Drive and Sound Card Jumper Settings" on page 5-14.
> – Check continuity of any cable attached to the adapter card and replace if necessary.
> – Make sure the speakers are not damaged. If damaged, replace the speakers.
> – Repeat the test in Step 019.
> **DID THE SYMPTOM CHANGE?**
> **Yes No**
>
>> **021**
>>
>> Replace the sound adapter card.
>> (Step **021** continues)

(continued)

021 (continued)
– or –
Replace the speakers.

022

– If you hear sound from the speakers, the system is working
  normally. If you suspect another problem, go to "Index of
  Symptoms, Messages, Error Codes, or Beeps" on page 2-10.

023

– The system is working normally.
– Click OK to close the dialog box. Exit Microsoft Windows.
– If the symptom remains or has changed, go to "Index of Symptoms,
  Messages, Error Codes, or Beeps" on page 2-10.

FAX/Modem Adapter

Note: Modems that are factory-installed in system units are fax/modems with a cable and connector to enable Wake Up on Ring software. Models with voice modems installed also have a voice modem cable connected to the sound adapter card.

If the factory-installed modem has been replaced with a different internal modem, Wake Up on Ring may not be supported unless the replacement modem has a 2-pin Wake Up on Ring keyed connector (see "Factory-Installed Modem Jumper and Switch Settings" on page 5-10).

| 001 |

– Power off the system unit.
– Remove all adapter cards from the riser card except for the modem and sound adapter card if factory installed.
– Remove all external devices except for the keyboard and mouse.
– Disconnect all telephone cables from the rear of the modem adapter card.
– Insert the Advanced Diagnostics diskette in drive A.
– Refer to "Factory-Installed Modem Jumper and Switch Settings" on page 5-10 to set the switches for COM1. The 14400 bps Data/FAX/Voice modem adapter modem card does not require jumper settings but uses switches attached to the modem bracket.
– Power on the system unit.
– Make a note of any error messages, then press **Esc**.
– Press **0 (SYSTEM CHECKOUT)**, then press **Enter**.
– Add the modem adapter to the list of installed devices, if not already present.
– Press **Y**, then press **Enter**.
– Press **0 (RUN TEST ONE TIME)**.
– Select **101 (MODEM ADAPTER)**, then press **Enter**.
– Follow the prompts and perform the modem tests.

DID YOU RECEIVE AN ERROR CODE OR INCORRECT AUDIO RESPONSE?
Yes   No

| 002 |

– Reconnect the telephone cable.
– Link to a computer service, such as a bulletin board or to another computer.
(Step **002** continues)

002 (continued)
DID THE MODEM COMMUNICATE?
Yes   No

> **003**
>
> – Check the outside phone line by connecting a working
>   telephone to the telephone wall jack. Listen for a dial tone.
> – If the phone line is good, replace the modem. If the symptom
>   remains, replace the system board.
> – If the phone line is bad, tell the customer to contact the
>   telephone company. The modem does not need replacing.

004

**DOES THE SYSTEM FAIL TO WAKE UP WHEN THE WAKE UP ON
RING FEATURE IS ENABLED IN THE SETUP UTILITY?**
Yes   No

> **005**
>
> – The Wake Up on Ring feature is working normally. If the
>   symptom remains, go to "Index of Symptoms, Messages,
>   Error Codes, or Beeps" on page 2-10.

006

– Power off the system unit.
– Power on the system unit and press **F1** while the memory count is
  running.
– In the Setup Utility, select the Rapid Resume option.
– Press the ↓ key to disable or enable both the Wake Up on Ring
  fields.
**CAN THE WAKE UP ON RING FEATURE BE ENABLED IN THE
SETUP UTILITY?**
Yes   No

> **007**
>
> Replace the system board.

008

– Check the Wake Up on Ring feature cable from the system board to
  the modem for continuity. Replace if necessary.
(Step **008** continues)

008 (continued)
– Check for proper installation of the Wake Up on Ring jumper cable.
  See "System Board Layout—Type I-1" on page 5-2 and "System
  Board Layout—Type I-2" on page 5-5.
**DOES THE SYSTEM WAKE UP WHEN WAKE UP ON RING IS
ENABLED IN THE SETUP UTILITY?**
Yes No

> **009**
>
> **Note:** If the phone lines attached to the modem have
>   experienced a high voltage surge (struck by lightning, for
>   example), first replace the modem and go to Step 001
>   on page 2-49.
>
> Replace the system board.

010

The modem is functioning correctly.

011

IS THE ERROR CODE 101XX?
Yes No

> **012**
>
> If the audio tones are incorrect, check the jumper and switch settings.
> If that does not correct the problem, replace the modem.

013

– Power off the system unit.
– Plug the modem adapter card into a different riser card slot.
– Power on the system unit.
– Run the modem adapter tests.
DID THE SYMPTOM REMAIN?
Yes No

> **014**
>
> Replace the riser card.

015

(Step **015** continues)

(continued)

015 (continued)
DOES THE SYSTEM UNIT WORK NORMALLY EXCEPT FOR THE MODEM?
Yes No

> **016**
>
> Go to "Start" on page 2-2.

017

– Power off the system unit.
– Reconnect the riser card.
– Remove the modem adapter card from the riser card.
– Power on the system unit.
– Check the voltages at pins B3, B5, B7, and B9 on the top of the riser card.

  B3 = +5 V dc
  B5 = –5 V dc
  B7 = –12 V dc
  B9 = +12 V dc
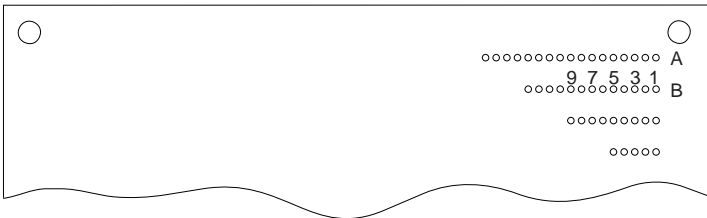
(Pin side)
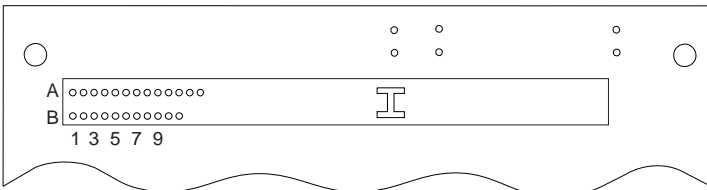
(Connector side)

Figure 2-8. Riser Cards - Machine Type 2144 and 2168

(Step **017** continues)

017 (continued)
ARE THE VOLTAGES CORRECT?
Yes No

> **018**
>
> Replace the riser card. If the symptom remains, replace the system board.

019

Check all jumper and switch settings.
If the symptom remains, replace the modem adapter card.
– or –
Replace the system board.

Monitor

Run the Setup Utility and make sure the monitor type shown matches the monitor installed. (See Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1.) First, set the system to VGA mode by holding down both mouse buttons and turning on the machine. Then, reset the monitor type in the Setup Utility.

If you need to set an option in the Setup Utility:

1. Make sure the Advanced Diagnostics diskette is in Drive A.

2. Power on the system unit.

3. Press **F1** while the memory count is running.

You may be testing a digital monitor with a row of LEDs under the control access door at the front of the monitor. If the monitor type is set to the wrong mode in the Setup Utility, the screen remains black and the first and last LEDs flash.

Note: Some monitors have a detachable system I/O signal cable between the monitor and the system unit. Check the line voltage, power cord, and continuity for the system I/O signal cable before replacing the unit. See "Detachable Monitor I/O Signal Cable Connector Test Points" on page 5-21 for pin identification.

High voltage Northern and Southern Hemisphere monitors may come with a voltage selector (110 V–220 V) switch. The 145-W power supply may have a voltage selector (110 V–220 V) switch. Match the switch to the line voltage.

Ensure the correct monitor frequency is set in the Setup Utility for the monitor used with the system (see "Using the Setup Utility" on page 1-16). If the monitor frequency is set incorrectly, the monitor may not be readable in certain modes. To determine the correct monitor frequency, look on the monitor for the part number. If the part number is not listed, see the product information shipped with the monitor. Set the monitor frequency equal to or less than the monitor's maximum horizontal frequency (also known as the horizontal scan rate). See "Refresh Rates and Monitor Frequencies" on page 1-12.

| 001 |

– Power off the system unit and monitor.
– Remove all adapter cards from the riser card.
– Make sure the monitor I/O signal cable is properly connected to the system unit and monitor.

(Step **001** continues)

001 (continued)
– Make sure the power cords are properly connected to the system unit and monitor, and that the line voltage is correct. See "Power Supply" on page 2-26.
– Make sure the monitor contrast and brightness controls are not turned too low.
– Power on the monitor, and wait 20 seconds.
– Power on the system unit.

> **Note:** Because monitor models may differ, review the Display Self Test before attempting to answer the following questions. The test has changed from previous levels. If the monitor was not sold together with the system unit, you may need to refer to the service information provided with the monitor.

– If you are not familiar with the self-test pattern produced by the Display Self Test, refer to steps 5 and 6 of "Display Self Test" on page 3-12 for a description of the self-test pattern.

> **Note:** *Do not* run the Display Self Test. Do not unplug the monitor I/O signal cable from the system unit.

DOES THE DISPLAY SELF-TEST PATTERN APPEAR ON THE SCREEN?

OR DO THE GREEN LEDs CYCLE FROM LEFT TO RIGHT (ON DIGITAL MONITORS WITH A ROW OF LEDs UNDER THE CONTROL ACCESS DOOR)?
Yes   No
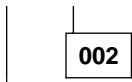
> **002**
>
> Go to Step 006 on page 2-56.

003

Unplug the monitor I/O signal cable from the system unit.
DID THE DISPLAY SELF-TEST PATTERN REMAIN ON THE SCREEN WITH A LIGHT OR DIM SCREEN (NOT TOTALLY BLACK)?

Note: You may need to perform this test in a dark or dimly lit room.

Yes   No
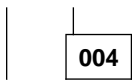
> **004**
>
> Replace the monitor.

005

(Step **005** continues)

(continued)

005 (continued)
Check the monitor I/O signal cable. Replace if defective.
– or –
Replace any optional video memory modules installed on the system board
and retest the system. If the symptom remains, replace the system board.

006

(From step 002)
– Power off the system unit and monitor.
– Unplug the monitor I/O signal cable from the system unit.
– Power on the system unit and monitor.
– Observe whether the screen lights up and does not remain black. You
   may have to turn the brightness control all the way up and be in a dark or
   dimly lit room.
**DOES THE SCREEN CHANGE FROM BLACK (WITH MONITOR POWER
OFF) TO A LIGHTER SHADE (WHEN POWER IS ON)?**

**OR DO THE LEDs CYCLE FROM LEFT TO RIGHT (DIGITAL POWER-ON
LED MONITORS ONLY)?**
Yes No

> **007**
>
> – Replace the monitor.

008

– Power off the system unit.
– Reconnect any disconnected cables.
– Make sure the Advanced Diagnostics diskette is in drive A.
– Power on the system unit.
IS THE SCREEN READABLE?

Note: If the screen shows a blinking cursor with no memory count running,
answer this question "No."

Yes No

> **009**
>
> – Power off the system unit.
> – Remove the hard disk drive system cable.
> – Power on the system unit.
> (Step **009** continues)

009 (continued)
IS THE SCREEN READABLE?
Yes   No
 │
 │   ┌─────┐
 │   │ **010** │
 │   └─────┘
 │   – Go to Step 015 on page 2-58.
 │
 ┌─────┐
 │ **011** │
 └─────┘
 – Go to "Index of Symptoms, Messages, Error Codes, or Beeps" on
   page 2-10.

────────────────────────────────────

┌─────┐
│ **012** │
└─────┘

– Press **Esc**.
– Press **0 (SYSTEM CHECKOUT)**, then press **Enter**.

   Note: Do not run the individual tests until you are instructed to do so by
            this check.

– Press **Y** or **N** as required when questions about installed devices appear
  on the screen.
– Select the **0 (RUN TESTS ONE TIME)** option from the System Checkout
  menu, then press **Enter**.
– Type **24 (VIDEO GRAPHICS ARRAY)**, then press **Enter**.
The image on the screen may be distorted, or the characters may be the
wrong size.

Note: You may have to refine the monitor controls to obtain the best image.

– Press **6 (RUN TESTS 1 THROUGH 5)**, then press **Enter**.
DID YOU ANSWER YES TO ALL OF THE QUESTIONS?
Yes   No
 │
 │   ┌─────┐
 │   │ **013** │
 │   └─────┘
 │   Replace the monitor. If the symptom remains, replace any optional
 │   video memory modules installed on the system board and retest the
 │   system. If the symptom remains, replace the system board.
 │
┌─────┐
│ **014** │
└─────┘
You have successfully completed the Advanced Diagnostics tests. If the
problem remains, go to "Index of Symptoms, Messages, Error Codes, or
Beeps" on page 2-10.

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(continued)

015

(From steps 010 and 015)
The following information helps you diagnose a video problem in the monitor
by the number of beeps (audio responses) heard.
– Power off the system unit.
– Insert the Advanced Diagnostics diskette into drive A.
– Power on the system unit.
– Listen for one beep at the end of POST.

> **Note:** If you receive more than one beep, reset the configuration
> information, see "Power-On Password Reset" on page 1-14, and
> then go to Step 015.

– Wait for the LED on drive A to come on, go off, and stay off. If the
  indicator LED fails to light after 1 minute, continue with the next step.
– Follow the steps in Figure 2-9. Listen for the beep each time you press
  Enter.

> **Note:** Use the numbers in the typewriter area of the keyboard. Do not
> use the numeric keypad.

Steps	Audio Response
1. Press **0**	None
2. Press **Enter**	1 Beep
3. Press **Y**	None
4. Press **Enter**	1 Beep
5. Press **0**	None
6. Press **Enter**	1 Beep
7. Type **24**	None
8. Press **Enter**	1 Beep
9. Type **6**	None
10. Press **Enter**	1 Beep

Figure 2-9. Steps to Select a Test

(Step **015** continues)

015 (continued)
DID YOU RECEIVE THE CORRECT AUDIO RESPONSES?
Yes No

> **016**
>
> – Check the power supply (see "Power Supply" on page 2-26).
> – If the power supply voltages are correct, replace the monitor.
> – If the symptom remains, replace any optional video memory
>   modules installed on the system board and retest the system. If the
>   symptom remains, replace the system board.

017

– Do not power off the system unit to perform this step.
– Unplug the monitor I/O signal cable from the system unit.
– Refer to the following figure, and measure the monitor connector voltages
  at the rear of the system unit, performing steps 1 through 4 sequentially.
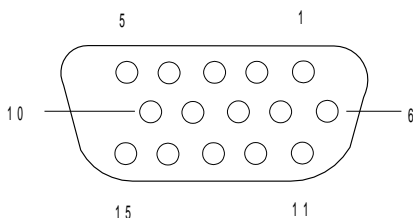
1. Press 7; then press **Enter** and check for:

   0 to +0.2 V dc from pin 13 to 10 (ground)
   0 to +0.2 V dc from pin 14 to 10 (ground)

2. Press **Enter**; then check for:

   +3.5 to +4.5 V dc from pin 13 to 10 (ground)
   0 to +0.2 V dc from pin 14 to 10 (ground)

3. Press **Enter**; then check for:

   0 to +0.2 V dc from pin 13 to 10 (ground)
   0 to +0.2 V dc from pin 14 to 10 (ground)

4. Press **Enter**; then check for:

   +0.5 to 1.0 V dc from pin 13 to 10 (ground)
   +3.5 to 4.5 V dc from pin 14 to 10 (ground)

Figure   2-10. Monitor Connector

(Step **017** continues)

(continued)

017 (continued)
ARE THE VOLTAGES CORRECT?
Yes   No

> **018**
>
> Replace any optional video memory modules installed on the system
> board and retest the system. If the symptom remains, replace the
> system board.

019

Replace the monitor. If the symptom remains, replace any optional video
memory modules installed on the system board and retest the system. If the
symptom remains, replace the system board.

Mouse

Note: A sticking keybutton can cause the mouse to operate incorrectly. If you suspect this, go to "Keyboard" on page 2-32.

001

– Power off the system unit.
– Make sure the mouse ball turns freely.
– Insert the Advanced Diagnostics diskette into drive A.
– Power on the system unit.
– Make a note of any error messages, then press **Esc.**
– Press **0 (SYSTEM CHECKOUT)**, then press **Enter**.
– Press **Y**, then press **Enter**.
– Press **0 (RUN TESTS ONE TIME)**, then press **Enter**.
– Run the Mouse tests.
– Follow the instructions on the screen.
DO THE MOUSE DIAGNOSTIC TESTS RUN WITHOUT ERRORS?
Yes   No

002

– If you receive any error *except* an 8613 error replace the mouse.
– If you receive an 8613 error, replace the system board.

003

– The system unit is operating normally.
– If the symptom remains, replace the mouse.

Undetermined Problem

Check the POST Error History

The system board retains the last three POST error codes in a POST Error History saved in CMOS memory. Each time a POST error code is detected at the power-on/power-off cycle, it is added to the bottom of the list in the POST Error History.

Most recent error
code is listed
at bottom

The following error(s) were detected when the system was started:

5962   Configuration Error
162   Configuration Error
301   Keyboard Error

Press Enter to run the Configuration Utility or Esc to continue.
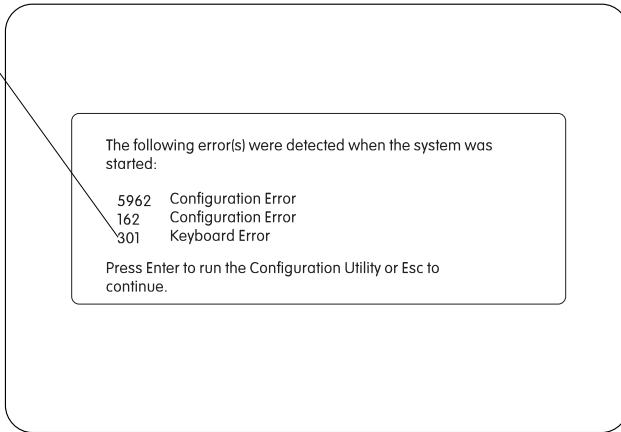
Figure 2-11. POST Error History Example

To view the POST Error History:

Note: The POST Error History can be accessed only during the initial (long)

POST when the POST Configuration icon appears.

- Press **F9** while the POST Configuration icon appears.

- If any POST errors are recorded, the POST Error History is displayed with the most-recent error shown at the bottom of the list.

To check for the error again, repeat the above steps to add the error to the list once more. You should see the same POST error code listed in the last two lines of the POST Error History.

To print a copy of the screen to an attached printer, press **Print Screen**.

If an error code is present, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10. If no error code is present, continue with this check.

Check the power supply voltages (see "Power Supply" on page 2-26). If the voltages are correct, return here and continue with the following steps:

1. Power off the system unit.

2. Perform the following checks, one by one, until you have isolated the problem FRU (refer to "Parts/Test Point Locations" on page 5-1 for locations):

   - Check all system board jumper positions.
   - Check all adapter card jumper positions.
   - Check all adapter card switch settings.
   - Check all device jumper positions.
   - Check all cables and connectors for proper installation.

If the jumpers, switch settings, and voltages are correct, return here and continue.

3. Remove or disconnect the following, one at a time:

   Adapters/Cards

   a. Non-IBM devices
   b. External devices
   c. Sound adapter card
   d. Any adapter
   e. Modem card
   f. Riser card

   Memory

   a. SIMMs
   b. Cache memory
   c. Video memory modules

   DASD

   a. CD-ROM drive
   b. Diskette drive
   c. Hard disk drive

4. Power on the system unit.

5. Repeat steps 1 through 4 until you find the failing device or adapter.

If the symptom changes, go to "Index of Symptoms, Messages, Error Codes, or Beeps" on page 2-10 or to the check procedure for the last item tested.

Replace the last item tested if the system operates normally after removing the last item.

Note: If you are unable to find a check procedure that corresponds to the device or error code, you either have an IBM device with its own

(continued)

service manual or a device not supported by IBM diagnostic tests.

If all devices and adapters have been removed, and the problem remains:

1. Remove all cables from connectors on the system board except the power supply and switch cables.

2. Remove all SIMMs from sockets.

3. Power on the system unit and listen for any beeps.

Note: Make sure the system board speaker is enabled. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5.

4. If there are beeps, replace the system board and use the current processor on the replacement FRU system board.

5. If there are no beeps, replace the processor and use the current system board.

6. If there are still no beeps, replace the current system board and use the FRU processor obtained in step 5.

Diagnostic Aids

Introduction

This section explains the diagnostic aids that are available for troubleshooting problems on the system.

Power-On Self Test

Each time you power on the system, the power-on self test (POST) is initiated. The POST takes up to 120 seconds to complete (with Rapid Resume disabled or not installed), depending on the options installed.

The POST checks the following:

- System board
- Memory
- VGA
- Hard disk drive(s)
- Diskette drive(s)
- Keyboard
- Mouse
- Parallel port
- Serial port(s)
- CD-ROM drive
- Sound adapter card
- Math coprocessor

To start the POST, turn on the monitor and the system unit. The following happens:

1. The POST Configuration icon, appears at the upper-right corner of the monitor.

   Pressing **F1** at this time causes the Setup Utility menu to appear after the POST has completed.

2. A count of the system memory appears at the upper-left corner of the screen.

3. If an error is detected, an error code appears under the system memory count.

   Note: A memory error can appear without the memory count as: XXXXXX XXXX 20X, where the first six Xs = memory address, the next four Xs = data, and the 20X can be 201 or 203.

4. Successful completion of POST is attained when there are no errors detected in the system.

5. If a critical error is encountered, the system halts.

6. The system attempts to load the operating system as customized. If an operating system is not found, a graphic message (icon) is displayed requesting the user to insert a diskette into drive A and press the F1 key to resume operation.

Advanced Diagnostics Diskette

The Advanced Diagnostics program comes on one diskette packaged with this book. The diskette is labeled "For Machine Type 2144 and 2168" and is for the **Service Level** I model.

The Advanced Diagnostics program is intended to test only IBM products. Non-IBM products, prototype cards, or modified options can give false errors and invalid system responses.

To load the Advanced Diagnostics diskette:

1. Power off the system unit.

2. Install the correct Advanced Diagnostics diskette in drive A.

3. Power on the system unit.

4. Do *not* press **F1** when the icon appears.

5. If any POST errors appear after POST, make a note of the errors and press the **Esc** key.

To access diagnostic tests from the SELECT AN OPTION Menu:

1. Press **0 (SYSTEM CHECKOUT)**.

2. At the Installed Devices menu, press **Y**, then **Enter**.

3. The **SYSTEM CHECKOUT** menu is displayed.

4. Select **0** or **1** from the **SYSTEM CHECKOUT** menu.

5. Select the device to be tested.

Diagnostic Menus

Select an Option Menu

This menu appears first if the system options are correctly set.

```
SELECT AN OPTION

 0 - SYSTEM CHECKOUT
 1 - FORMAT DISKETTE
 2 - COPY DISKETTE

 9 - END DIAGNOSTICS

 To run SETUP:
    a)  Press Ctrl+Alt+Del.
    b)  Then press F1 while the configuration icon is
        displayed in the upper right hand corner.

 ENTER THE ACTION DESIRED
 ?
```

0 - SYSTEM CHECKOUT: Starts the system checkout procedure.

