

FRONT

PICTURE 1

March 21, 1990

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EDITION Edition Notice
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Refer to the *Hardware Maintenance Reference General Information* pamphlet in this manual for the following safety information:

- General Safety
- Electrical Safety.

First Edition (March 1990)

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1.0 Product Description

The IBM (*) Personal System/2 (*) Model 60 computers use the IBM Micro Channel (*) architecture. The features of the various types of Model 60 are:

- Security: cover lock and power-on password
- System board:
 - 10-MHz 80286 Microprocessor.
 - 80287 Math Coprocessor connector.
 - 1MB (MB = 1,048,576 bytes) of random access memory (RAM). The total system memory capacity is 16MB.
 - 64 bytes of complementary metal-oxide semiconductor random access memory (CMOS RAM).
 - Read-only memory basic input/output system (ROM BIOS).
 - Video graphics array (VGA).
 - Eight expansion slots, including one occupied by the fixed-disk-drive adapter.
 - Serial port.
 - Parallel port.
 - Diskette-drive controller.
 - Keyboard connector.
 - Pointing-device connector.
 - Display connector.
 - Fixed-disk-drive connector.
- Power supply:
 - Automatically switches to the 100-125 Vac or the 200-240 Vac range
 - 50 or 60 Hz
 - 207 or 225 watts.
- Battery (to keep CMOS RAM active when power is off)
- Speaker
- 101/102-key keyboard
- Fixed disk drives supported (see "Fixed Disk Drives" in topic 2.2).

(*) IBM, Personal System/2, and Micro Channel are trademarks of the International Business Machines Corporation.

Subtopics

1.1 Security

1.2 System-Board Features

1.1 Security

Subtopics

1.1.1 Cover Lock

1.1.2 Power-On Password

1.1.1 Cover Lock

The cover lock is on the left side of the system unit and can be unlocked with the user's key.

If the keys for the cover lock are lost, a new cover-lock assembly can be ordered (see the parts section in the *Hardware Maintenance Service* pamphlet for the model you are servicing). The new assembly contains two keys. Use one of the new keys, along with a pair of pliers to force the old cover lock open.

1.1.2 Power-On Password

A power-on password denies access to the system when the system is powered-on. To service a system with an active and *unknown* power-on password, power-off the system and, do one of the following depending on which battery and speaker assembly is installed:

- If the assembly has pins, short pins 2 and 3 together.
- If the assembly has no pins, insert a meter lead into connector 1 and short the other end of the lead to frame ground.

With the assembly shorted, power-on the system. This deactivates the power-on password. Remove the short after the POST is finished.

To reactivate the power-on password, the user must start the system with the Reference Diskette in