1 - FORMAT DISKETTE: Formats a scratch diskette for diagnostic use only.

2 - COPY DISKETTE: Copies the Advanced Diagnostics diskette to another diskette.

9 - END DIAGNOSTICS: Gives the option to restart the system.

Diskette Drive Menu

This menu allows you to test the diskette drives and the control logic on the system board.

```
TESTING -
600
DISKETTE DIAGNOSTIC MENU
----------------------------
OPTION
 1 - SEEK TEST
 2 - WRITE, READ, COMPARE TEST
 3 - VERIFY DISKETTE TEST
 4 - SPEED TEST
 5 - DISKETTE CHANGE TEST
 9 - RETURN TO CONTROL PROGRAM

 FOR OPTION 9
 TYPE '9' AND PRESS 'ENTER'
 FOR OTHER OPTIONS (1 THRU 5)
 TYPE THE OPTION NUMBER,
 DRIVE ID (1,A), AND PRESS 'ENTER'
```

1 - SEEK TEST: Tests the basic diskette seek operations, including sequential and random diskette drive head positioning.

2 - WRITE, READ, COMPARE TEST: Tests the basic diskette operations, including a series of random seeks. Each seek is followed by a write, read, and comparison of data.

3 - VERIFY DISKETTE TEST: Verifies data accessing and each sector.

4 - SPEED TEST: Measures the time required for one revolution of the diskette.

5 - DISKETTE CHANGE TEST: Tests the diskette change signal and write-protect feature as you remove and insert a diskette.

9 - RETURN TO CONTROL PROGRAM: Returns to the System Checkout menu or continues with the next device test.

Hard Disk Drive Menu

This menu allows you to test the hard disk drive and controller.

```
HARD DISK DIAGNOSTIC MENU
-------------------------
 1 - WRITE, READ, COMPARE (ON TEST CYLINDER)
 2 - SEEK TEST
 3 - HEAD SELECT
 4 - ERROR DETECTION AND CORRECTION
 5 - RUN ALL TESTS
 6 - READ VERIFY
 7 - FORMAT UTILITY
 9 - RETURN TO CONTROL PROGRAM

 FOR OPTION 9
 TYPE '9' AND PRESS 'ENTER'
 FOR OTHER OPTIONS (1 THRU 5)
 TYPE THE OPTION NUMBER,
 DRIVE ID (1,C), AND PRESS 'ENTER'
```

1 - WRITE, READ, COMPARE (ON TEST CYLINDER): Tests the hard disk read and write operations.

2 - SEEK TEST: Sequentially moves the hard disk heads inward one cylinder at a time until the last cylinder is reached. The heads then reset to the first cylinder and a random seek test is performed.

3 - HEAD SELECT: Data is written to the test cylinder by each hard disk head; the data is then read and checked for any errors.

4 - ERROR DETECTION AND CORRECTION: Tests the hard disk error checking and correction circuits by reading data, altering the data, and writing the data at the test cylinder. A comparison test detects any errors.

5 - RUN ALL TESTS: Runs tests 1, 2, 3, and 4; also reads track 0.

6 - READ VERIFY: A read operation is performed on the entire hard disk; any tracks that cannot be read are reported with existing defects.

7 - FORMAT UTILITY: Selects the Format Selection menu.

9 - RETURN TO CONTROL PROGRAM: Returns to the System Checkout menu or continues with the next device test.

Video Graphics Array Menu

This menu allows you to test the VGA and SVGA monitors and control logic on the system board.

```
VIDEO GRAPHICS DISPLAY

 1 - VGA TEST
 2 - DISPLAY ATTRIBUTES
 3 - CHARACTER TESTS
 4 - GRAPHICS TESTS
 5 - SCREEN PAGING
 6 - RUN TESTS 1 THROUGH 5, 8
 7 - SYNC TEST
 8 - EXTENDED MODE TESTS
 9 - RETURN TO CONTROL PROGRAM
```
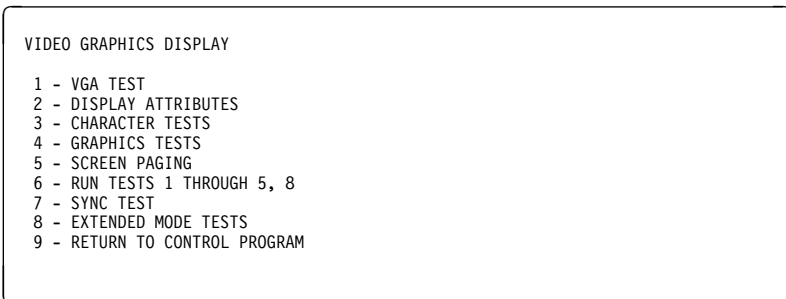
1 - VGA TEST: Verifies the video portion of the system board.

2 - DISPLAY ATTRIBUTES: Shows the following character attributes: normal and high intensity, reverse video, blinking, non-monitor, and 16 colors.

3 - CHARACTER TESTS: Shows the following character modes: 40x25, 80x25, 80x30, and 256 ASCII characters.

4 - GRAPHICS TESTS: Displays various patterns to test the monitor graphics modes.

5 - SCREEN PAGING: Tests the video-addressing circuitry.

6 - RUN TESTS 1 THROUGH 5, 8: Performs tests 1 through 5 on a VGA monitor and tests 1 through 5 plus 8 on SVGA and HiFunction monitors.

7 - SYNC TEST: Provides a test signal to allow voltage measurement at the video connector.

8 - EXTENDED MODE TESTS: Shows a subset of the following character modes: either 80x60 or 132x43; also 132x25. Also shows a subset of the following graphic modes: 640x480x256, 800x600x256, and 1024x768x16.

Note: This test is only available for SVGA Tri-Synch and Multi-Scanning monitors. Availability also depends on the amount of video DRAM present.

9 - RETURN TO CONTROL PROGRAM: Returns to the System Checkout menu or continues with the next device test.

Formatting a Hard Disk

Hard disks normally contain tracks in excess of their stated capacity to allow for defective tracks. The user is notified by a diagnostic message when the defect limit has been reached and service is recommended.

The Advanced Diagnostics Format utility is different from the operating system format program. Before the customer can transfer information from the backup diskettes to the hard disk, the hard disk must be formatted using the operating system format program. Have the customer refer to the operating system manual for a description of the hard disk preparation commands.

Warning: All data on the selected hard disk is destroyed during a format operation or surface analysis.

Format Utility

```
FORMAT SELECTION MENU
---------------------
 1 - CONDITIONAL FORMAT
 2 - UNCONDITIONAL FORMAT
 3 - SURFACE ANALYSIS
 9 - RETURN TO HARD DISK MENU

 FOR OPTION 9
 TYPE '9' AND PRESS 'ENTER'
 FOR OTHER OPTIONS (1 THRU 5)
 TYPE THE OPTION NUMBER,
 DRIVE ID (1,C), AND PRESS 'ENTER'
```

1 - CONDITIONAL FORMAT: The hard disk is scanned for any defective tracks, then formatted (except for any known defective tracks).

2 - UNCONDITIONAL FORMAT: The hard disk is formatted, except for any defective tracks that you specify.

3 - SURFACE ANALYSIS: Scans the hard disk by writing, reading, and comparing a unique data pattern to detect any defective tracks.

9 - RETURN TO HARD DISK MENU: Returns to the Hard Disk menu.

Warning: Formatting results in a complete loss of data on the hard disk, including system software. If you are directed to or elect to format the hard disk, you must do the following:

1. Prior to formatting, have the customer back up all information.
2. Prior to returning the system to the customer, you must reinstall the system software on the hard disk.

Formatting Procedure

Before replacing a failing hard disk drive, try to format it as follows:

1. Power off the system unit. Check that the hard disk drive cable is tightly connected.

2. Insert the Advanced Diagnostics diskette into drive A.

3. Power on the system unit.

4. Press **0 (SYSTEM CHECKOUT),** then press **Enter**.

5. Depending on the options installed in the system, questions about attached devices may appear on the screen. Answer as required, then press **Enter**.

6. Press **Y (IS THE LIST CORRECT (Y/N)?)**, then press **Enter**. If the list is incorrect, follow the instructions on the screen to correct the list before answering "Yes."

7. Press **0 (RUN TESTS ONE TIME)**, then press **Enter**.

8. Select **17 (HARD DISK DRIVE)**, then press **Enter**.

9. Press **7 (FORMAT MENU)**, then press **Enter**.

10. Press **1, C**, then press **Enter**.

11. Press **Y (DO YOU WANT TO CONTINUE (Y/N)?)**, then press **Enter**.

12. Press **Y** or **N (ALL DEFECTS WILL BE SHOWN ON THE MONITOR, THEY CAN ALSO BE PRINTED ON LPT1. IS A HARD COPY NEEDED?)**, then press **Enter**.

13. If you were instructed to perform an **UNCONDITIONAL FORMAT**, follow the instructions on the screen.

14. Prior to formatting, have the customer back up all information.

15. Prior to returning the system to the customer, you must reinstall the system software on the hard disk.

Error Log for Intermittent Problems

Use the following steps to create an error log, run the diagnostic tests, and automatically record any error messages in an error log. This procedure is normally used to diagnose an intermittent problem.

For POST errors, refer to "POST Error History" on page 1-26 to access the POST Error History.

Note: The errors must be logged to a diskette drive. If recording errors on a diskette, use a formatted data diskette or a copy of the Advanced Diagnostics diskette that is not write-protected. **Do not run any diskette test when logging to a diskette drive.**

Creating the Error Log

1. Load the Advanced Diagnostics diskette from drive A.

2. Press **0 (SYSTEM CHECKOUT)**, then **Enter**.

3. Depending on the options installed in the system, questions about attached devices may appear on the screen. Answer as required; then press **Enter**.

4. Press **Y** or **N (IS THE LIST CORRECT (Y/N)?)**, then **Enter**.

5. Press **2 (LOG UTILITIES)**, then **Enter**.

6. Press **0 (START ERROR LOG)**, then **Enter**.

7. Press **0 (SELECT DEVICE FOR LOG (0-DISKETTE))**, then **Enter**.

8. If you are logging to diskette, press **A** or **B (ENTER THE DRIVE ID FOR ERROR LOG?)**, then **Enter**. Follow the instructions on the screen.

9. Press **9 (END LOG UTILITIES)**, then **Enter**.

Starting the Test

1. Press **1 (RUN TESTS MULTIPLE TIMES)**, then **Enter**.

2. Select the device you suspect has a failure, then press **Enter**.

3. Select the number of times the test is to be run, then press **Enter**.

4. Press **N (WAIT EACH TIME AN ERROR OCCURS (Y/N)?)**, then **Enter**.

5. Follow any instructions on the screen and select all available tests.

   Note: Do not press any keys during the keyboard test.

6. To end **(RUN TEST CONTINUOUSLY)**, press and hold the **Ctrl** key; then press the **Break** key. The system completes testing and returns to the Installed Devices menu.

Display the Error Log

1. Depending on the options installed in the system, questions about attached devices appear on the screen. Answer as required; then press **Enter**.

2. Press **Y** or **N (IS THE LIST CORRECT (Y/N)?)**, then **Enter**.

3. Press **2 (LOG UTILITIES)**, then **Enter**.

4. Press **2 (DISPLAY LOG)**, then **Enter**.

5. Press **A** or **B (ENTER THE DRIVE ID FOR ERROR LOG?)**, then **Enter**.

6. If no errors occurred, the Log Utilities menu appears. If errors are displayed, go to "Start" on page 2-2.

Display Self Test

Be sure the monitor has been turned on for approximately 5 minutes before you start the Display Self Test.

Note: If you are testing a digital power-on LED monitor with a row of LEDs under the access door at the front of the monitor, ignore Step 5a and do Step 5b only. For monitors with an on/off LED only, do only Step 5a.

Run the test as follows:

1. Power off the system unit and monitor.

2. Disconnect the monitor signal cable from the system unit.

3. Power on the monitor. Check to see that the power-on LED is lit.

4. Turn the brightness and contrast controls to their maximum positions.

   a. If the monitor has an on/off LED only, the following symptoms indicate the monitor is still good:

      • The monitor screen should get lighter (it should not stay completely black). You may want to check the monitor in a dark or dimly lit room.

      • The monitor screen should show a power-off discharge (a flash of light) when turned off.

      Note: If you can see the flash of light but not the lighter screen, you may want to perform Step 5 again in a dark or dimly lit room.

   b. If the monitor has a row of LEDs next to the control buttons, the following symptom indicates the monitor is still good:

      • The row of LEDs should repeatedly flash (or blink) in sequence from left to right.

Repair Information

Removals and Replacements—Machine Type 2144

CAUTION:
**Before removing any FRU, power off the system unit, unplug all power
cords from electrical outlets, disconnect any interconnecting cables,
and disconnect any telephone cords.**

**The power supply might contain +5 V dc auxiliary power when the
system is powered off. Be sure to unplug the power cord before
attempting any replacements.**

Warning: The system board, processors, adapter cards, SIMMs, video
memory modules, and upgrade processors can be damaged by electrostatic
discharge. Use an electrostatic discharge (ESD) strap to establish personal
grounding. If you don't have an ESD strap, establish personal grounding by
touching a ground point with one hand before touching the static-sensitive
FRUs.

The arrows in the removals and replacements procedures show the direction
of movement to remove a field-replaceable unit (FRU), to turn a screw, or to
press a tab to release the FRU.

Begin all removals by removing the cover (and rear cover, if applicable).

When other FRUs must be removed prior to removing the failing FRU, they
are listed at the top of the page. Go to the removal procedure for each FRU
listed, remove the FRU, and then continue with the removal of the failing
FRU.

To replace a FRU, reverse the removal procedure and follow any notes that
pertain to replacement. See "Parts/Test Point Locations" on page 5-1 for
internal cable connection and arrangement information.

Before disconnecting any cables, note their locations. Reinstall any new
FRUs with cables in the same locations.

1005—Cover
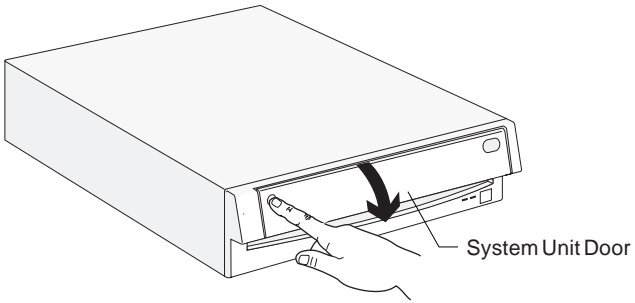
Figure   4-1. Push In on the Door
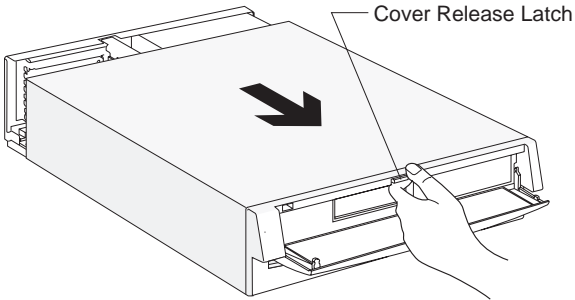
Figure   4-2. Pull Out on the Cover

1010—Left Drive Support Bracket

- Disconnect any cables necessary for removal.
- Slide bracket toward back to release catches. Lift up to remove.

(Front View)
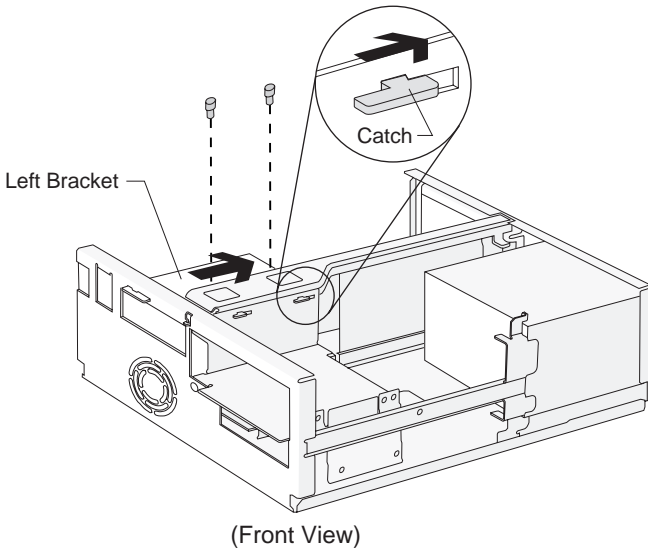
Figure   4-3. Left Drive Support Bracket

1015—Right Drive Support Bracket

- Disconnect any cables necessary for removal.

(Front View)
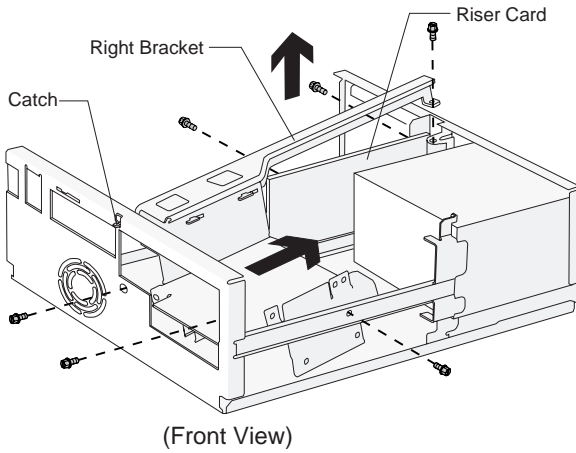
Figure 4-4. Right Drive Support Bracket

1020—3.5-In. Bays

- Left drive support bracket (1010)

(Front View)
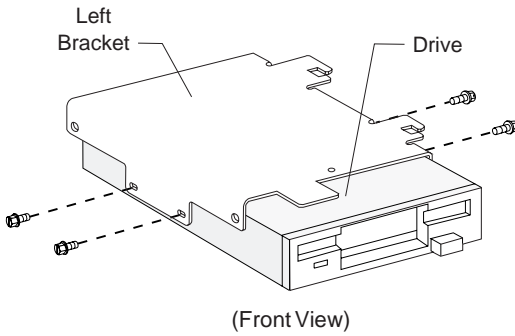
Figure   4-5. 3.5-In. Bay 1

1025—5.25-In. Bay

- Left drive support bracket (1010)
- CD-ROM drive or other drives
- Right drive support bracket (1015)

When removing a drive, reinstall the new FRU in the same bay. Any of
these devices may be installed in any 5.25-in. bay:

- CD-ROM drive (if Multimedia model)
- 5.25-in. diskette drive
- Dual 3.5-in. and 5.25-in. diskette drive
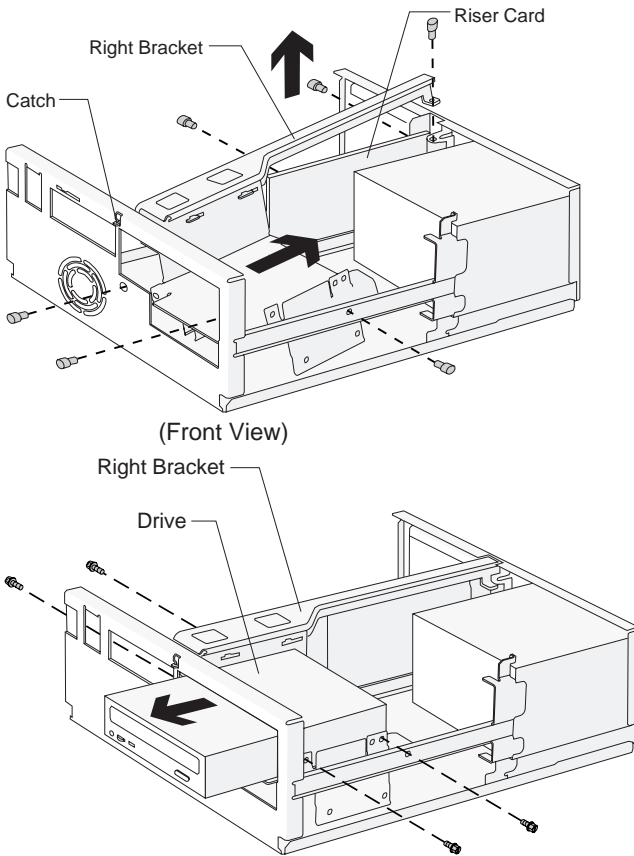
Figure 4-6. 5.25-In. Bay

1030—Hard Disk Drive

- Left drive support bracket (1010)
- Right drive support bracket (1015)

Note: Refer to Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 and install the correct software.

(Front Upside Down View)
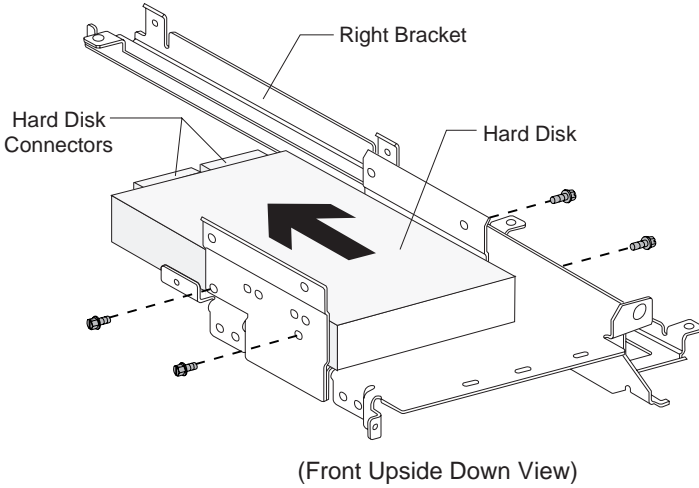
Figure   4-7. Hard Disk Drive—Bay 3

(Front Upside Down View)
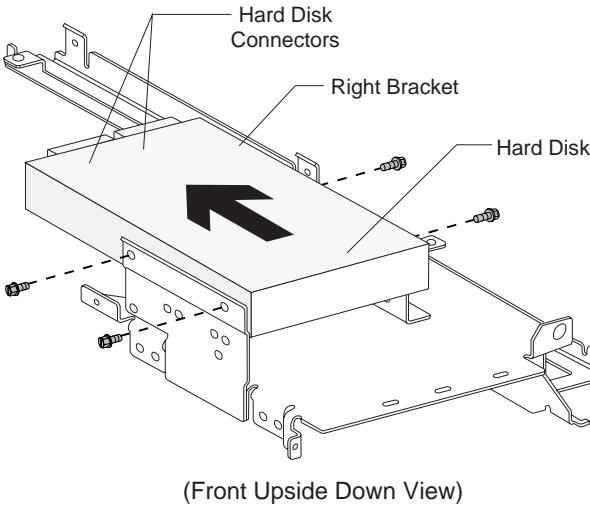
Figure   4-8. Hard Disk Drive—Bay 4

1033—CD-ROM Changer Emergency Disc Removal

1. Remove the CD-ROM drive from the computer.
2. Remove the *left* adhesive label on the left side of the CD-ROM drive. Handle the label carefully; it will be used again.
3. Remove the two top panel screws, and remove the top panel.
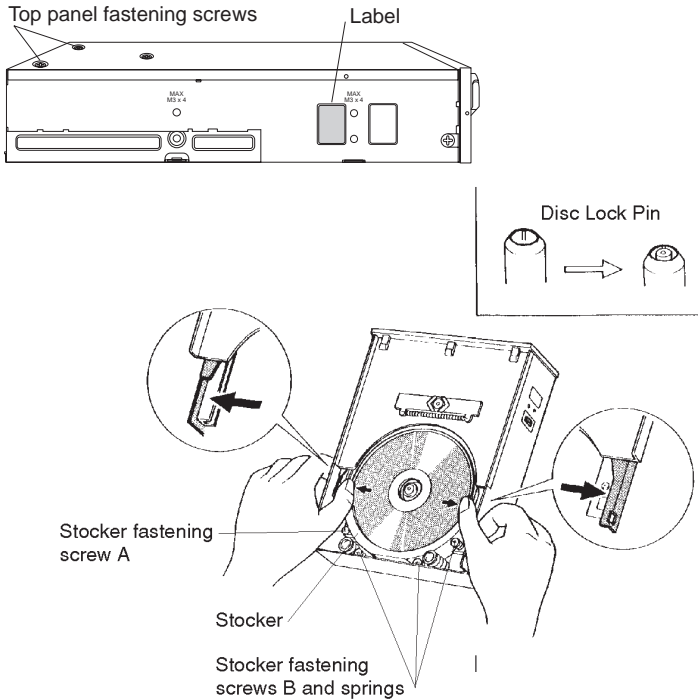
4. Turn the emergency eject gear until the disc lock pin is pushed down.
5. Hold the CD-ROM drive as shown and carefully spread the left and right disc guide plates so that the disc drops into the stocker mechanism.
6. Remove the stocker fastening screw A.
7. Remove the three stocker fastening screws B and the three springs.
8. While keeping the left and right disc guide plates spread, remove the disc together with the stocker. Carefully remove the disc, to prevent damage.

Note

1. Replace the removed parts by reversing the above procedure.
2. To prevent dust from entering the CD-ROM drive, reattach the adhesive label (use cellophane tape or similar if necessary).

1035—Adapter Cards

* Remove any cables (note location of cables).
* Reset jumpers on adapter cards.
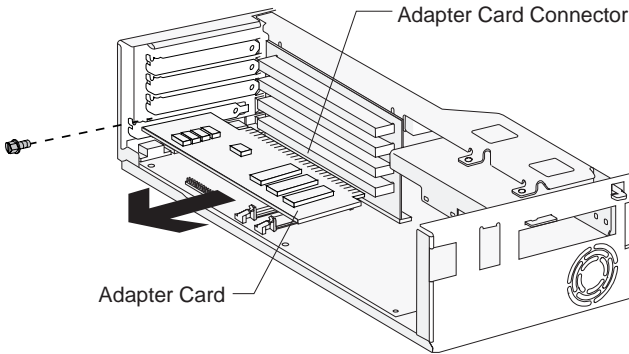
Figure   4-9. Adapter Cards

Note: When reinstalling a modem adapter card, ensure the modem Wake Up on Ring cable is connected from the 2-pin keyed connector on the modem to the system board. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for connector locations.

1040—Power Supply

- Right drive support bracket (1015).
- Disconnect any cables necessary for removal.
- Remove rear cover to locate power supply screws.

Power Supply

(Back View)

Rear Cover
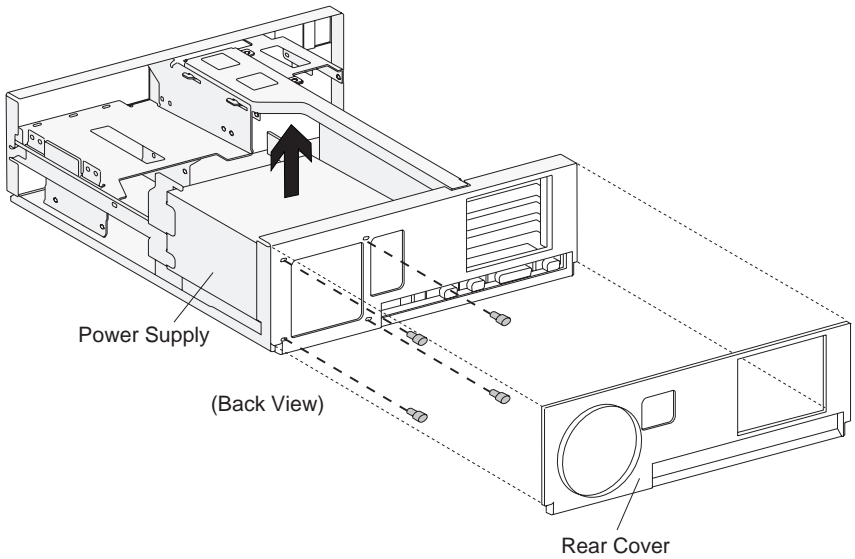
Figure   4-10. Power Supply

1045—Riser Card

- Adapter Cards (1035)
- Left drive support bracket (1010)

Some riser cards may contain a VESA local bus extension.
See "Parts Catalog" on page 7-1 for FRU part number.
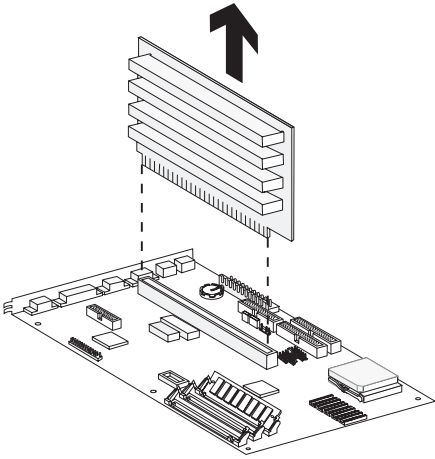
Figure   4-11. Riser Card

1050—Memory (SIMM)

Warning: Memory cards are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

• Adapter cards (1035) if applicable

Note: Run the Setup Utility after adding or removing memory.
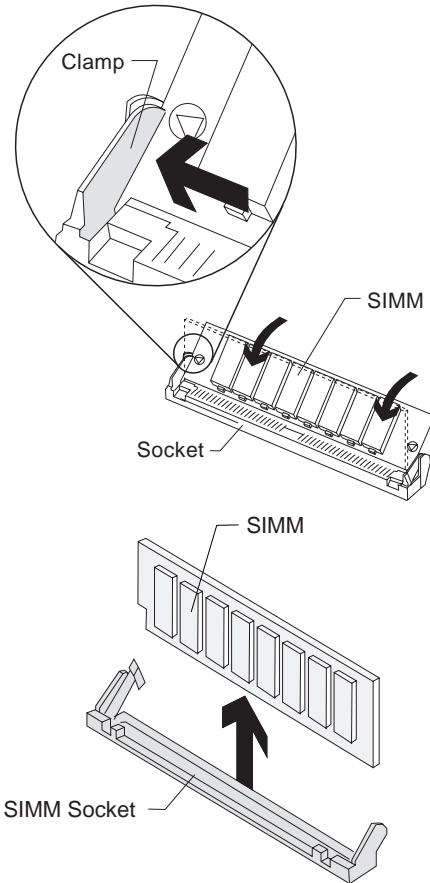
Figure 4-12. System Board SIMM Sockets

1055—Cache Memory—Type I-1

Warning: Memory cards are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (1035) if applicable
- Riser card (1045) if applicable

Note: Run the Setup Utility after adding or removing memory.
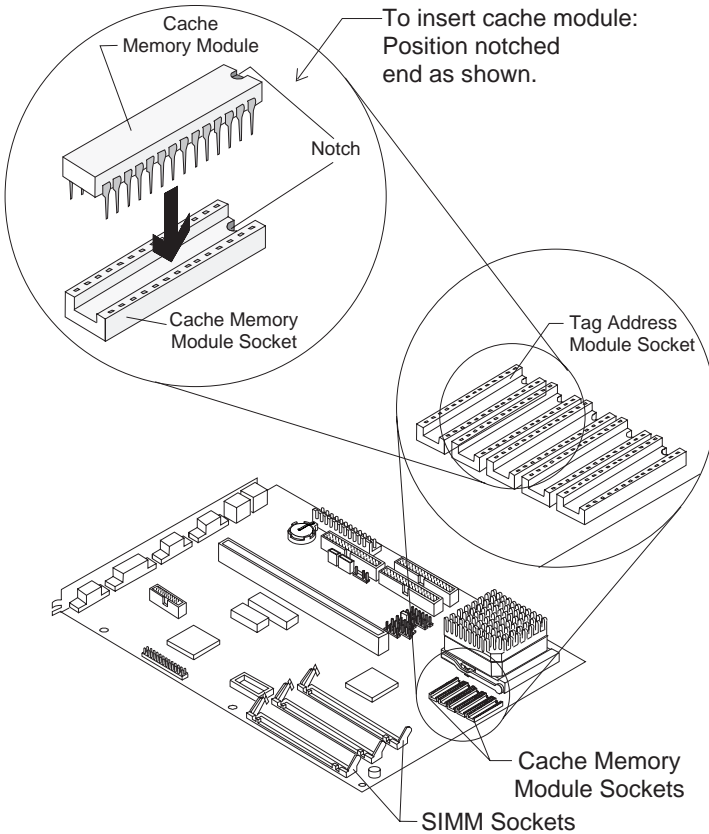
Figure   4-13. Cache Memory Modules - Type I-1

┌─ **Important** ───┐

For proper operation, only two cache memory configurations are
supported:

0KB   All five cache memory module connectors are *empty*.

128KB   All five cache memory module connectors are *populated*.

Note: There are no system board cache memory jumpers to set.

└───┘

To install cache memory in a system board with no cache memory
previously installed, do the following.

1. Locate cache memory module connectors U28 - U32 on the system
   board (see Figure 4-13 on page 4-14).

2. Install one 28-pin module (8KB x 8, 15 ns SRAM) in memory module
   U28.

3. Install four 28-pin modules (32KB x 8, 20 ns SRAM) in memory
   modules U29 - U32.

1055—Cache Memory—Type I-2

Warning: Memory cards are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (1035) if applicable
- Riser card (1045) if applicable

Notes:

1. See "System Board Layout—Type I-2" on page 5-5 for cache memory jumper settings.

2. Run the Setup Utility after adding or removing memory.
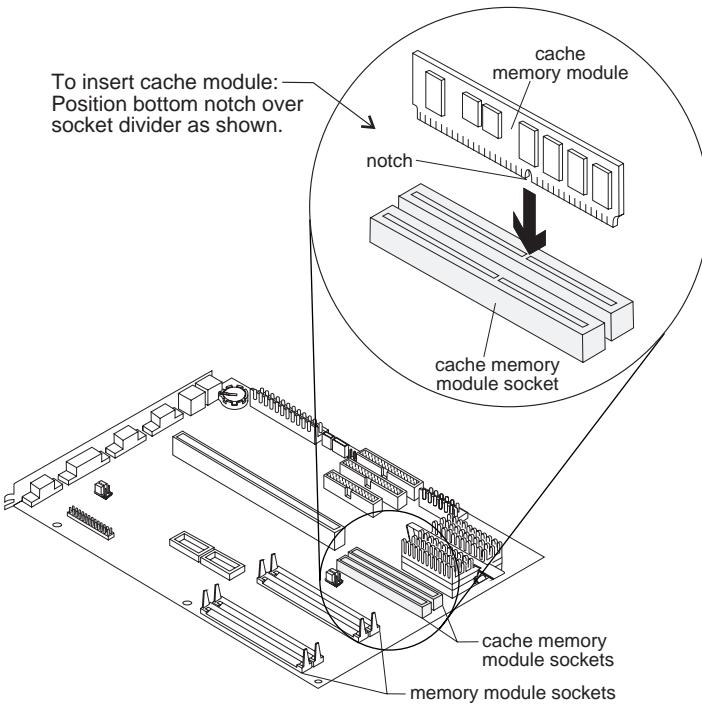
Figure   4-14. Cache Memory Modules - Type I-2

1056—Video Memory—Type I-1

Warning: Video memory DRAM modules are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (1035) if applicable.
- Use the Video Memory Removal Tool to remove the video memory module.

Note: Run the Setup Utility after adding or removing memory.
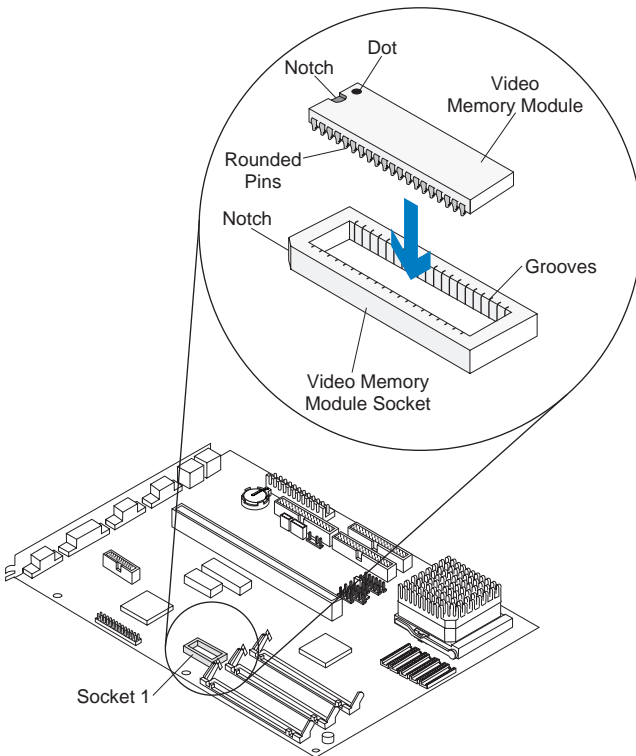
Figure 4-15. System Board Video Memory Module - Type I-1

1056—Video Memory—Type I-2

Warning: Video memory DRAM modules are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (1035) if applicable.
- Use the Video Memory Removal Tool to remove the video memory module.

Note: Run the Setup Utility after adding or removing memory.
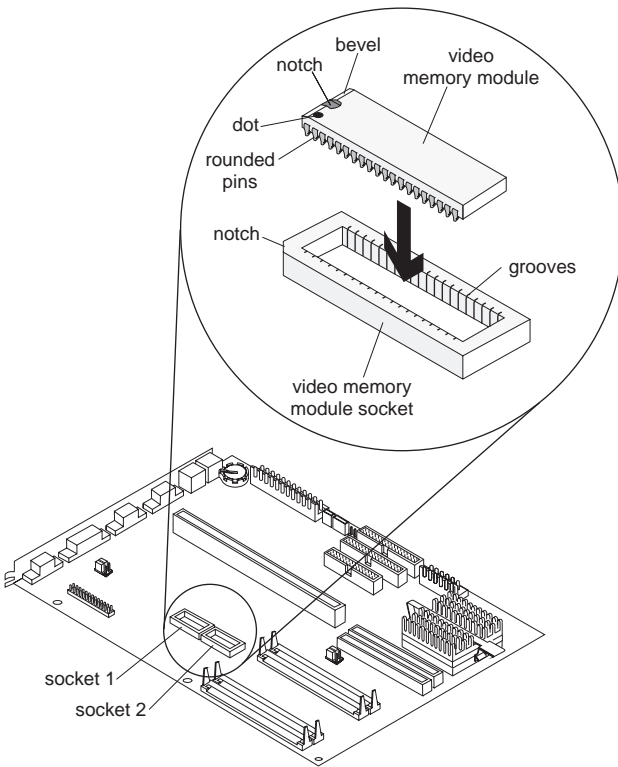
Figure 4-16. System Board Video Memory Module - Type I-2

1060—Upgrade Processors—Type I-1

Warning: Processors are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (1035) if applicable.
- Left drive support bracket (1010).
- Right drive support bracket (1015).
- To remove the processor, raise the socket lever, remove the old processor, insert the upgrade processor, then lower the socket lever firmly.
- When installing, be certain the dot on the processor is aligned with the dot in the socket.

Notes:

1. Determine which type of processor you are installing and make sure the jumpers are set correctly.

2. Run the Setup Utility after installing a processor.
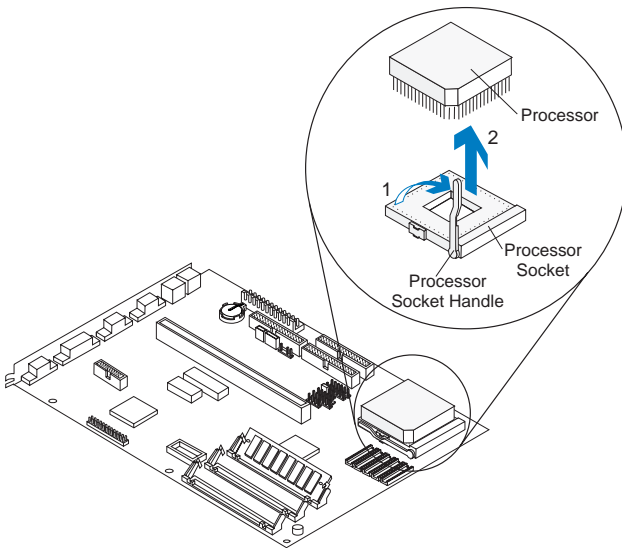
Figure 4-17. Processor Upgrade - Type I-1

1060—Upgrade Processors—Type I-2

Warning: Processors are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (1035) if applicable.
- Left drive support bracket (1010).
- Right drive support bracket (1015).
- To remove the processor: remove the processor retaining clip, raise the socket lever, remove the old processor, insert the upgrade processor, lower the socket lever firmly, then install the processor retaining clip.
- When installing, be certain the dot on the processor is aligned with the dot in the socket.

Notes:

1. Determine which type of processor you are installing and make sure the jumpers are set correctly.

2. Run the Setup Utility after installing a processor.

Figure   4-18. Processor Upgrade - Type I-2

1080—Lithium Battery

- Adapter cards (1035) if applicable.
- Left drive support bracket (1010).
- Riser card (1045).
- Insert the tip of a screwdriver under the clip (**1**) and raise the clip carefully (**2**) to remove the battery.

CAUTION:
The lithium battery presents a fire, explosion, or severe burn risk. Do not recharge it, disassemble it, heat it above 100°C (212°F), incinerate it, or expose its cell contents to water. Dispose of the battery as required by local ordinances or regulations.

Warning: Be careful when removing the battery. If the retaining clip is broken, the system board must be replaced.

Note: Run the Setup Utility after installing a battery.
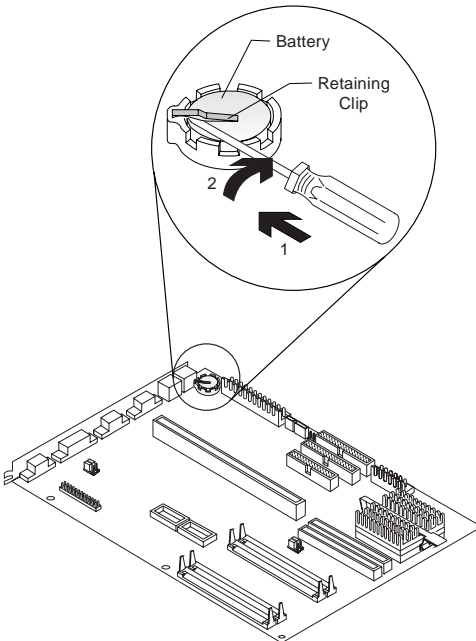
Figure   4-19. Lithium Battery

1085—Indicator LED and Cable

- Left drive support bracket (1010).
- Right drive support bracket (1015).
- Push in on the indicator LED and remove assembly from the rear.

Indicator LED
and cable
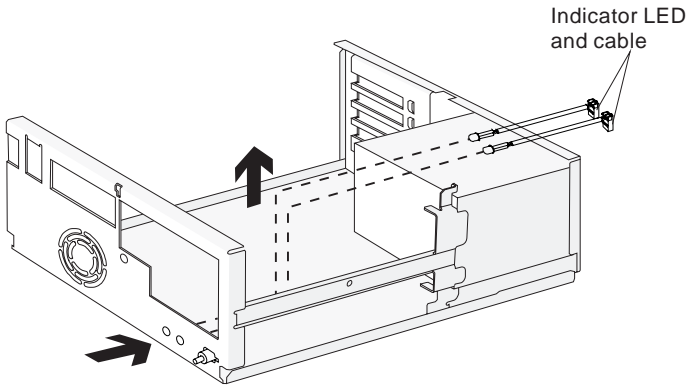
Figure   4-20. Indicator LED and Cable

1090—System Board

- Adapter cards (1035).
- Left drive support bracket (1010).
- Riser card (1045).
- Disconnect any cables necessary for removal.
- Memory (SIMMs) (1050).
- Video memory modules (1056) if applicable.
- Cache memory modules (1055) if applicable.
- Processor or math coprocessor/upgrade processor (1060) if applicable.

Notes:

1. Be certain to reinstall the SIMMs, optional math coprocessor/upgrade processor, video memory, and cache memory on the new system board if applicable.

2. When reinstalling a new system board, push the board to the rear and place it over the front locating pin prior to installing the screws.

3. Run the Setup Utility after changing the system board.
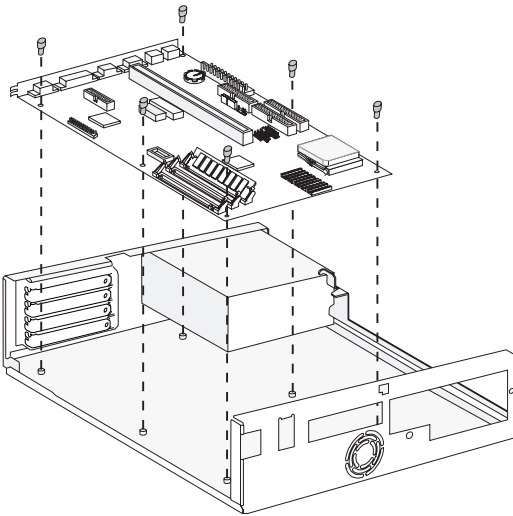
Figure   4-21. System Board

Removals and Replacements—Machine Type 2168

Note: The Machine Type 2168 might contain drives and devices not illustrated in this book. Follow replacement instructions for the same size device if in doubt. See Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for exact model configurations.

The arrows in the removals and replacements procedures show the direction of movement to remove a field-replaceable unit (FRU), to turn a screw, or to press a tab to release the FRU.

Begin all removals by removing the cover (and rear cover, if applicable).

When other FRUs must be removed prior to removing the failing FRU, they are listed at the top of the page. Go to the removal procedure for each FRU listed, remove the FRU, and then continue with the removal of the failing FRU.

To replace a FRU, reverse the removal procedure and follow any notes that pertain to replacement. See "Parts/Test Point Locations" on page 5-1 for internal cable connection and arrangement information.

Before disconnecting any cables, note their locations. Reinstall any new FRUs with cables in the same locations.

CAUTION:
Before removing any FRU, power off the system unit, unplug all power cords from electrical outlets, disconnect any interconnecting cables, and disconnect any telephone cords.

The power supply might contain +5 V dc auxiliary power when the system is powered off. Be sure to unplug the power cord before attempting any replacements.

Warning: The system board, processors, adapter cards, SIMMs, video memory modules, and upgrade processors can be damaged by electrostatic discharge. Use an electrostatic discharge (ESD) strap to establish personal grounding. If you don't have an ESD strap, establish personal grounding by touching a ground point with one hand before touching the static-sensitive FRUs.

2005—Cover

• Unscrew the two screws behind the front handle.
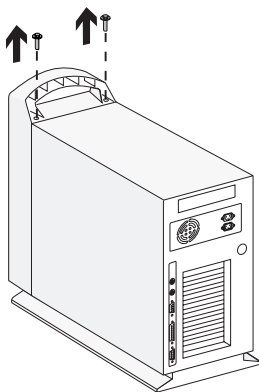
(Back View)

Figure   4-22. Remove the Screws
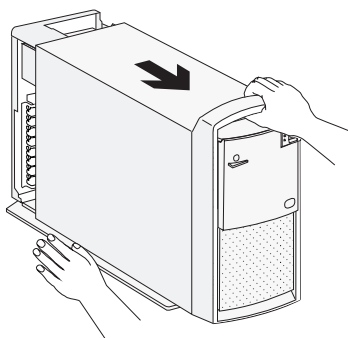
(Front View)

Figure   4-23. Pull Out on the Cover

2020—3.5-In. Bays

- Disconnect any cables on the drive.
- Remove the screws.
- Pull out the diskette drive.
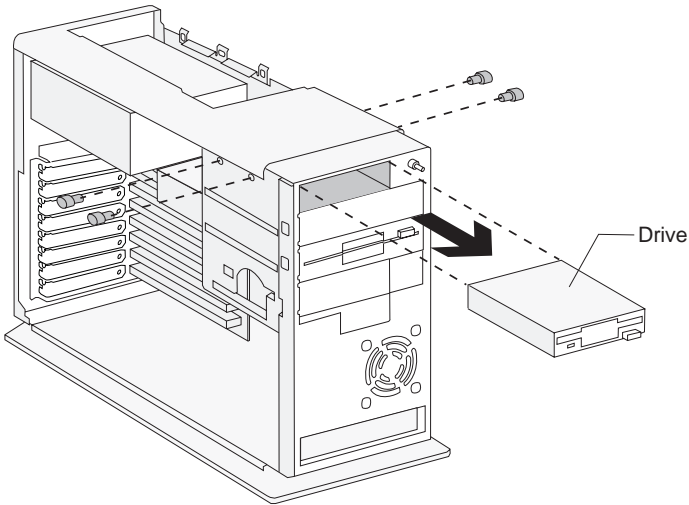
(Front View)

Figure   4-24. Bay 1 (3.5-In.)
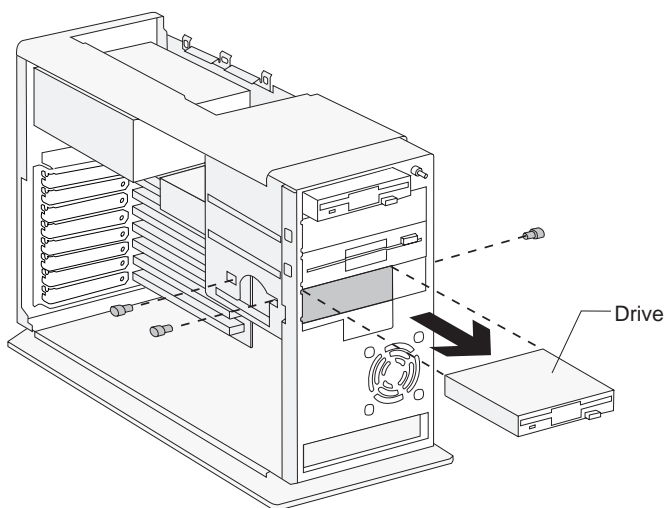
(Front View)

Figure   4-25. Bay 4 (3.5-In.)

2025—5.25-In. Bays

- Disconnect any cables on the drive.
- Remove the screws.
- Pull out the diskette drive.

When removing a drive, install the new FRU in the same bay. Any of these devices may be installed in any 5.25-in. bay:

- CD-ROM drive (if Multimedia model)
- 5.25-in. diskette drive
- Dual 3.5-in. and 5.25-in. diskette drive
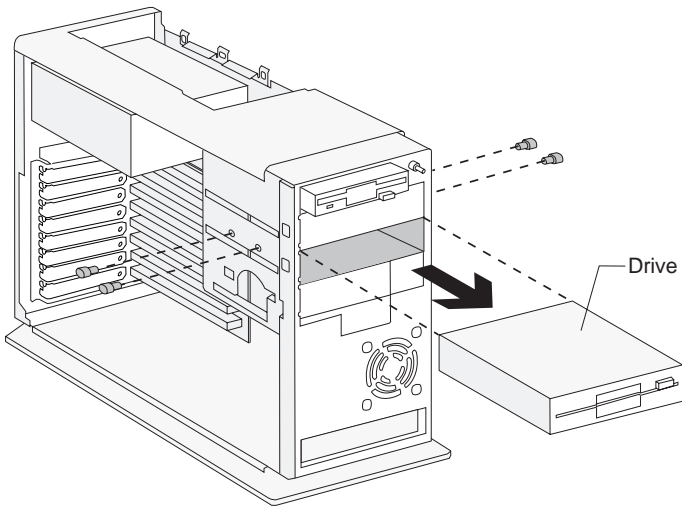
(Front View)

Figure 4-26. Bays 2 and 3 (5.25-In.)

2030—Hard Disk Drives

Bay 5

- Disconnect any cables on the drive.
- Remove the screws.
- Slide the hard disk drive to the rear and tilt to remove.
- Remove the mounting bracket from the old drive and install the bracket on the replacement drive.

Note: Refer to Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 and install the correct software.

(Back View)
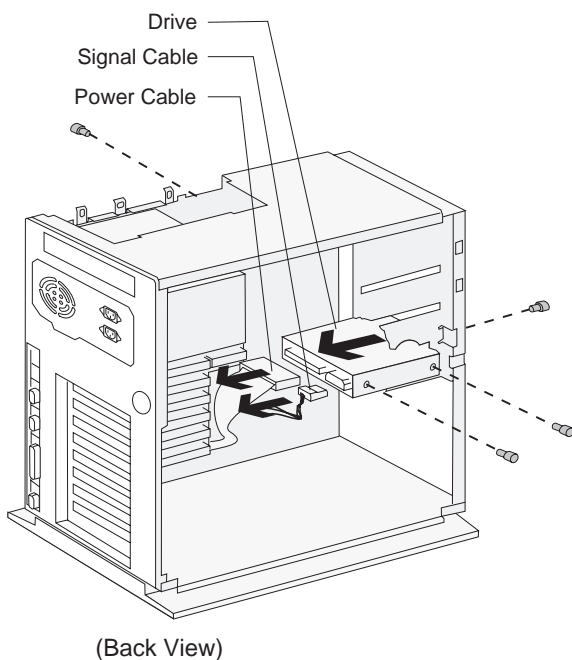
Figure   4-27. Hard Disk Drive—Bay 5
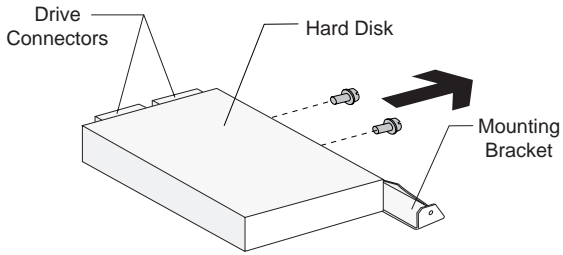
(Front Upside Down View)

Figure   4-28. Mounting Bracket—Bay 5

Bay 6

- Disconnect any cables on the drive.
- Remove the screws.
- Lift out the hard disk drive.
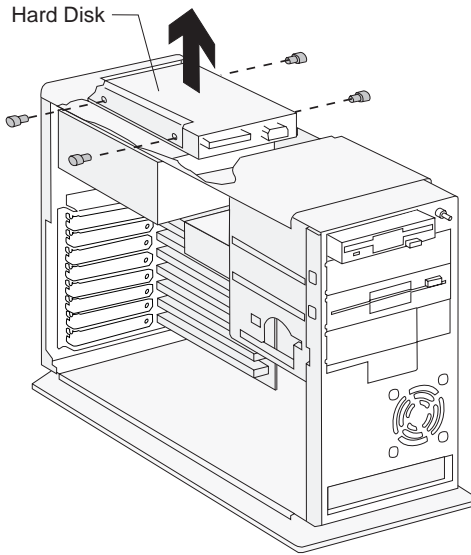
(Front View)

Figure   4-29. Hard Disk Drive—Bay 6

2033—CD-ROM Changer Emergency Disc Eject Procedure

See "1033—CD-ROM Changer Emergency Disc Removal" on page 4-9 for procedure.

2035—Adapter Cards

Note: Before removing an adapter card, note the location of the adapter card and cables. When removing an adapter card, install the replacement card in the same slot as the one you removed.

• Remove any cables (note location of cables).
• Remove the adapter card mounting screw (**1**).
• Pull out the adapter card (**2**).
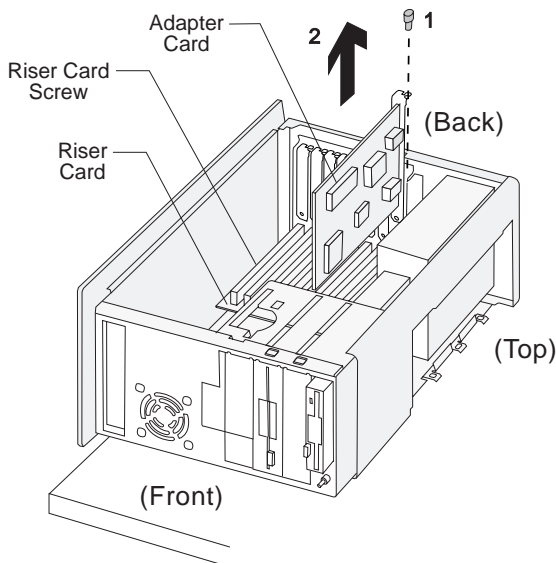
Figure   4-30. Adapter Cards

Note: When reinstalling a modem adapter card, ensure the modem Wake Up on Ring cable is connected from the 2-pin keyed connector on the modem to Wake Up on Ring connector on the system board. See "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for locations.

2040—Power Supply

- Disconnect any cables necessary for removal.
- Remove the power supply mounting screws.
- Lift out the power supply.
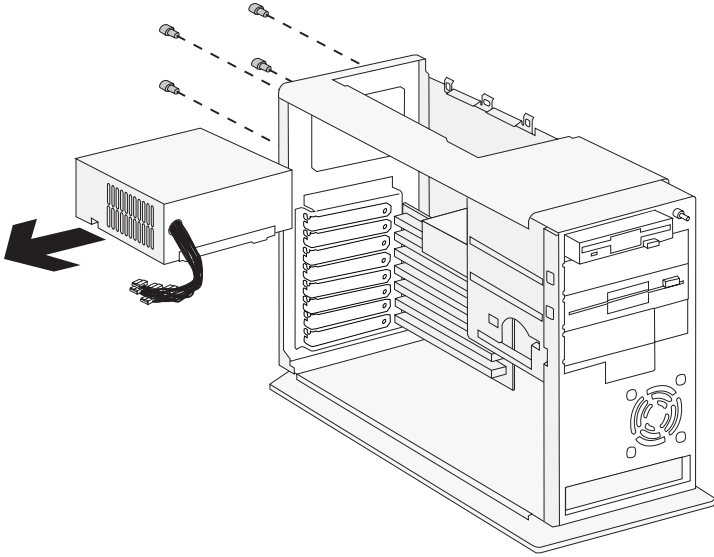
Figure 4-31. Power Supply

2045—Riser Card

- Adapter cards (2035) if applicable.
- Riser card power connector.
- Remove the riser card mounting screw (**1**).
- Remove the riser card (**2**).

Some riser cards may contain a VESA local bus extension. See "System Board Layout—Type I-2" on page 5-5 for socket locations on the system board.
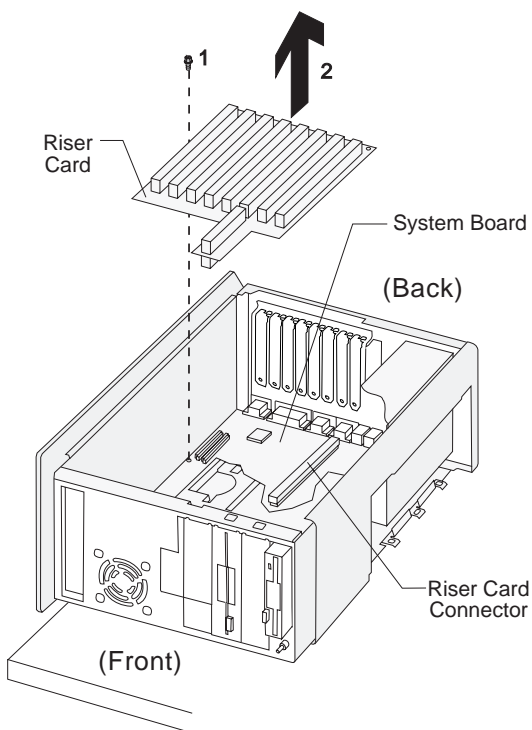
Figure   4-32. Riser Card

2050—Memory (SIMM)

Warning: Memory cards are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (2035) if applicable.
- Riser card (if SIMMs located behind riser card).
- Push out on the side clamps to release the module.
- Pull the module up and out to remove.

Note: Run the Setup Utility after adding or removing memory.
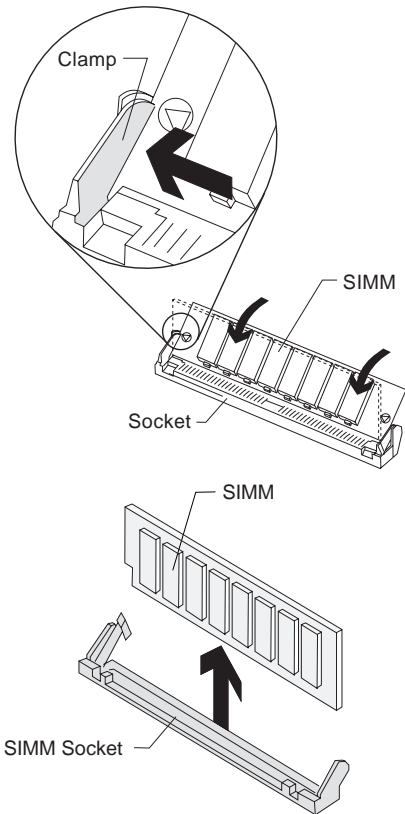
Figure   4-33. Memory SIMM

2055—Cache Memory—Type I-2

Warning: Memory cards are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (2035) if applicable
- Riser card (2045) if applicable

Notes:

1. See "System Board Layout—Type I-2" on page 5-5 for cache memory jumper settings.

2. Run the Setup Utility after adding or removing memory.
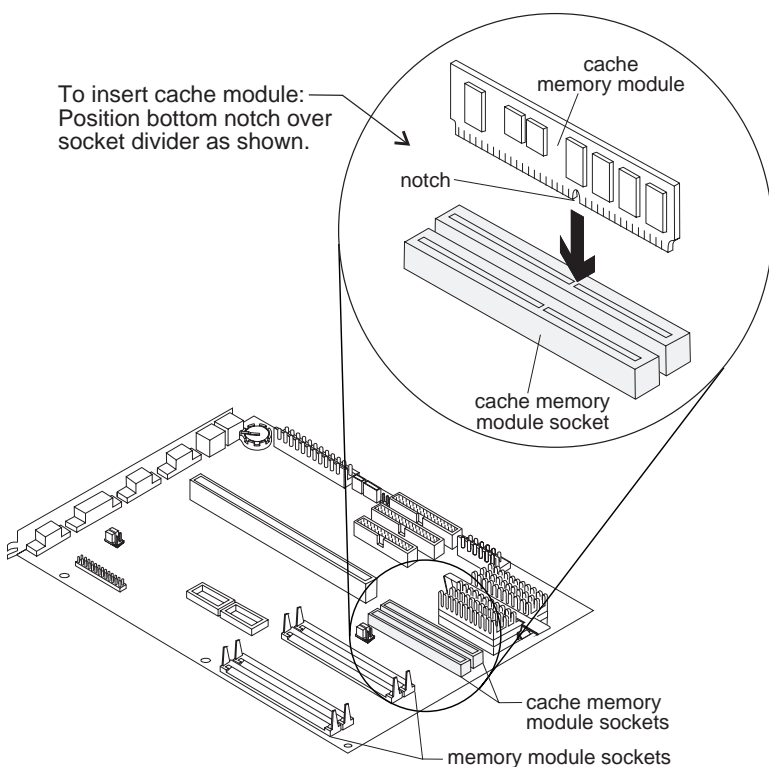
Figure 4-34. Cache Memory

2056—Video Memory—Type I-2

Warning: Video memory DRAM modules are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (2035) if applicable.
- Use the Video Memory Removal Tool to remove the video memory.

Note: Run the Setup Utility after adding or removing memory. See "Parts/Test Point Locations" on page 5-1 for location on the system board.
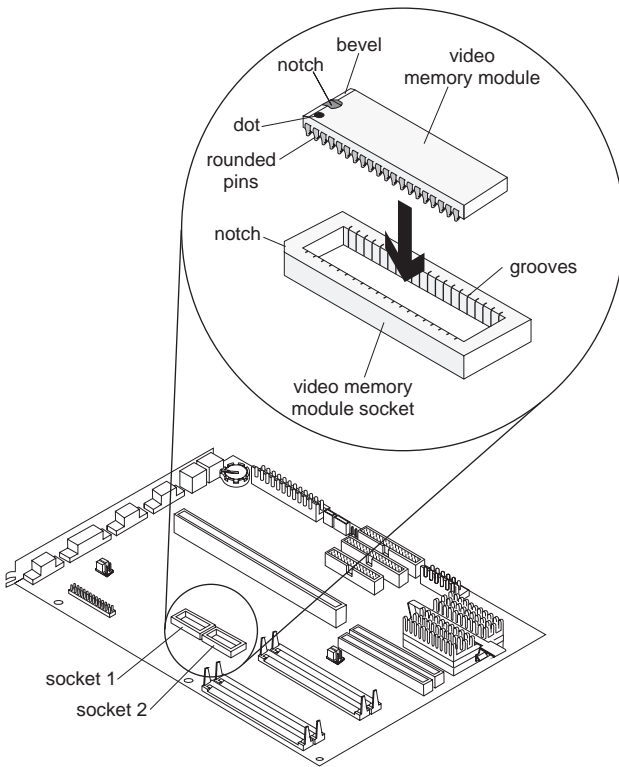
Figure 4-35. System Board Video Memory Module - Type I-2

2060—Upgrade Processors—Type I-2

Warning: Processors are sensitive to static discharge. See "Handling ESD-Sensitive Parts" on page 4-41.

- Adapter cards (2035) if applicable.
- To remove the processor: remove the processor retaining clip, raise the socket lever, remove the old processor, insert the upgrade processor, lower the socket lever firmly, then install the processor retaining clip.
- When installing, be certain the dot on the processor is aligned with the dot in the socket.

Notes:

1. Determine which type of processor you are installing and make sure the jumpers are set correctly.

2. Run the Setup Utility after installing a processor.
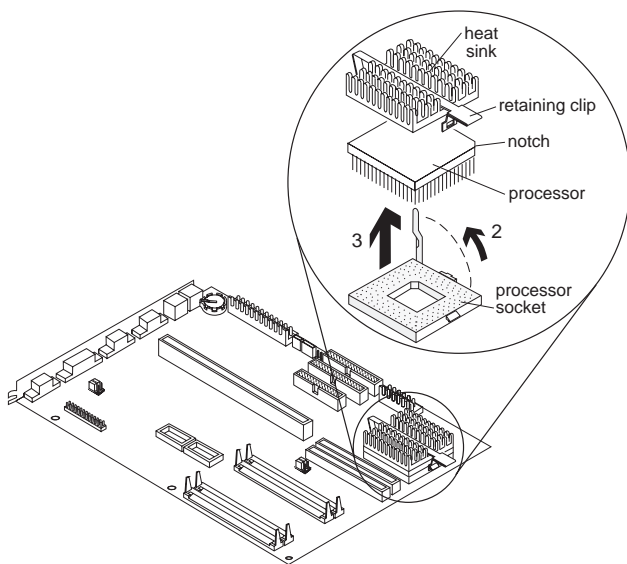
Figure   4-36. System Board - Type I-2

2080—Lithium Battery

- Adapter cards (2035) if applicable.
- Riser card (2045).
- Insert the tip of a screwdriver under the clip (**1**) and raise the clip carefully (**2**) to remove the battery.

CAUTION:
The lithium battery presents a fire, explosion, or severe burn risk. Do not recharge it, disassemble it, heat it above 100°C (212°F), incinerate it, or expose its cell contents to water. Dispose of the battery as required by local ordinances or regulations.

Warning: Be careful when removing the battery. If the retaining clip is broken, the system board must be replaced.

Note: Run the Setup Utility after installing a battery.
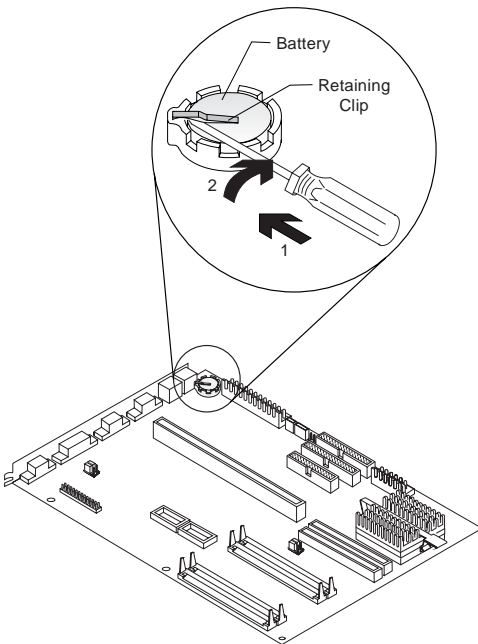
Figure   4-37. Lithium Battery

2085—Indicator LED and Cable

• Push in on the indicator LED and remove from the rear.
• Disconnect the LED and cable from the system board.

See "Parts/Test Point Locations" on page 5-1 for LED and cable locations.

Indicator LEDs
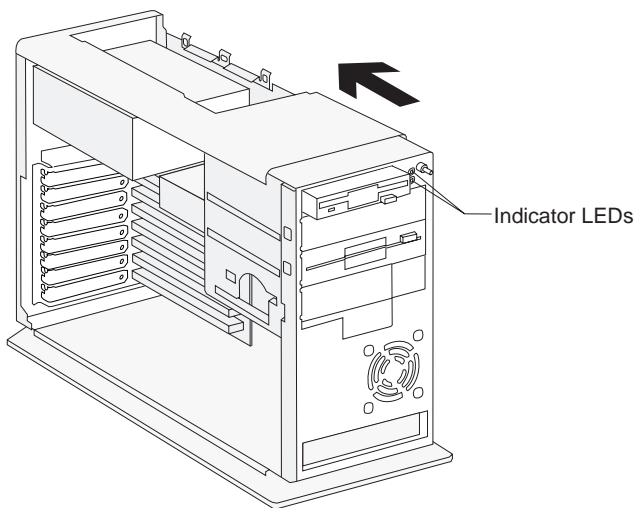
2090—System Board

- Adapter cards (2035) if applicable.
- Riser card (2045).
- Disconnect any cables necessary for removal.
- Memory (SIMM) (2050) if applicable.
- Video memory (2056) if applicable.
- Cache memory (2055) if applicable.
- Math coprocessor/upgrade processor (2060) if applicable.

Notes:

1. Be certain to reinstall the processor, SIMMs, optional math coprocessor/upgrade processor, video memory, and cache memory in the new system board if applicable.

2. When reinstalling a new system board, push the board to the rear and place it over the front locating pin prior to installing the screws.

3. Run the Setup Utility after changing the system board.
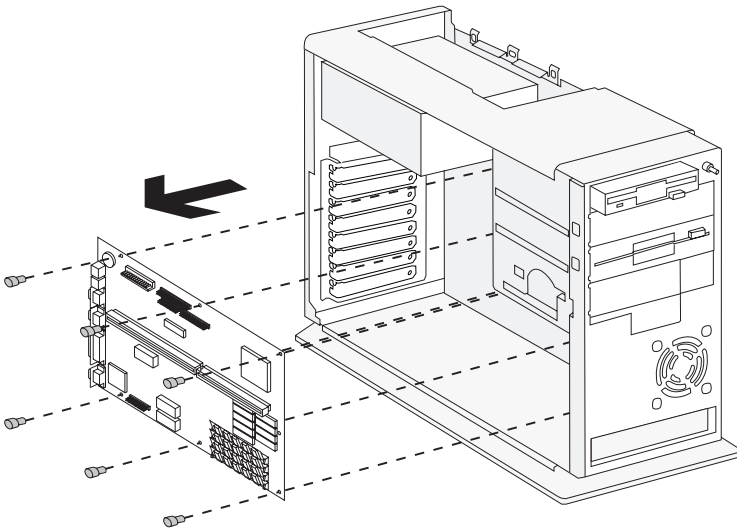
Handling ESD-Sensitive Parts

Many products use parts that are known to be sensitive to electrostatic discharge (ESD). To prevent damage when you work with ESD-sensitive parts, observe the following instructions. Do these in addition to taking all the usual precautions, such as switching off the power and unplugging the power cord before removing adapter cards.

- Keep the ESD-sensitive part in its original shipping container (a special ESD bag) until you are ready to install the part into the machine.

- Make the fewest possible movements with your body to prevent an increase of static electricity from clothing fibers, carpets, and furniture.

- Put the ESD wrist strap on your wrist. Ensure the machine is turned off. Connect the wrist strap to the serial bracket mounting screw. This discharges any static electricity in your body to the machine frame.

- Hold the ESD-sensitive part by its edge connector shroud (cover). *Do not touch its pins.* If you are removing a pluggable module, use the correct tool.

- Do not place the ESD-sensitive part on the machine cover or on a metal table. If you need to put down the ESD-sensitive part for any reason, first put it into its special bag.

  Machine covers and metal tables are electrical grounds. They increase the risk of damage because they make a discharge path from your body through the ESD-sensitive part. (Large metal objects can be discharge paths without being grounded.)

- Prevent ESD-sensitive parts from being accidentally touched by other personnel or customers. Reinstall machine covers when you are not working on the machine.

- If possible, keep all ESD-sensitive parts in a grounded metal cabinet (case).

- Be extra careful while working with ESD-sensitive parts when cold-weather heating is used because low humidity increases static electricity.

Software Installation Procedure

The Aptiva Recovery Diskette includes an Install program that can be used to restore the original Aptiva system software with the Original Aptiva Software diskettes or the IBM Aptiva Personal Computer Multimedia Exploration CD.

Refer to Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 to determine the correct software FRU part number. Then, install the original Aptiva software on the hard disk drive. Use the following procedure:

1. Power off the system unit.

2. Insert the Recovery Diskette into drive A.

3. Power on the system unit.

4. If Rapid Resume is enabled, press **Ctrl+Alt+Del** while the Rapid Resume logo screen is displayed.

5. Select "Install Aptiva Software" item on the menu.

6. Follow the instructions on the display. (You will be prompted for each of the Original Aptiva Software diskettes or the IBM Aptiva Multimedia Pack CD.)

7. When the Install program has finished, remove the diskette and/or CD. Press **Ctrl+Alt+Del** to restart the system.

Parts/Test Point Locations

System Board Layout—Type I-1

Figure 5-1. System Board Type I-1

System Board Locations—Type I-1

J1	Keyboard connector
J2	Mouse connector
J3	Serial Port A connector
J4	Serial Port B connector
J5	Parallel Port connector (Printer)
J6	Monitor signal connector
J7	Diskette drive connector
J8	Power supply connector
J9	Primary Hard Disk IDE (Hard Disk 1, Hard Disk 2)
J10	Primary Hard Disk IDE (Hard Disk 3 or CD-ROM, Hard Disk 4) (For hard disk drive jumper settings, see page 5-11)
J11	Riser Connector—ISA AT bus
J13	System board flash jumper (Normal: 1-2)
J14	VESA Video feature connector
J15	Video Disable (Normal: 1-2)
J20	RAM 72-pin memory SIMM Socket - Bank 2 (see page 5-18)
J21	RAM 72-pin memory SIMM Socket - Bank 1 (see page 5-18)
J22	RAM 72-pin memory SIMM Socket - Bank 0 (see page 5-18)
J26	LED Connector (Power: 1-2, Hard Disk Drive: 3-4)
J27	Internal Speaker (Enable: 1-2, Disable: open)
J29	Power Supply 2-pin connector (on/off switch)
J30	Power Supply 3-pin connector
J34	Riser Connector—VESA local bus
J35,J36,J37	System board clock speed selection
J41	Infrared (IR) connector
J42	Internal graphics connector
JP1	Diskette drive write protect override jumper
JP2	Smart Energy System (SES) supply present (Normal: 2-3)
JP3,JP4	VESA local bus jumpers (VESA: 1-2, PCI: 2-3)
JP5	Modem Wake Up on Ring
JP6/JP30	System board voltage regulator
JP7	VESA local bus connector
JP8,JP9	DMA channel jumpers
JP10	DX4 Processor speed jumper
JP11	Linear graphics size jumper (128MB: 1-2, 2GB: 2-3)
JP12	Mouse enable (Enable: 1-2, Disable: 2-3)
JP13	VESA local bus jumper
JP14	Power-on Password Reset (Normal: 1-2, Clear: 2-3)
JP15	VGA jumper (Enable: 1-2, Disable: 2-3)
JP23,JP24,JP25	Processor jumpers (see page 5-4)
JP38,JP39,JP40	Processor jumpers (see page 5-4)
JP41	Printer IRQ select jumper
U6	Processor
U18	Video Memory Module Connector
U22	System BIOS
U28	Cache Memory Tag Socket (see page 4-14)
U29,U30,U31,U32	Cache Memory Sockets (see page 4-14)

Processor Type Settings—Type I-1

When installing an upgrade processor, make sure the system board
processor jumpers are set as shown below.

Processor	JP23	JP24	JP25	JP38	JP39	JP40
486DX2-66 - or - 486DX4-100	1-2,3-4	2-3	Open	1-2	Open	Open
P24T - or - P24CT	1-2,3-4	1-2,4-5	1-2,3-4	2-3	3-4,5-6	1-2

Figure   5-2. Processor Type Settings—Type I-1

Processor Speed Settings—Type I-1

When installing a processor, make sure jumper JP10 is set to the correct
processor speed as shown below.

Processor Speed	Jumper JP10	Default Setting
100MHz	Open	X
66MHz, 80MHz	2-3	
50MHz	1-2	

Figure   5-3. Processor Speed Settings

System Board Layout—Type I-2
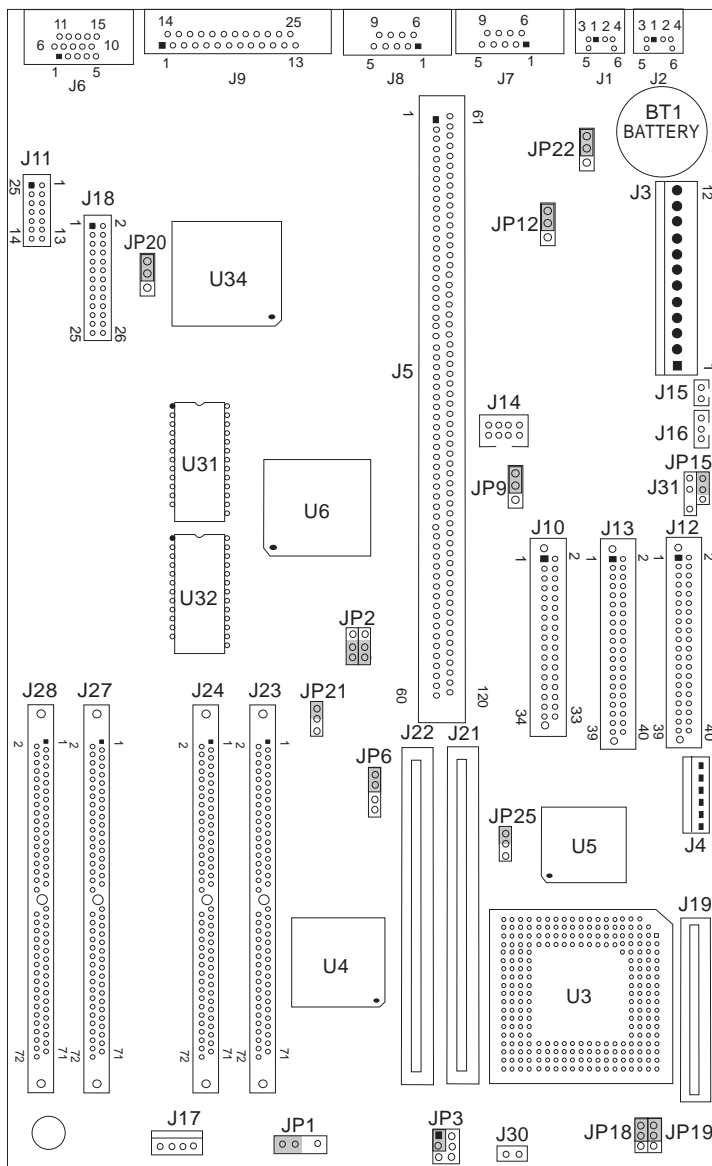
Figure 5-4. System Board Type I-2

System Board Locations—Type I-2

BT1	Battery
J1	Mouse connector
J2	Keyboard connector
J3	Power supply connector
J4	Power supply connector
J5	Riser Connector—ISA AT bus
J6	Monitor signal connector
J7	Serial Port A connector
J8	Serial Port B connector
J9	Parallel Port connector (Printer)
J10	Diskette drive connector
J11	Internal VGA video connector
J12	Primary Hard Disk IDE (Hard Disk 1, Hard Disk 2)
J13	Secondary Hard Disk IDE (Hard Disk 3 or CD-ROM, Hard Disk 4)
J14	System board voltage regulator
J15	Power Supply 2-pin connector (On/off switch)
J16	Power Supply 3-pin connector
J17	HDD/Power LED connector (Power: 1-2, HDD: 3-4)
J18	VESA Video feature connector
J19	External voltage regulator connector
J21	Primary cache memory connector
J22	Secondary cache memory connector
J23	SIMM 72-pin Socket - Bank 0
J24	SIMM 72-pin Socket - Bank 1
J27	SIMM 72-pin Socket - Bank 2
J28	SIMM 72-pin Socket - Bank 3
J30	Fan +12 V dc connector
J31	Modem wake-up on ring connector
JP1	External speaker (Enable: 1-2, Disable: open)
JP2	System board bus speed (see page 5-7)
JP3	Processor speed (see page 5-7)
JP6	Cache memory size selection (0KB or 256KB cache: 1-3, 2-4, 512KB cache: 3-5, 4-6)
JP9	System board flash jumper (Normal: 1-2)
JP12	Diskette Drive (FDD) write enable (Enable: 1-2, Disable: open)
JP15	Smart Energy System SES (Enable: 2-3, Disable: 1-2)
JP18/JP19	Processor Manufacturer (Intel: 1-2, Cyrix: 2-3)
JP20	Regular DRAM, EDO DRAM (Normal: 1-2)
JP21	Processor clock voltage selection (+5 V dc: 1-2, +3.3 V dc: 2-3)
JP22	Battery/CMOS (Battery On (Normal): 1-2, Clear CMOS: open)
JP25	Processor speed (see page 5-7)
U3	Processor
U4	Data buffer controller
U5	System controller
U31	Video DRAM module connector
U32	Video DRAM module connector
U34	Video controller

Processor Speed Setting—Type I-2

When installing a processor, make sure jumper JP3 and JP25 are set to the correct speed as shown below.

Processor Speed	Jumper JP3	Default Setting
75MHz, 90MHz, 100MHz	1-3	X
120MHz, 133MHz, 150MHz, 166MHz	1-3, 2-4	

Processor Speed	Jumper JP25	Default Setting
75MHz, 90MHz, 100MHz, 120MHz, 133MHz,	1-2	X
150MHz, 166MHz	2-3	

Figure   5-5. Processor Speed Setting

System Board Bus Speed Settings—Type I-2

When installing an upgrade processor, make sure jumper JP2 is set for the correct system board bus speed as shown below.

System Board Bus Speed	Jumper JP2	Default
50MHz	1-3, 2-4	X
60MHz	1-3, 4-6	
66.6MHz	3-5, 4-6	

Figure   5-6. System Board Bus Speed Settings—Type I-2

Power Supply Cable Connector Specifications

Refer to the following figures when checking voltages for power supply connectors and cables.

When checking voltages, the power supply fan must be running. To power on the power supply without using the on/off switch, use a screwdriver or other tool to connect pins 2 and 3 on connector J30 (with the switch cable plug disconnected from the connector on the system board).
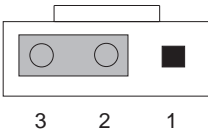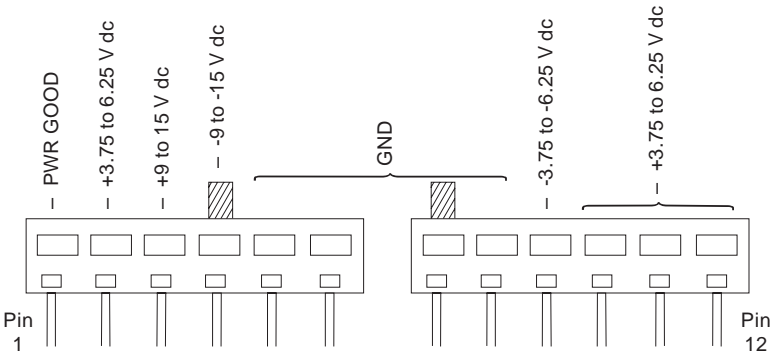

Figure 5-7. Connector J30 on System Board

Figure 5-8. System Board Power Supply Connectors (J8 Bottom View)

5 V dc   12 V dc

4   **1**
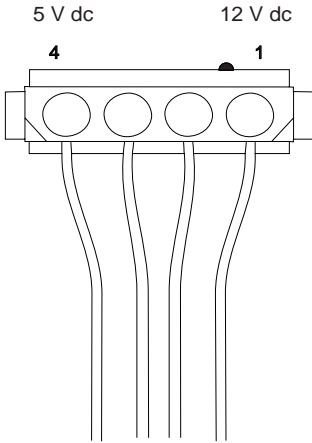
Figure   5-9. Hard Drive or CD-ROM Power Cable Connector

1   **4**

5 V dc   12 V dc
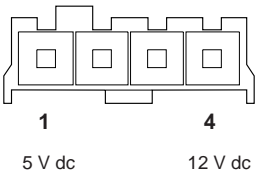
Figure   5-10. 3.5-In. Diskette Drive Power Cable Connector

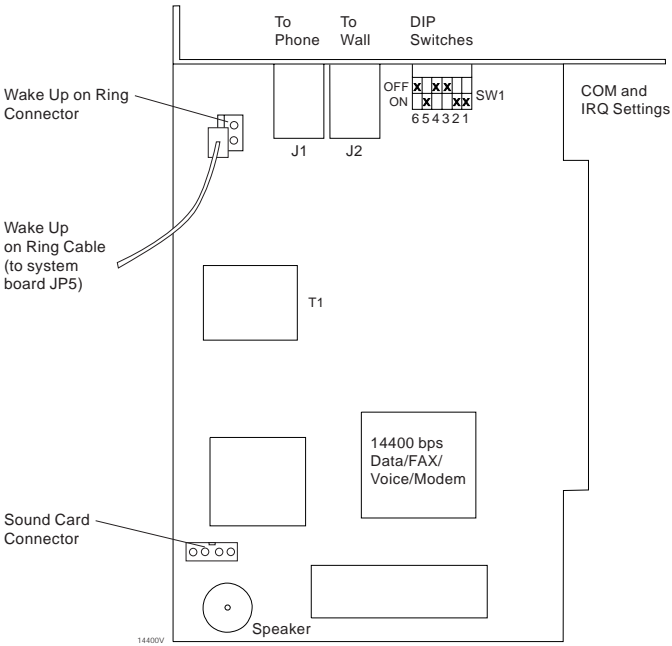# Factory-Installed Modem Jumper and Switch Settings

Figure   5-11. 14400 bps Data/FAX/Voice/Modem Card

Modem Switch Settings

For the 14400 bps data/FAX/voice/modem card, the dual-inline package (DIP) switches set the COM port address and the IRQ level as shown. For Advanced Diagnostics tests, use COM1.

Table   5-1. DIP Switch Settings

	Address 1	2	3	4	5	6	IRQ
COM1	3F8	On	On	Off	Off	On	Off	4
COM2	2F8	Off	On	Off	On	Off	Off	3
COM3	3E8	On	Off	Off	Off	On	Off	4
COM4	2E8	Off	Off	Off	On	Off	Off	3

Note: The modem adapter card allows settings of IRQ 2 and IRQ 5 levels, which are not supported by IBM BIOS. Unpredictable results may occur if these settings are used.

Hard Disk Drive Jumper Settings

Up to four drive devices (hard disk drives or CD-ROM drives) can be installed in **Service Level** I systems. If any drives do not show in the Installed Devices list in the Setup Utility, ensure the jumper settings and connectors are set as shown here. Refer to "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for connector location information.

Primary Hard Disk Drive IDE Local Bus Connector

At the primary hard disk drive IDE connector, make sure the first drive installed is set as the master drive (**1** in the following figures).

Note: If a second drive is installed, it must be attached to the secondary IDE connector. Set the jumpers as the slave drive (**2** in the following figures).

All preloaded software contained on the Recovery Diskettes should be installed on the master hard disk drive on the primary connector.

Secondary Hard Disk Drive Connector

If additional drives are connected to the secondary hard disk drive connector, set the first drive connected to this connector as the master drive (**1** in the following figures). If a second drive is connected to the secondary hard disk drive connector, set the jumpers as the slave drive (**2** in the following figures). Ensure all software is set to recognize all installed drives.

In multimedia systems, the CD-ROM drive is connected to the secondary drive connector at the factory as the master drive. If an additional hard disk drive is connected to the secondary connector, it must be set as the master drive, **1** , and the CD-ROM drive jumpers reset as the slave drive (see "CD-ROM Drive and Sound Card Jumper Settings" on page 5-14).

Note: Check the Setup Utility for correct installation:

Hard Disk 1	Master drive
Hard Disk 2	Slave drive
Hard Disk 3	Master drive (CD-ROM if other drive not connected to this connector)
Hard Disk 4	Slave drive (CD-ROM if hard disk installed at secondary connector, Hard Disk 3)

For jumper settings, match your hard disk drive to one of the following figures.   **1** = Master Drive   **2** = Slave Drive.
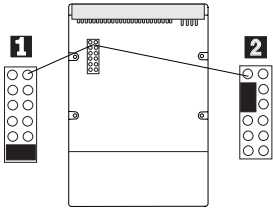
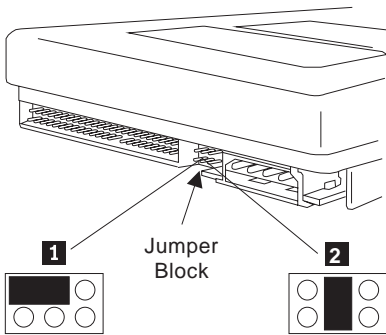

Figure   5-12. 538MB, 1.6GB, 2.0GB Drive

Figure   5-13. 635MB, 850MB Drive

Continued on next page.

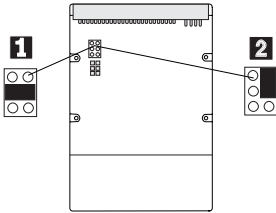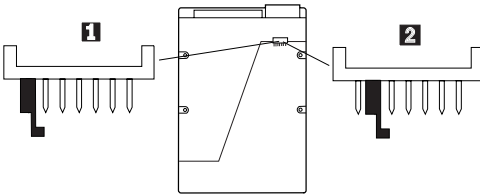For jumper settings, match your hard disk drive to one of the following figures. ◼1 = Master Drive ◼2 = Slave Drive.

Figure 5-14. 635MB, 850MB, 1.0GB, 1.2GB Drive

Figure 5-15. 1.2GB, 1.7GB Drive

CD-ROM Drive and Sound Card Jumper Settings

In multimedia systems, the CD-ROM drive is connected to the system board secondary drive connector at the factory. CD-ROM drive jumpers are set as the master drive, as shown in Figure 5-16. If an additional hard disk drive is connected to the secondary connector, it must be set as the master drive (see **1** in figure 5-12) and the CD-ROM drive jumpers reset as the slave drive as shown in Figure 5-16.

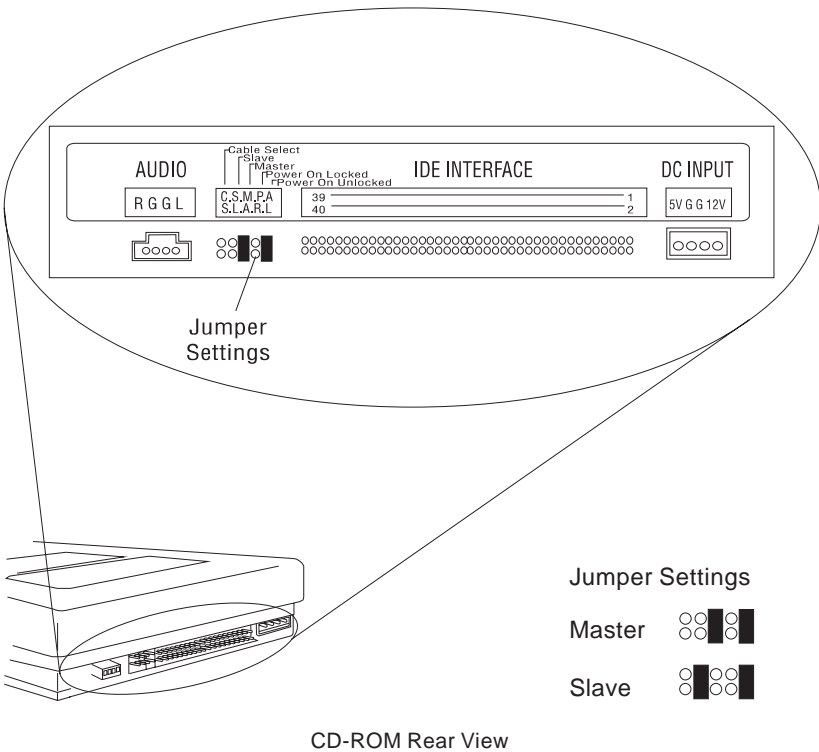Check the Setup Utility for correct installation.

CD-ROM Rear View

Figure 5-16. CD-ROM Drive Jumper Settings

Service Level I multimedia systems (MM3 or MM4 in the Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1) contain one of the sound adapter cards illustrated here.

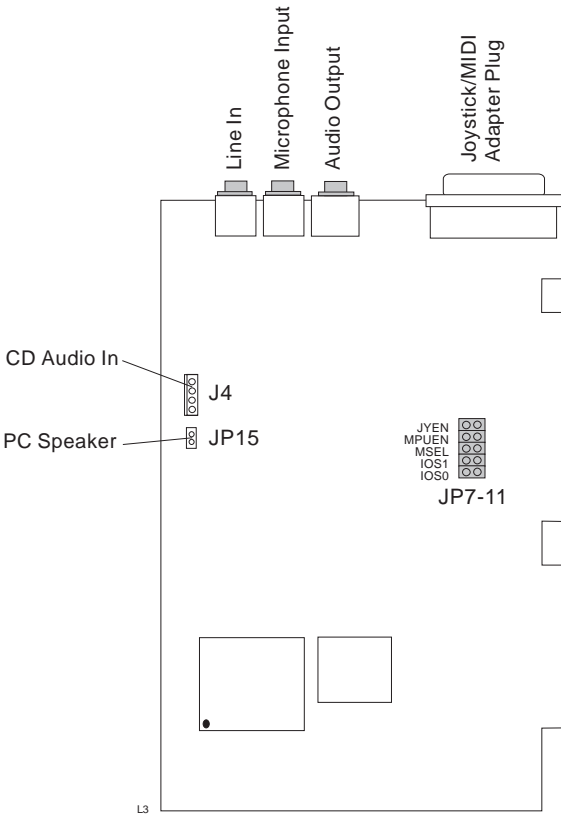The Level 3 sound adapter card jumper settings should be set as shown below..

Figure 5-17. CD-ROM Level 3 Sound Card Jumper Settings

Note: Some open pins may have an extra jumper parked on one pin. Make sure the jumpers match the above settings while performing Advanced Diagnostics tests.

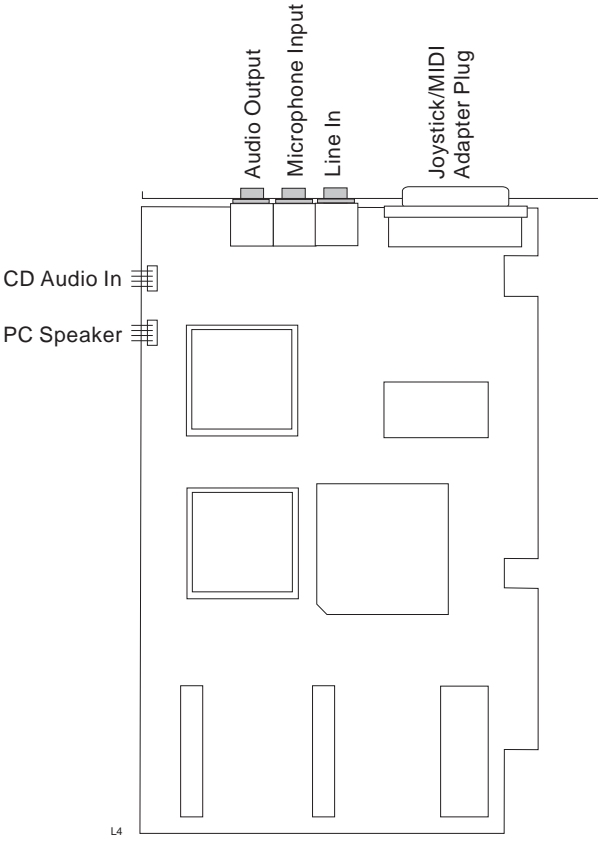The Level 4 sound adapter card, as shown below, has no jumpers to set.

Figure   5-18. CD-ROM Level 4 Sound Card

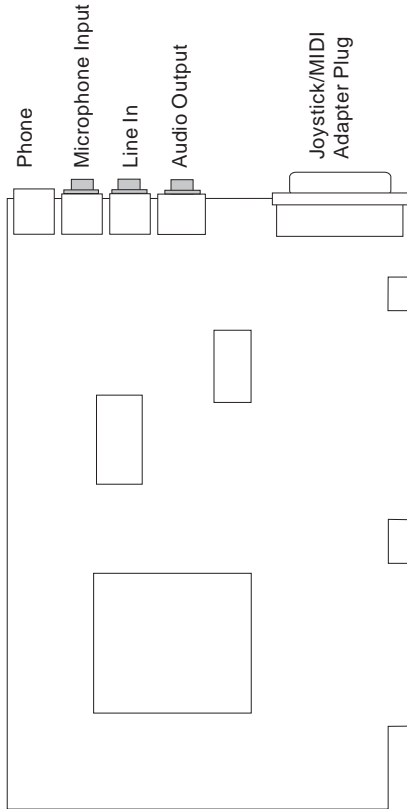The MWave card, as shown below, has no jumpers to set.

Phone
Microphone Input
Line In
Audio Output
Joystick/MIDI
Adapter Plug

Figure   5-19. MWave Card (Combination Modem/Sound)

SIMM Configurations—Type I-1

Factory-installed SIMMs are non-parity SIMMs. However, both parity and non-parity industry standard SIMMs (2MB, 4MB, 8MB, 16MB, or 32MB) are supported. When installing SIMMs, run the Setup Utility to clear XX62 or 164 error codes.

SIMMs can be installed in any order and size. See Table 5-2.

To verify the size of an unknown SIMM, do the following.

1. Power off the system unit.
2. Install the SIMM in J20, J21, or J22 and power on the system unit.
3. Read the SIMM memory count shown at the top left of the screen as the system displays the POST icon.

Table 5-2 (Page 1 of 2). Gold-Contact SIMM Configurations (System Board Type I-1)

Total Memory	J22 (Bank 0)	J21 (Bank 1)	J20 (Bank 2)
2MB	2MB	—	—
4MB	2MB	2MB	—
4MB	4MB	—	—
6MB	2MB	4MB	—
6MB	2MB	2MB	2MB
8MB	4MB	4MB	—
8MB	4MB	2MB	2MB
8MB	8MB	—	—
10MB	2MB	8MB	—
10MB	4MB	4MB	2MB
12MB	2MB	2MB	8MB
12MB	4MB	4MB	4MB
12MB	4MB	8MB	—
14MB	2MB	4MB	8MB
16MB	16MB	—	—
16MB	4MB	4MB	8MB
16MB	8MB	8MB	—
18MB	2MB	8MB	8MB
20MB	4MB	8MB	8MB
20MB	4MB	16MB	—

| Table 5-2 (Page 2 of 2). Gold-Contact SIMM Configurations (System Board Type I-1)			
Total Memory	J22 (Bank 0)	J21 (Bank 1)	J20 (Bank 2)
24MB	8MB	8MB	8MB
24MB	4MB	4MB	16MB
32MB	16MB	16MB	—
32MB	32MB	—	—
32MB	8MB	8MB	16MB
36MB	4MB	16MB	16MB
40MB	4MB	4MB	32MB
48MB	16MB	16MB	16MB
48MB	8MB	8MB	32MB
64MB	32MB	32MB	—
64MB	16MB	16MB	32MB
96MB	32MB	32MB	32MB

SIMM Configurations—Type I-2

Factory-installed SIMMs are non-parity SIMMs. However, both parity and non-parity industry standard SIMMs are supported. When installing SIMMs, run the Setup Utility to clear XX62 or 164 error codes.

The following are the *preferred* combinations of SIMMs that provide the best performance. Each memory bank pair (Banks 0/1, Banks 2/3) must contain a matched pair of SIMMs having the same size and speed.

Table 5-3. Gold-Contact SIMM Configurations (System Board Type I-2)				
Total Memory	J23 (Bank 0)	J24 (Bank 1)	J27 (Bank 2)	J28 (Bank 3)
8MB	4MB	4MB	—	—
8MB	—	—	4MB	4MB
16MB	4MB	4MB	4MB	4MB
16MB	8MB	8MB	—	—
16MB	—	—	8MB	8MB
24MB	4MB	4MB	8MB	8MB
24MB	8MB	8MB	4MB	4MB
32MB	8MB	8MB	8MB	8MB
32MB	16MB	16MB	—	—
32MB	—	—	16MB	16MB
40MB	4MB	4MB	16MB	16MB
40MB	16MB	16MB	4MB	4MB
48MB	8MB	8MB	16MB	16MB
48MB	16MB	16MB	8MB	8MB
64MB	16MB	16MB	16MB	16MB
64MB	32MB	32MB	—	—
64MB	—	—	32MB	32MB
72MB	4MB	4MB	32MB	32MB
72MB	32MB	32MB	4MB	4MB
80MB	8MB	8MB	32MB	32MB
84MB	32MB	32MB	8MB	8MB
96MB	16MB	16MB	32MB	32MB
96MB	32MB	32MB	16MB	16MB
128MB	32MB	32MB	32MB	32MB

Detachable Monitor I/O Signal Cable Connector Test Points
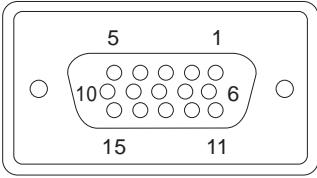
System board
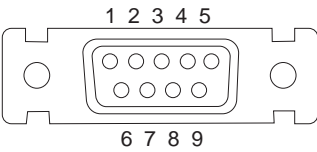
Monitor end of cable
(on some models)

Figure   5-20. Detachable Monitor I/O Signal Cable Connectors

Test each connector between the following pins:

System Pin	Monitor Pin
1	1
2	2
3	3
13	4
14	5
6	6
7	7
8	8
10	9
11	9

System Board Connector Specifications

Refer to "System Board Layout—Type I-1" on page 5-2 and "System Board Layout—Type I-2" on page 5-5 for connector identification and location information.

Monitor/Signal

Pin	Signal Name	I/O
1	Red Video	O
2	Green Video	O
3	Blue Video	O
4	Monitor ID Bit 2	I
5	Synch Ground	
6	Red Ground	
7	Green Ground	

Pin	Signal Name	I/O
8	Blue Ground	
9	No Connection	
10	Synch Ground	
11	Monitor ID Bit 0	I
12	Monitor ID Bit 1	I
13	Horizontal Synch	O
14	Vertical Synch	O
15	Monitor ID Bit 3	I

Parallel Port

Pin	Signal Name	I/O
1	Strobe	O
2	Data Bit 0	I/O
3	Data Bit 1	I/O
4	Data Bit 2	I/O
5	Data Bit 3	I/O
6	Data Bit 4	I/O
7	Data Bit 5	I/O
8	Data Bit 6	I/O
9	Data Bit 7	I/O
10	Acknowledge	I
11	Busy	I
12	Paper Empty	I
13	Select	O

Pin	Signal Name	I/O
14	Auto Feed	N/A
15	Error	I
16	Initialize	O
17	Select (In)	O
18	Ground	Power
19	Ground	Power
20	Ground	Power
21	Ground	Power
22	Ground	Power
23	Ground	Power
24	Ground	Power
25	Ground	Power

Serial Port

Pin	Signal Name	I/O
1	Data Carrier Detect	I
2	Receive Data	I
3	Transmit Data	O
4	Data Terminal Ready	O
5	Signal Ground	
6	Data Set Ready	I
7	Request To Send	O
8	Clear To Send	I
9	Ring Indicator	I

Mouse

Pin	Signal Name	I/O
1	Mouse Data	I/O
2	No Connection	
3	Ground	Power
4	+5 V dc	Power
5	Mouse Clock	I/O
6	No Connection	

Keyboard

Pin	Signal Name	I/O
1	Data	I/O
2	Mouse Data	
3	Ground	Power
4	+5 V dc	Power
5	Clock	I/O
6	Mouse Clock	

Rapid Resume Power

Pin	Signal Name
1	AUX5
2	POWER_CNTRL
3	Ground

On/Off Switch Connector

Pin	Signal Name
1	AUX5
2	Switch

Modem Wake Up on Ring Detect Connector

Pin	Signal Name
1	AUX5
2	Key (not populated)
3	EXT_WAKEUP
4	Ground

Speaker Connector

Pin	Signal Name
1, 2	Disabled
3, 4	Enabled

Power Cable Connector

Pin	Signal Name		Pin	Signal Name
1	Power Good (+5 V dc)		7	Ground
2	+5 V dc		8	Ground
3	+12 V dc		9	–5 V dc
4	–12 V dc		10	+5 V dc
5	Ground		11	+5 V dc
6	Ground		12	+5 V dc

Diskette Cable Connector

Pin	Signal Name	I/O	Pin	Signal Name	I/O
1	Ground		18	Direction	O
2	Density Select	O	19	Ground	
3	No Connection		20	Step	O
4	No Connection		21	Ground	
5	Ground		22	Write Data	I
6	No Connection		23	Ground	
7	Ground		24	Write Enable	O
8	Index	I	25	Ground	
9	Ground		26	Track 0	I
10	Motor Enable 0	O	27	Ground	
11	Ground		28	Write Protect	I
12	Drive Select 1	O	29	Ground	
13	Ground		30	Read Data	I
14	Drive Select 0	O	31	Ground	
15	Ground		32	Select Head 1	O
16	Motor Enable 1	O	33	Ground	
17	Ground		34	Diskette Change	I

Note: The diskette drive signal cable for drive A has a twist for the Drive Select and Motor Enable signals.

Hard Disk Cable Connectors

Pin	Signal Name	I/O		Pin	Signal Name	I/O
1	Host Reset	O		21	No Connection	
2	Ground			22	Ground	
3	Host Data 7	I/O		23	Host IOW	O
4	Host Data 8	I/O		24	Ground	Power
5	Host Data 6	I/O		25	Host IOR	O
6	Host Data 9	I/O		26	Ground	Power
7	Host Data 5	I/O		27	I/O Channel Ready	I
8	Host Data 10	I/O		28	No Connection	
9	Host Data 4	I/O		29	No Connection	
10	Host Data 11	I/O		30	Ground	Power
11	Host Data 3	I/O		31	Host IRQ	I
12	Host Data 12	I/O		32	No Connection	
13	Host Data 2	I/O		33	Host A1	O
14	Host Data 13	I/O		34	No Connection	
15	Host Data 1	I/O		35	Host A0	O
16	Host Data 14	I/O		36	Host A2	O
17	Host Data 0	I/O		37	Host CS0	O
18	Host Data 15	I/O		38	Host CS1	O
19	Ground	Power		39	$\overline{ACTIVE}$	I
20	No Connection			40	Ground	Power

ISA AT Riser Connector

Table 5-4 (Page 1 of 2). ISA Riser Connector			
Description	Pin	Pin	Description
+12V	B01	A01	+12V
VCC	B02	A02	Ground
Ground	B03	A03	Ground
Ground	B04	A04	$\overline{IOCHCK}$
RSTDRV	B05	A05	SD(7)
VCC	B06	A06	SD(6)
IRQ9	B07	A07	SD(5)
-5V	B08	A08	SD(4)
DRQ2	B09	A09	SD(3)
-12V	B10	A10	SD(2)
$\overline{NOWS}$	B11	A11	SD(1)
+12V	B12	A12	SD(0)
Ground	B13	A13	IOCHRDY
$\overline{SMEMW}$	B14	A14	AEN
$\overline{SMEMR}$	B15	A15	SA(19)
$\overline{IOW}$	B16	A16	SA(18)
$\overline{IOR}$	B17	A17	SA(17)
$\overline{DACK}3$	B18	A18	SA(16)
DRQ3	B19	A19	SA(15)
$\overline{DACK}1$	B20	A20	SA(14)
DRQ1	B21	A21	SA(13)
$\overline{REFRESH}$	B22	A22	SA(12)
SYSCLK	B23	A23	SA(11)
IRQ7	B24	A24	SA(10)
IRQ6	B25	A25	SA(9)
IRQ5	B26	A26	SA(8)
IRQ4	B27	A27	SA(7)
IRQ3	B28	A28	SA(6)
$\overline{DACK}2$	B29	A29	SA(5)
TC	B30	A30	SA(4)
BALE	B31	A31	SA(3)
VCC	B32	A32	SA(2)
OSC	B33	A33	SA(1)
Ground	B34	A34	SA(0)

Table 5-4 (Page 2 of 2). ISA Riser Connector			
Description	**Pin**	**Pin**	**Description**
Ground	B35	A35	Ground
VCC	B36	A36	Ground
VCC	B37	A37	VCC
$\overline{M}16$	B38	A38	$\overline{SBHE}$
$\overline{IO}16$	B39	A39	LA(23)
IRQ10	B40	A40	LA(22)
IRQ11	B41	A41	LA(21)
IRQ12	B42	A42	LA(20)
IRQ15	B43	A43	LA(19)
IRQ14	B44	A44	LA(18)
$\overline{DACK}0$	B45	A45	LA(17)
DRQ0	B46	A46	$\overline{MEMR}$
$\overline{DACK}5$	B47	A47	$\overline{MEMW}$
DRQ5	B48	A48	SD(8)
$\overline{DACK}6$	B49	A49	SD(9)
DRQ6	B50	A50	SD(10)
$\overline{DACK}7$	B51	A51	SD(11)
DRQ7	B52	A52	SD(12)
VCC	B53	A53	SD(13)
$\overline{MASTER}$	B54	A54	SD(14)
Ground	B55	A55	SD(15)
Ground	B56	A56	Ground
Ground	B57	A57	Ground
VCC	B58	A58	Ground
VCC	B59	A59	VCC
VCC	B60	A60	VCC

VESA Video Feature Connector

Table 5-5. VESA Video Feature Connector			
Description	**Pin**	**Pin**	**Description**
Ground	1	2	Pixel Data(0)
Ground	3	4	Pixel Data(1)
Ground	5	6	Pixel Data(2)
$\overline{EVIDEO}$: External pixel data enable	7	8	Pixel Data(3)
$\overline{ESYNC}$: External HSYNC, VSYNC and $\overline{BLANK}$ enable	9	10	Pixel Data(4)
$\overline{EDCLK}$: External Dot Clock enable	11	12	Pixel Data(5)
No Connection	13	14	Pixel Data(6)
Ground	15	16	Pixel Data(7)
Ground	17	18	DCLK: Dot Clock
Ground	19	20	$\overline{BLANK}$
Ground	21	22	HSYNC
No Connection	23	24	VSYNC
No Connection	25	26	Ground

VESA Local Bus Riser Connector

The signals marked (PCI RISER) are present to support the PCI riser card. They are not used with VESA local bus or ISA-only risers. The VESA connector on the VESA riser has a plastic divider in those positions.

Table 5-6 (Page 1 of 3). VESA Local Bus Riser Connector			
Description	**Pin**	**Pin**	**Description**
CD(0)	B01	A01	CD(1)
CD(2)	B02	A02	CD(3)
CD(4)	B03	A03	Ground
CD(6)	B04	A04	CD(5)
CD(8)	B05	A05	CD(7)
Ground	B06	A06	CD(9)
CD(10)	B07	A07	CD(11)
CD(12)	B08	A08	CD(13)
VCC	B09	A09	CD(15)

Table 5-6 (Page 2 of 3). VESA Local Bus Riser Connector			
Description	**Pin**	**Pin**	**Description**
CD(14)	B10	A10	Ground
CD(16)	B11	A11	CD(17)
CD(18)	B12	A12	VCC
CD(20)	B13	A13	CD(19)
Ground	B14	A14	CD(21)
CD(22)	B15	A15	CD(23)
CD(24)	B16	A16	CD(25)
CD(26)	B17	A17	Ground
CD(28)	B18	A18	CD(27)
CD(30)	B19	A19	CD(29)
VCC	B20	A20	CD(31)
CA(31)	B21	A21	CA(30)
Ground	B22	A22	CA(28)
CA(29)	B23	A23	CA(26)
CA(27)	B24	A24	Ground
CA(25)	B25	A25	CA(24)
CA(23)	B26	A26	CA(22)
CA(21)	B27	A27	VCC
CA(19)	B28	A28	CA(20)
Ground	B29	A29	CA(18)
CA(17)	B30	A30	CA(16)
CA(15)	B31	A31	CA(14)
VCC	B32	A32	CA(12)
CA(13)	B33	A33	CA(10)
CA(11)	B34	A34	CA(8)
CA(9)	B35	A35	Ground
CA(7)	B36	A36	CA(6)
CA(5)	B37	A37	CA(4)
Ground	B38	A38	$\overline{HITM}$
CA(3)	B39	A39	$\overline{BE}0$
CA(2)	B40	A40	VCC
No Connection	B41	A41	$\overline{BE}1$
$\overline{LRESET}$	B42	A42	$\overline{BE}2$
D/$\overline{C}$	B43	A43	Ground
M/$\overline{IO}$	B44	A44	$\overline{BE}3$

Table 5-6 (Page 3 of 3). VESA Local Bus Riser Connector

Description	Pin	Pin	Description
W/$\overline{R}$	B45	A45	$\overline{ADS}$
LDEV (PCI RISER)	B46	A46	802NMI (PCI RISER)
CPUNMI (PCI RISER)	B47	A47	$\overline{BOFF}$ (PCI RISER)
$\overline{CPURDY}$	B48	A48	$\overline{CPURDY}$
Ground	B49	A49	$\overline{LDEV}0$
IRQ9	B50	A50	$\overline{LREQ}0$
$\overline{BRDY}$	B51	A51	Ground
$\overline{BLST}$	B52	A52	$\overline{LGNT}0$
ID(0)	B53	A53	VCC
ID(1)	B54	A54	ID(2)
Ground	B55	A55	ID(3)
LCLK	B56	A56	ID(4)
VCC	B57	A57	$\overline{802KEN}$
$\overline{BS}16$	B58	A58	$\overline{EADS}$

SIMM—72 Pin

Pin	Signal Name	I/O	Pin	Signal Name	I/O
1	Ground		18	MA6	I
2	SIMMD0	I/O	19	Open	
3	SIMMD0	I/O	20	SIMMD4	I/O
4	SIMMD1	I/O	21	SIMMD4	I/O
5	SIMMD1	I/O	22	SIMMD5	I/O
6	SIMMD2	I/O	23	SIMMD5	I/O
7	SIMMD2	I/O	24	SIMMD6	I/O
8	SIMMD3	I/O	25	SIMMD6	I/O
9	SIMMD3	I/O	26	SIMMD7	I/O
10	+5 V dc	I	27	SIMMD7	I/O
11	CASP	I	28	MA7	I
12	MA0	I	29	BS0	I
13	MA1	I	30	+5 V dc	I
14	MA2	I	31	MA8	I
15	MA3	I	32	MA9	I
16	MA4	I	33	RAS5	I
17	MA5	I	34	RAS4	I

Pin	Signal Name	I/O		Pin	Signal Name	I/O
35	DP0	I		54	SIMMD10	I/O
36	DP0	I		55	SIMMD11	I/O
37	DP1	I		56	SIMMD11	I/O
38	DP1	I		57	SIMMD12	I/O
39	Ground	I		58	SIMMD12	I/O
40	BCAS0	I		59	+5 V dc	I
41	BCAS2	I		60	SIMMD13	I/O
42	BCAS3	I		61	SIMMD13	I/O
43	BCAS1	I		62	SIMMD14	I/O
44	RAS4	I		63	SIMMD14	I/O
45	RAS5	I		64	SIMMD15	I/O
46	BS1	I		65	SIMMD15	I/O
47	AWE	I		66	BS2	I
48	Open			67	PD1	O
49	SIMMD8	I/O		68	PD2	O
50	SIMMD8	I/O		69	PD3	O
51	SIMMD9	I/O		70	PD4	I
52	SIMMD9	I/O		71	BS3	I
53	SIMMD10	I/O		72	Ground	

Safety Inspection Guide

General Guidelines

The purpose of this Safety Inspection Guide is to help you identify possible unsafe conditions on machines that are being inspected for a Maintenance Agreement. Each machine has needed items installed to provide the operators and service personnel with an acceptable level of safety. This guide lists only these items. Good judgment should be used to identify possible safety conditions not covered by this Safety Inspection Guide.

If any unsafe conditions are present, you must find out how serious the hazard is and if you can continue before you correct the hazard.

All current IBM Aptiva service supplements outlining feature/model changes, along with the machine history, should be reviewed.

Check the following items:

- Damaged, missing, or changed parts, especially in the area of the On/Off switch and the power supply.
- Damaged, missing, or changed covers.
- Possible safety exposure from any non-IBM attachments.

Parts Catalog

How to Use This Parts Catalog

• SIMILAR ASSEMBLIES: If two assemblies contain a majority of identical parts, they are broken down on the same list. Common parts are shown by one index number. Parts peculiar to one or the other of the assemblies are listed separately and identified by description.

• AR: (As Required) in the Units column indicates that the quantity is not the same for all machines.

• NP: (Non-Procurable) in the Units column indicates that the part is non-procurable and that the individual parts or the next higher assembly should be ordered.

• NR: (Not Recommended) in the Units column indicates that the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.

• NS: (Not Shown)

• R: (Restricted) in the Units column indicates that the part has a restricted availability.

Note: See the Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for model specifications.

Assemblies (Service Level H)

Catalog Section

Assembly 1: Machine Type 2144 System Unit - Exterior (SL-I)
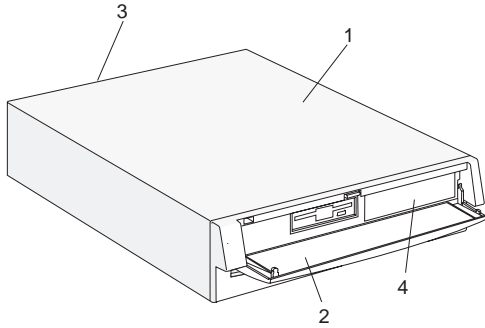
Asm– Index	Part Number	Units	Description
1–1			Top Cover Assembly with Bezel, Pull-Down Door, Rear Cover, and Labels.
–1	10H2926	1	Machine Type 2144 Base model
–2	42H0348	1	Machine Type 2144 Pull-Down Door
–3	06H5742	1	Machine Type 2144 Rear I/O Panel
–4	10H3078	1	5.25-in. Bay Blank Panel
–NS	10H3080	1	Machine Type 2144 Feet (Packet of 4)

Assembly 2: Machine Type 2144 System Unit - Interior (SL-I)

Asm–Index	Part Number	Units	Description
2–1			System Board **Note:** See theAppendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for model specifications. **All system board FRUs are shipped without processor, cache memory modules, video DRAM modules, or SIMMs**. When upgrading or replacing a system board, any non-failing FRUs must be removed from the original system board and reinstalled on the new FRU system board.
–1	40H4250	1	System Board - Type I-1
–2	71G0794	1	486DX2-50MHz Processor
–2	71G0795	1	486DX2-66MHz Processor
–2	41H7822	1	486DX2-80MHz Processor
–2	42H0380	1	486DX4-100MHz Processor
–2	07H0972	1	Cx586C-100MHz Processor
–1	11H9669	1	System Board - Type I-2
–2	06H7589	1	P54-75MHz Processor
–2	06H6063	1	P54C-100MHz Processor
–2	42H0378	1	P54C-120MHz Processor
–2	06H8228	1	P54C-133MHz Processor
–2	06H9892	1	P54C-150MHz Processor
–2	07H0971	1	P54C-166MHz Processor
–NS	06H5729	1	Processor Fan
–3	06H7225	1	Riser Card (ISA/PCI)
–3	10H2830	1	Riser Card (4-Connector AT)
–4	93F2394	1	Hard Disk Drive Ribbon Cable
–5	93F2395	1	Diskette Drive Ribbon Cable
–6	93F2388	1	Indicator LED and Cable, Hard Drive
–7	93F2389	1	Indicator LED and Cable, Power
–NS	13H8078	1	Dual LED Indicator Cable
–	06H5743	1	Hard Disk/CD-ROM Bracket

Assembly 2: (continued)

			Factory-Installed Modems: For MWave Card, see page 7-13.
–NS	04H5788	1	Data/FAX/Modem Card (14400 bps)
–	04H5773	1	Modem Data/FAX/Voice (14400 bps)
–	04H5934	1	14.4KHz Modem WOR cable
–	41H7819	1	28.8KHz MWave WOR cable
–	41H7820	1	Modem Splitter
–	10H3199	1	FAX/Voice modem sound cable
–8	06H3861	1	Power Supply (5V dc) (145-W LV/HV Switch-selectable)
–8	42H2380	1	Power Supply (5V dc) (EMEA Only) (145-W LV/HV Switch-selectable)
–8	06H3862	1	Power Supply (3.3V dc) (145-W LV/HV Switch-selectable)
–9	60G2258	1	Power Switch to System Board Cable
–10		1	System Board Memory
–10	92G7540	1	SIMM, 4MB, 72-Pin Gold
–10	92G7542	1	SIMM, 8MB, 72-Pin Gold
–10	07H0974	1	SIMM EDO, 4MB, 72-Pin Gold
–10	07H0975	1	SIMM EDO, 8MB, 72-Pin Gold
–NS	10H3070	1	Cache Memory kit, Type I-1 128KB (4 cache, 1 tag module)
–NS	42H0393	1	Cache Memory kit, Type I-2 256KB (1 cache module)
–NS	41H9638	1	Video Memory Module 512KB DRAM
–NS	93F0063	1	Lithium Battery (CR2032)
–11	93F0067	1	Jumper, 2 position (Packet of 4)
–12	93F0041	1	Packet (Mounting Screws)
–13	06H5727	1	System Base Chassis

Assembly 3: Machine Type 2168 System Unit - Exterior (SL-I)
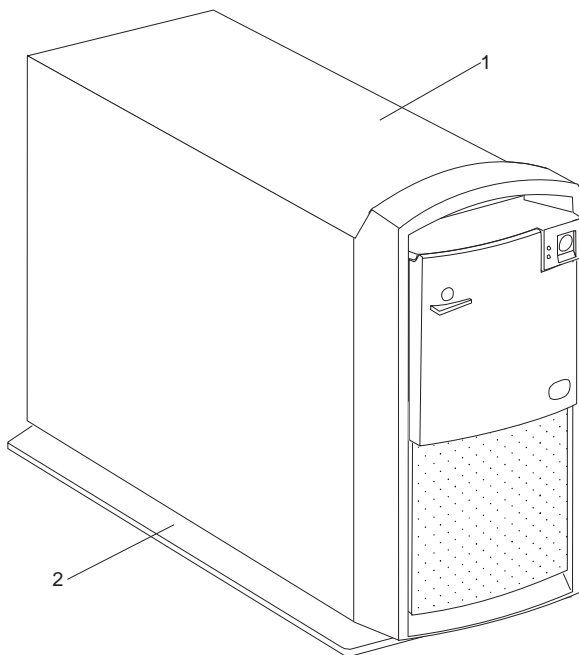
Asm– Index	Part Number	Units	Description
3–1			Top Cover Assembly with Bezel and Pull-Down Door (Does not include system base—see "Assembly 4: Machine Type 2168 System Unit - Interior (**SL-**I)" on page 7-8)
–1	42H0343	1	Machine Type 2168 Base model (includes logo and labels)
–2	34G1861	1	Base Assembly

Assembly 4: Machine Type 2168 System Unit - Interior (SL-I)

Asm–Index	Part Number	Units	Description
4–1			System Boards **Note:** See theAppendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for model specifications. **All system board FRUs are shipped without processor, cache memory modules, video DRAM modules, or SIMMs**. When upgrading or replacing a system board, any non-failing FRUs must be removed from the original system board and reinstalled on the new FRU system board.
–1	11H9669	1	System Board Type I-2
–2	06H7589	1	P54-75MHz Processor
–2	06H6063	1	P54C-100MHz Processor
–2	42H0378	1	P54C-120MHz Processor
–2	06H8228	1	P54C-133MHz Processor
–2	06H9892	1	P54C-150MHz Processor
–2	07H0971	1	P54C-166MHz Processor
–NS	06H1796	1	Processor Fan
–3	11H8453	1	Riser Card, (ISA/PCI)
–3	10H3151	1	Riser Card, (8-Connector AT)
–5	34G1870	1	Adapter Card Front Support
–6	42H0344	1	3.5-in. Bay Blank Panel
–7	42H0345	1	5.25-in. Bay Blank Panel
–8	42H0347	1	Blank Audio Panel
–9	34G1861	1	Base Assembly
–10	93F2394	1	Hard Disk Drive Ribbon Cable
–11	93F2395	1	Diskette Drive Ribbon Cable

Assembly 4: (continued)

–12			Factory-Installed Modems For MWave Card, see page 7-13.
–NS	04H5783	1	Data/FAX/Modem Adapter Card (2400 bps/9600 bps/4800 bps)
–NS	04H5788	1	Data/FAX/Modem Adapter Card (14400 bps)
–12	04H5773	1	Modem Data/FAX/Voice Adapter Card (14400 bps)
–NS	04H5934	1	14.4KHz Modem Wake Up on Ring cable
–NS	41H7819	1	28.8KHz MWave Wake Up on Ring cable
–NS	41H7820	1	Modem Splitter
–NS	10H3199	1	FAX/Voice modem sound cable (U.S.)
–13	93F2388	1	Indicator LED and Cable, Hard Drive
–14	93F2389	1	Indicator LED and Cable, Power
–NS	13H8078	1	Dual LED Indicator Cable
–15	06H2973	1	Power Supply (3.3Vdc) (145-W LV/HV Switch-selectable)
–15	42H2380	1	Power Supply (3.3Vdc) EMEA Only (145-W LV/HV Switch-selectable)
–16	60G2258	1	Power Switch to System Board Cable
–17	92G7540	1	SIMM, 4MB, 72-Pin Gold
–17	92G7542	1	SIMM, 8MB, 72-Pin Gold
–10	07H0974	1	SIMM EDO, 4MB, 72-Pin Gold
–10	07H0975	1	SIMM EDO, 8MB, 72-Pin Gold
–18	42H0393	1	Cache Memory kit, Type I-2 256KB (1 cache module)
–NS	41H9638	1	Video Memory Module, Type I-2 512KB DRAM
–19	93F0063	1	Lithium Battery (CR2032)
–NS	93F0067	1	Jumper, 2 position (Packet of 4)
–20	93F0041	1	Packet (Mounting Screws)
–NS	60G1995	1	Packet (Cover Mounting Screws)

Assembly 5: Diskette and Hard Disk Drives
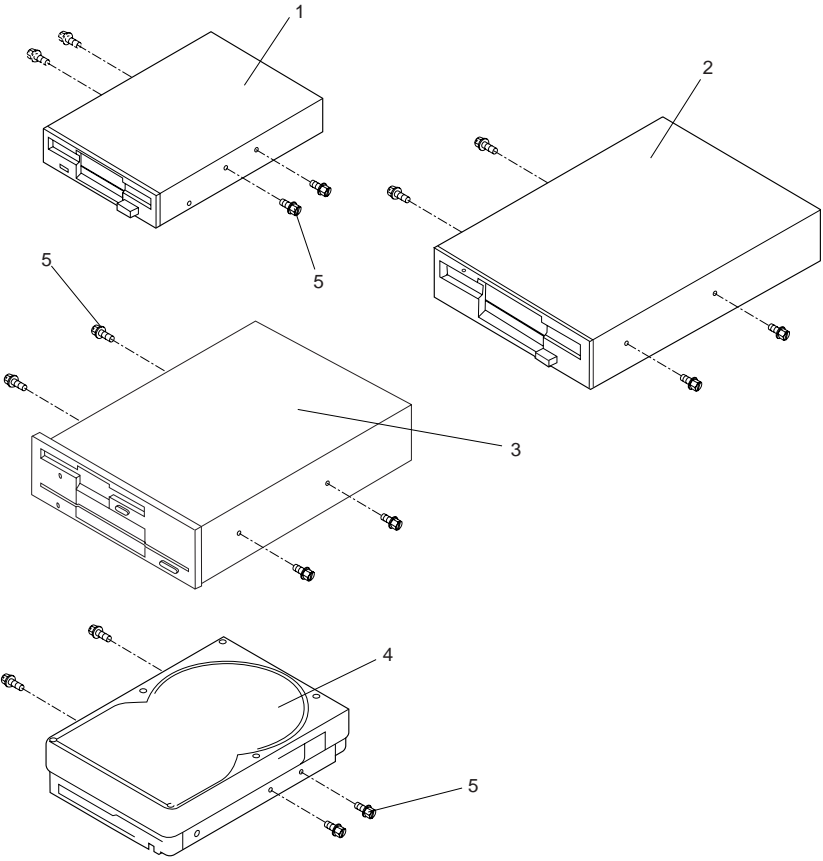
Assembly 5: (continued)

Asm– Index	Part Number	Units	Description
5–1	04H7404	1	3.5-in. 1.44MB Diskette Drive
–2	60G2308	1	5.25-in. 1.2MB Diskette Drive
–3	60G2310	1	Dual 3.5-In. and 5.25-In. Diskette Drive
–4	06H9063	1	635MB Hard Disk Drive
–4	42H1816	1	850MB Hard Disk Drive
–4	06H8726	1	1GB Hard Disk Drive
–4	07H0383	1	1.2GB Hard Disk Drive
–4	06H9064	1	1.6GB Hard Disk Drive
–4	07H1122	1	2GB Hard Disk Drive
–NS	06H5743	1	Hard Disk/CD-ROM Bracket (Machine Type 2144 Only)
			Note: See theAppendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for model specifications.
–5	93F0041	1	Packet (Mounting Screws)

Assembly 6: CD-ROM, Sound Cards (Multimedia Models)

Asm– Index	Part Number	Units	Description
6–1			See the Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for model specifications.
–1	06H7654	1	5.25-in. CD-ROM Drive (4X-IDE)
–1	06H9441	1	5.25-in. CD-ROM Changer (4X-IDE)
–1	06H9429	1	5.25-in. CD-ROM Drive (6X-IDE)
–2	10H2924	1	CD-ROM Drive Audio Cable (MM3)
–2	04H5990	1	CD-ROM Drive Audio Cable (MM4)
–3	93F2394	1	CD-ROM/Hard Disk Ribbon Cable
–3	93F2395	1	Diskette Drive Ribbon Cable
–NS	06H5743	1	Hard Disk/CD-ROM Bracket (Machine Type 2144 Only)
–4	38H6795	1	Sound Adapter Card (MM3)
–4	25H5895	1	Sound Adapter Card (MM4)
–4	38H6789	1	MWave Adapter Card (Australia)
–4	41H9626	1	MWave Adapter Card (Austria)
–4	55H6504	1	MWave Adapter Card (Belgium)
–4	41H9619	1	MWave Adapter Card (Denmark)
–4	55H6500	1	MWave Adapter Card (Finland)
–4	38H6785	1	MWave Adapter Card (France)
–4	38H6787	1	MWave Adapter Card (Germany)
–4	38H6793	1	MWave Adapter Card (Italy)
–4	41H9613	1	MWave Adapter Card (Japan)
–4	41H9629	1	MWave Adapter Card (Netherlands)
–4	41H9632	1	MWave Adapter Card (New Zealand)
–4	55H6502	1	MWave Adapter Card (Portugal)
–4	42H4864	1	MWave Adapter Card (Norway)
–4	38H6791	1	MWave Adapter Card (Spain)
–4	41H9616	1	MWave Adapter Card (Sweden)
–4	41H9622	1	MWave Adapter Card (Switzerland)
–4	38H6795	1	MWave Adapter Card (UK)
–4	42H0856	1	MWave Adapter Card (U.S./Canada/LA/Brazil)

–5	10H2833	1	Speaker Power Supply (MM3) (U.S. and Canada)
–5	10H2835	1	Speaker Power Supply (MM3)(U.K.)
–5	10H2837	1	Speaker Power Supply (MM3)(EMEA)
–5	10H3076	1	Speaker Power Supply (MM3)(AP)
–6	74G0311	2	Speakers (MM3)(Cables included) (4 watt/channel)
–7	04H5588	1	Speaker Power Supply (MM4) (U.S. and Canada)
–7	10H2839	1	Speaker Power Supply (MM4)(U.K.)
–7	10H2841	1	Speaker Power Supply (MM4)(EMEA)
–7	10H3077	1	Speaker Power Supply (MM4)(AP)
–8	73G4527	2	Speakers (MM4)(Cables included) (30 watt/channel)
–7	42H0951	1	Speaker Power Supply (MM5) (U.K.; Sub-Woofer)
–7	42H0953	1	Speaker Power Supply (MM5) (EMEA; Sub-Woofer)
–8	42H1008	2	Speakers (MM5)(Cables included) (EMEA; Sub-Woofer)
–NS	30H2312	1	Microphone (Headset/Base included)
–NS	60G2272	1	Microphone (Base included - EMEA)
–9	93F0041	1	Packet (Mounting screws)

Assembly 7: Monitor and Power Cord (Linecord)

Asm–Index	Part Number	Units	Description
7–1			Monitors (includes tilt swivel and monitor I/O cable) EQ = Equatorial NH = Northern hemisphere SH = Southern hemisphere LV = Low Voltage HV = High Voltage UV = Universal Voltage (auto-sense) See the Appendix, "Model/Monitor Configurations and FRU Part Numbers" on page A-1 for model specifications. For monitors sold separately from IBM Aptiva system units, see the service information provided with the monitor. All monitor FRUs include a monitor I/O cable. Order replacement cables only for missing or damaged cables. **14-Inch Monitor - Type 2238 (13.0-Inch diagonal viewing area) SVGA Monitor**
–1	96G2008	1	- .28, 100/240V 50/60Hz, EQ/UV

			14-Inch Monitor - Type 6542 (12.3-Inch diagonal viewing area) (P1439-G40) SVGA Monitor
−1	96G3108	1	- .28, 100/240V 50/60Hz, NH/UV
−1	96G3109	1	- .28, 100/240V 50/60Hz, EQ/UV
			14-Inch Monitor - Type 6542 (13.0-Inch diagonal viewing area) (P1458-G41) SVGA Multi-Synch Monitor
−1	96G3110	1	- .28, 100/127V 50/60Hz, NH/LV
−1	96G3111	1	- .28, 200/240V 50/60Hz, NH/HV
−1	96G3112	1	- .28, 100/240V 50/60Hz, NH/UV
−1	96G3114	1	- .28, 100/240V 50/60Hz, EQ/UV
−1	96G3113	1	- .28, 100/240V 50/60Hz, SH/UV
			15-Inch Monitor - Type 6543 (13.4-Inch diagonal viewing area) (P1558-G50) SVGA Multi-Synch Monitor
−1	96G3115	1	- .28, 100/127V 50/60Hz, NH/LV
−1	96G3116	1	- .28, 200/240V 50/60Hz, NH/HV
−1	96G3117	1	- .28, 100/240V 50/60Hz, NH/UV
−1	96G3119	1	- .28, 100/240V 50/60Hz, EQ/UV
−1	96G3118	1	- .28, 100/240V 50/60Hz, SH/UV
			17-Inch Monitor - Type 6543 (15.7-Inch diagonal viewing area) (P1558-G70) SVGA Multi-Synch Monitor
−1	96G3121	1	- .28, 100/240V 50/60Hz, NH/UV
−1	96G3123	1	- .28, 100/240V 50/60Hz, EQ/UV
−1	96G3122	1	- .28, 100/240V 50/60Hz, SH/UV
			Power Cord (linecord) for monitor and system unit
−	93F2364	1	- U.S.
−	14F0032	1	- Arabic countries
−	93F2365	1	- Australia
−	13F9978	1	- Belgium (Dutch)
−	13F9978	1	- Belgium (French)
−	93F2366	1	- Brazil
−	13F9978	1	- Bulgaria
−	93F2364	1	- Canada (English)
−	93F2364	1	- Canada (French)
−	13F9978	1	- Czech Republic

–	13F9996	1	- Denmark
–	13F9978	1	- Finland
–	13F9978	1	- France
–	13F9978	1	- Germany
–	13F9978	1	- Greece
–	13F9978	1	- Hungary
–	14F0086	1	- Israel
–	14F0068	1	- Italy
–	93F2366	1	- Latin America (Spanish)
–	13F9978	1	- Netherlands
–	93F2365	1	- New Zealand
–	13F9978	1	- Norway
–	13F9978	1	- Poland
–	13F9978	1	- Portugal
–	13F9978	1	- Romania
–	13F9978	1	- Russia
–	13F9978	1	- Serbia
–	13F9978	1	- Slovakia
–	14F0014	1	- South Africa
–	13F9978	1	- Spain
–	13F9978	1	- Sweden
–	14F0050	1	- Switzerland (French)
–	14F0050	1	- Switzerland (German)
–	14F0050	1	- Switzerland (Italian)
–	13F9978	1	- Turkey
–	14F0032	1	- UK/Ireland
–	13F9978	1	- Yugoslavia (Latin)

Power cords for the following countries are controlled in those countries.

Bangladesh, Brunei, China, Hong Kong, Indonesia, Macau, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand

Assembly 8: Keyboard and Mouse
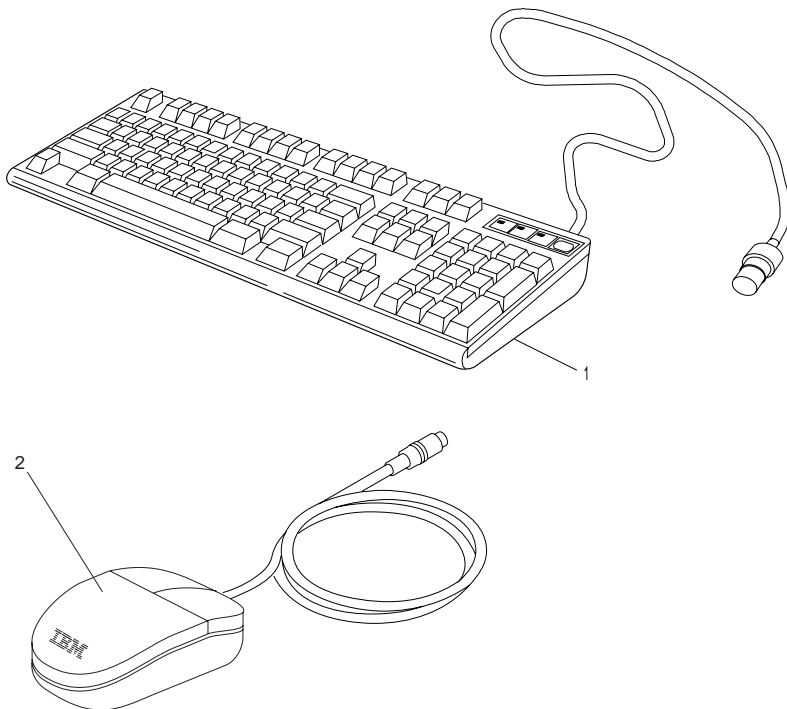
Asm–Index	Part Number	Units	Description
8–1			**Keyboard (Rubber Dome)**
–1	06H9750	1	- Arabic countries
–1	06H9752	1	- Belgium (Dutch)
–1	06H9751	1	- Belgium (French)
–1	06H9749	1	- Brazil
–1	06H9753	1	- Bulgaria
–1	06H9743	1	- Canada (English)
–1	06H9745	1	- Canada (French)
–1	06H9754	1	- Czech Republic
–1	06H9755	1	- Danish
–1	06H9756	1	- Dutch
–1	06H9774	1	- Finland
–1	06H9757	1	- France
–1	06H9758	1	- Germany

Assembly 8: (continued)

–1	06H9760	1	- Greece
–1	06H9761	1	- Hebrew
–1	06H9762	1	- Hungary
–1	06H9764	1	- Italy
–1	06H9773	1	- Latin America (Spanish)
–1	06H9765	1	- Norway
–1	06H9766	1	- Poland
–1	06H9767	1	- Portugal
–1	06H9768	1	- Romania
–1	06H9770	1	- Russia
–1	06H9769	1	- Russia (Cyrillic)
–1	06H9771	1	- Serbia (Cyrillic)
–1	06H9772	1	- Slovakia
–1	06H9786	1	- South Africa
–1	06H9773	1	- Spain
–1	06H9774	1	- Sweden
–1	06H9775	1	- Switzerland
–1	06H9776	1	- Turkey
–1	06H9778	1	- U.K. English
–1	06H9743	1	- U.S. English)
–2	06H4595	1	Mouse
–	60G1990	1	Ball and Clip for mouse—Level 2 (for Mouse FRU number 33G1913)
–	93F2380	1	Ball and Clip for mouse—Level 1 (for Mouse FRU number 33G3835)

Assembly 9: Software
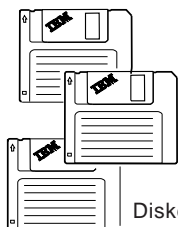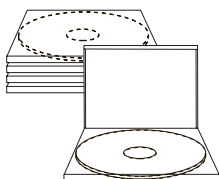
Diskettes   CD-ROM

Note:
Refer to theAppendix, "Model/Monitor Configurations and FRU Part
Numbers" on page A-1 for model specifications.

Asm–Index	Part Number	Units	Description
9–			**Diskette Package —** **Windows, OS/2 Warp**
–	42H1964	1	- Asia Pacific
–	07H1586	1	- Latin America (Spanish)
–	07H1591	1	- Latin America (Brazil)
–			**CD-ROM Package —** **Windows, OS/2 Warp**
–	42H1981	1	- Asia Pacific
–	42H1973	1	- Latin America (Spanish)
–	42H1977	1	- Latin America (Brazil)
–	42H1985	1	- North America (French Canadian)
–			**Diskette Package —** **Microsoft Windows '95**
–	07H1577	1	- Asia Pacific
–	07H1579	1	- Latin America (Spanish)
–	07H1581	1	- Latin America (Brazil)
–	07H1573	1	- North America (U.S. and Canada)
–	07H1575	1	- North America (French Canadian)
–			**CD-ROM Package —** **Microsoft Windows '95**
–	42H1983	1	- Asia Pacific
–	42H1975	1	- Latin America (Spanish)
–	42H1979	1	- Latin America (Brazil)
–	42H1987	1	- North America (French Canadian)

–			**Diskette Package —** **DOS 6.3/Windows Non-Multimedia** **EMEA Model 2144-120**
–	77H6838	1	- Greece
–	72H6781	1	- Turkey
–			**Diskette/CD-ROM Package —** **DOS 7.0/Windows Non-Multimedia** **EMEA Model 2144-120**
–	77H6777	1	- Belgium (Dutch)
–	77H6773	1	- Belgium (French)
–	72H6813	1	- France
–	77H6834	1	- Portugal
–	72H6807	1	- U.K.
–			**Diskette/CD-ROM Package —** **VTC-Dictation EMEA** **Model 2168-152**
–	72H6586	1	- Germany
–	72H6568	1	- U.K.
–			**Diskette/CD-ROM Package —** **Windows '95/Vibra EMEA** **Models 2144-121, -131, -133, -141**
–	72H6682	1	- Greece
–	72H6688	1	- Hebrew
–	72H6676	1	- Eastern Europe
–	72H6670	1	- Russia
–	72H6664	1	- Turkey
–			**Diskette/CD-ROM Package —** **Windows '95, MPEG** **EMEA Multimedia** **Models 2168-132, -142, -162, -172**
–	77H6138	1	- Austria
–	72H6658	1	- Belgium(Dutch)
–	72H6652	1	- Belgium(French)
–	72H6616	1	- Denmark
–	72H6622	1	- Finland
–	72H6574	1	- France
–	72H6580	1	- Germany
–	72H6592	1	- Italy
–	72H6628	1	- Holland
–	77H6144	1	- Ireland
–	72H6604	1	- Norway
–	72H6634	1	- Portugal

–	72H6598	1	- Spain
–	72H6610	1	- Sweden
–	72H6640	1	- Swiss(French)
–	72H6646	1	- Swiss(German)
–	72H6562	1	- U.K.
–			**CD-ROM Package —** **Windows, OS/2 Warp** **EMEA Model 2144-120**
–	53H3346	1	- Denmark
–	53H3370	1	- France
–	53H3306	1	- Germany
–	53H3414	1	- Holland
–	53H3386	1	- Italy
–	53H3402	1	- Spain
–	53H3326	1	- Sweden
–	53H3286	1	- United Kingdom
–			**CD-ROM Package — Multimedia,** **Windows '95, OS/2 Warp** **EMEA Models 2144-121, -131, -133,** **-141 -941, -951**
–	53H3354	1	- Denmark
–	1956782	1	- Finland
–	53H3378	1	- France
–	53H3314	1	- Germany
–	1956768	1	- Holland
–	53H3394	1	- Italy
–	1956775	1	- Norway
–	1956803	1	- Portugal
–	53H3410	1	- Spain
–	53H3334	1	- Sweden
–	1956789	1	- Swiss(French)
–	1956761	1	- Swiss(German)
–	53H3294	1	- United Kingdom

Part Number Index

Part Number	Asm–Index	Page	Part Number	Asm–Index	Page
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07H1575	9–	7-21		7–	7-18
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07H1581	9–	7-21		7–	7-18
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10H2833	6–5	7-15	13H8078	2–NS	7-5
10H2835	6–5	7-15		4–NS	7-10
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10H2926	1–1	7-3		7–	7-18
10H3070	2–NS	7-6		7–	7-18
10H3076	6–5	7-15	14F0068	7–	7-18
10H3077	6–7	7-15	14F0086	7–	7-18
10H3078	1–4	7-3	1956761	9–	7-23
10H3080	1–NS	7-3	1956768	9–	7-23
10H3151	4–3	7-9	1956775	9–	7-23
10H3199	2–	7-6	1956782	9–	7-23
	4–NS	7-10	1956789	9–	7-23
11H8453	4–3	7-9	1956803	9–	7-23
11H9669	2–1	7-5	25H5895	6–4	7-14
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13F9978	7–	7-17	34G1861	3–2	7-7
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41H7820	2–	7-6	53H3306	9–	7-23
	4–NS	7-10	53H3314	9–	7-23
41H7822	2–2	7-5	53H3326	9–	7-23
41H9613	6–4	7-14	53H3334	9–	7-23
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41H9622	6–4	7-14	53H3370	9–	7-23
41H9626	6–4	7-14	53H3378	9–	7-23
41H9629	6–4	7-14	53H3386	9–	7-23
41H9632	6–4	7-14	53H3394	9–	7-23
41H9638	2–NS	7-6	53H3402	9–	7-23
	4–NS	7-10	53H3410	9–	7-23
42H0343	3–1	7-7	53H3414	9–	7-23
42H0344	4–6	7-9	55H6500	6–4	7-14
42H0345	4–7	7-9	55H6502	6–4	7-14
42H0347	4–8	7-9	55H6504	6–4	7-14
42H0348	1–2	7-3	60G1990	8–	7-20
42H0378	2–2	7-5	60G1995	4–NS	7-10
	4–2	7-9	60G2258	2–9	7-6
42H0380	2–2	7-5		4–16	7-10
42H0393	2–NS	7-6	60G2272	6–NS	7-15
	4–18	7-10	60G2308	5–2	7-12
42H0856	6–4	7-14	60G2310	5–3	7-12
42H0951	6–7	7-15	71G0794	2–2	7-5
42H0953	6–7	7-15	71G0795	2–2	7-5
42H1008	6–8	7-15	72H6562	9–	7-23
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42H1964	9–	7-21	72H6574	9–	7-22
42H1973	9–	7-21	72H6580	9–	7-22
42H1975	9–	7-21	72H6586	9–	7-22
42H1977	9–	7-21	72H6592	9–	7-22
42H1979	9–	7-21	72H6598	9–	7-23
42H1981	9–	7-21	72H6604	9–	7-22
42H1983	9–	7-21	72H6610	9–	7-23
42H1985	9–	7-21	72H6616	9–	7-22
42H1987	9–	7-21	72H6622	9–	7-22
42H2380	2–8	7-6	72H6628	9–	7-22
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Appendix. Model/Monitor Configurations and FRU Part Numbers

The models described in this Appendix are **Service Level** I **(SL-I)** machines. Only factory-installed parts are listed.

If the machine you are servicing has **Service Level** I on the label, but you cannot find it listed in this appendix, call your local IBM Aptiva Servicer Bulletin Board for updated model information (in the U.S., call 1-919-248-3540).

Tables A-2 through A-4 outline by model the FRUs that may be ordered by the part number indicated. You can find the Machine Type (2144, 2168) and Model (-XXX) on the front of the system unit.

To determine the correct FRU to install, go to the appropriate country table listed below. Then, look across the top of the country table for the FRU you want to replace. The part number to order is listed by model. For descriptions of system boards and parts, see "Parts Catalog" on page 7-1.

For IBM monitors sold separately from IBM Aptiva system units, see Table A-6 on page A-8.

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Table A-1. U.S. and Canada Machine Types 2144 and 2168 (Factory-Installed Parts).

Model	System Board	Processor	Memory	Hard Drive	Monitor	Modem	Sound Card	Power Supply	Software
A12(MM4)	11H9669	06H8228	92G7540	07H0383	N/A	42H0856	42H0856	06H3862	07H1573
A40(MM4)	11H9669	06H8228	92G7542	07H1122	N/A	42H0856	42H0856	06H2973	07H1573
A44(MM4)	11H9669	06H8228	92G7542	07H1122	N/A	42H0856	42H0856	06H2973	07H1573
A50(MM4)	11H9669	06H9892	92G7542	06H9064	N/A	42H0856	42H0856	06H2973	07H1573
A51(MM4)	11H9669	06H9892	92G7542	06H9064	N/A	42H0856	42H0856	06H2973	07H1573
A52(MM4)	11H9669	06H9892	92G7542	07H1122	N/A	42H0856	42H0856	06H2973	07H1573
A90(MM4)	11H9669	07H0971	92G7542	06H9064	N/A	42H0856	42H0856	06H2973	07H1573
A91(MM4)	11H9669	07H0971	92G7542	06H9064	96G3115	42H0856	42H0856	06H2973	07H1573
A92(MM4)	11H9669	07H0971	92G7542	07H1122	N/A	42H0856	42H0856	06H2973	07H1573
A93(MM4)	11H9669	07H0971	92G7542	07H1122	96G3115	42H0856	42H0856	06H2973	07H1573
C45(MM4)	11H9669	06H8228	92G7542	07H1122	N/A	42H0856	42H0856	06H2973	07H1575

Notes:

1. AXX Models = U.S.A.   CXX Models = Canada.
2. MM = Multimedia model.
3. N/A = Not included in model.
4. For software, see page 7-21.
5. For monitor frequencies, see Table A-6 on page A-8.

Table A-2. EMEA Machine Types 2144 and 2168 (Factory-Installed Parts).

Model	System Board	Processor	Memory	Hard Drive	Monitor	Modem	Sound Card	Power Supply	Software
120	40H4250	07H0972	92G7540	06H9063	96G3109	N/A	N/A	42H2380	See 7-21.
121(MM4)	40H4250	07H0972	92G7540	06H9063	96G3109	N/A	25H5895	42H2380	See 7-21.
131(MM4)	11H9669	06H7589	92G7540	42H1825	96G3116	N/A	25H5895	06H3862	See 7-21.
132(MM4)	11H9669	06H7589	92G7540	42H1825	96G3116	See 7-13.	See 7-13.	06H2973	See 7-21.
133(MM4)	11H9669	06H7589	92G7540	42H1825	96G3109	N/A	25H5895	06H3862	See 7-21.
141(MM4)	11H9669	06H6063	92G7540	07H0383	96G3116	N/A	25H5895	06H3862	See 7-21.
142(MM4)	11H9669	06H6063	92G7540	07H0383	96G3116	See 7-13.	See 7-13.	06H2973	See 7-21.
152(MM4)	11H9669	42H0378	92G7452	07H0383	96G3116	See 7-13.	See 7-13.	06H2973	See 7-21.
162(MM5)	11H9669	06H8228	07H0975	06H9064	96G3116	See 7-13.	See 7-13.	06H2973	See 7-21.
172(MM4)	11H9669	06H9892	07H0975	06H9064	96G3121	See 7-13.	See 7-13.	06H2973	See 7-21.

Notes:

1. MM = Multimedia model.
2. N/A = Not included in model.
3. For software, see page 7-21.
4. For monitor frequencies, see Table A-6 on page A-8.

Table A-3 (Page 1 of 2). Latin America Machine Type 2144, 2168 (Factory-Installed Parts)

Model	System Board	Processor	Memory	Hard Drive	Monitor	Modem	Sound Card	Power Supply	Software
K15(MM4)	40H4250	42H0380	92G7540	42H1825	96G3109	42H0856	42H0856	42H2380	07H1581
K16(MM4)	40H4250	42H0380	92G7540	42H1825	96G3119	42H0856	42H0856	42H2380	07H1581
K33(MM4)	11H9669	06H6063	92G7540	07H0383	96G3109	42H0856	42H0856	06H3862	07H1591
K35(MM4)	11H9669	06H6063	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	07H1591
K43(MM4)	11H9669	06H6063	92G7540	07H0383	96G3109	42H0856	42H0856	06H3862	07H1581
K45(MM4)	11H9669	06H6063	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	07H1581
K55(MM4)	11H9669	06H8228	92G7540	07H0383	96G3109	42H0856	42H0856	06H2973	07H1581
K65(MM4)	11H9669	06H8228	92G7540	07H0383	96G3119	42H0856	42H0856	06H2973	07H1581
K66(MM4)	11H9669	06H8228	92G7542	07H0383	96G3119	42H0856	42H0856	06H2973	07H1581
L11	40H4250	42H0380	92G7540	06H9063	96G2008	04H5788	N/A	42H2380	25H5769
L15(MM4)	40H4250	42H0380	92G7540	42H1825	96G2008	42H0856	42H0856	42H2380	07H1579
L16(MM4)	40H4250	42H0380	92G7540	42H1825	96G3119	42H0856	42H0856	42H2380	07H1579
L33(MM4)	11H9669	06H6063	92G7540	07H0383	96G2008	42H0856	42H0856	06H3862	07H1586
L35(MM4)	11H9669	06H6063	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	07H1586
L43(MM4)	11H9669	06H6063	92G7540	07H0383	96G2008	42H0856	42H0856	06H3862	07H1579

Notes:

1. KXX Models = Brazil.   LXX Models = Latin America.   UXX Models = Universal.
2. MM = Multimedia model.
3. N/A = Not included in model.
4. For software, see page 7-21.
5. For monitor frequencies, see Table A-6 on page A-8.

Model	System Board	Processor	Memory	Hard Drive	Monitor	Modem	Sound Card	Power Supply	Software
L45(MM4)	11H9669	06H6063	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	07H1579
L55(MM4)	11H9669	06H8228	92G7540	07H0383	96G2008	42H0856	42H0856	06H2973	07H1579
L65(MM4)	11H9669	06H8228	92G7540	07H0383	96G3119	42H0856	42H0856	06H2973	07H1579
L66(MM4)	11H9669	06H8228	92G7542	07H0383	96G3119	42H0856	42H0856	06H2973	07H1579
U11	40H4250	42H0380	92G7540	06H9063	96G3109	04H5788	N/A	42H2380	25H5769
U15	40H4250	42H0380	92G7540	42H1825	96G3109	04H5788	N/A	42H2380	07H1581
U16	40H4250	42H0380	92G7540	42H1825	96G3119	04H5788	N/A	42H2380	07H1581
U33(MM4)	11H9669	06H6063	92G7540	07H0383	96G3109	42H0856	42H0856	06H3862	07H1586
U35(MM4)	11H9669	06H6063	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	07H1586
U43(MM4)	11H9669	06H6063	92G7540	07H0383	96G3109	42H0856	42H0856	06H3862	07H1581
U45(MM4)	11H9669	06H6063	92G7540	07H0383	96G3109	42H0856	42H0856	06H3862	07H1581
U55(MM4)	11H9669	06H8228	92G7540	07H0383	96G3109	42H0856	42H0856	06H2973	07H1581
U65(MM4)	11H9669	06H8228	92G7540	07H0383	96G3119	42H0856	42H0856	06H2973	07H1581
U66(MM4)	11H9669	06H8228	92G7542	07H0383	96G3119	42H0856	42H0856	06H2973	07H1581

Notes:

1. KXX Models = Brazil.   LXX Models = Latin America.   UXX Models = Universal.
2. MM = Multimedia model.
3. N/A = Not included in model.
4. For software, see page 7-21.
5. For monitor frequencies, see Table A-6 on page A-8.

Table A-4. Asia-Pacific Machine Types 2144, 2168 (Factory-Installed Parts)

Model	System Board	Processor	Memory	Hard Drive	Monitor	Modem	Sound Card	Power Supply	Software
X17(MM4)	11H9669	06H7589	92G7540	42H1825	N/A	42H0856	42H0856	06H3862	42H1964
X27(MM4)	11H9669	06H6063	92G7540	07H0383	N/A	42H0856	42H0856	06H3862	42H1964
X37(MM4)	11H9669	06H6063	92G7540	07H0383	N/A	42H0856	42H0856	06H2973	42H1964
X47(MM4)	11H9669	06H8228	92G7540	06H9064	N/A	42H0856	42H0856	06H2973	42H1964
Y17(MM4)	11H9669	06H7589	92G7540	42H1825	N/A	42H0856	42H0856	06H3862	42H1964
Y27(MM4)	11H9669	06H6063	92G7540	07H0383	N/A	42H0856	42H0856	06H3862	42H1964
Y37(MM4)	11H9669	06H6063	92G7540	07H0383	N/A	42H0856	42H0856	06H2973	42H1964
Y47(MM4)	11H9669	06H8228	92G7540	06H9064	N/A	42H0856	42H0856	06H2973	42H1964
Z17(MM4)	11H9669	06H7589	92G7540	42H1825	N/A	42H0856	42H0856	06H3862	42H1964
Z27(MM4)	11H9669	06H6063	92G7540	07H0383	N/A	42H0856	42H0856	06H3862	42H1964
Z37(MM4)	11H9669	06H6063	92G7540	07H0383	N/A	42H0856	42H0856	06H2973	42H1964
Z47(MM4)	11H9669	06H8228	92G7540	06H9064	N/A	42H0856	42H0856	06H2973	42H1964

Notes:
1. XXX Models = Asean.
2. YXX Models = Australia.
3. ZXX Models = New Zealand.
4. MM = Multimedia model.
5. N/A = Not included in model.
6. For software, see page 7-21.
7. For monitor frequencies, see Table A-6 on page A-8.

Table A-5. Japanese Machine Types 2144, 2168 (Factory-Installed Parts)

Model	System Board	Processor	Memory	Hard Drive	Monitor	Modem	Sound Card	Power Supply	Software
S20(MM4)	11H9669	06H6063	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	See 7-21.
S30(MM4)	11H9669	42H0378	92G7540	07H0383	96G3119	42H0856	42H0856	06H3862	See 7-21.
S50(MM4)	11H9669	06H8228	92G7542	06H9064	96G3119	42H0856	42H0856	06H2973	See 7-21.
S60(MM4)	11H9669	06H9892	92G7542	06H9064	96G3119	42H0856	42H0856	06H2973	See 7-21.

Notes:

1. MM = Multimedia model.
2. N/A = Not included in model.
3. For software, see page 7-21.
4. For monitor frequencies, see Table A-6 on page A-8.

Table A-6 applies only to monitors sold with **Service Level** I computers. The monitor part number can be found on the back of the monitor.

See "Assembly 7: Monitor and Power Cord (Linecord)" on page 7-16 for FRU part numbers.

Table A-6. Monitor-to-FRU Index and Monitor Frequency Settings		
Monitor Part Number	**FRU Number**	**Monitor Frequency (KHz)**
96G2007	96G2008	37.9
96G1572	96G3108 Express-Repair	37.9
96G1578	96G3109	37.9
96G1569	96G3110	56.0
96G1570	96G3111	56.0
96G1567	96G3112	56.0
96G1571	96G3113	56.0
96G2875	96G3114	56.0
96G1573	96G3115	56.9
96G1574	96G3116 Express-Repair	56.9
96G1579	96G3117	56.9
96G1575	96G3118	56.9
96G1576	96G3119	56.9
96G1581	96G3120	56.9
96G1870	96G3121 Express-Repair	64.0
96G1871	96G3122	64.0
96G1892	96G3123	64.0
96G1893	96G3124	64.0
Note: Express-Repair is the EMEA Central Repair Service Center.		

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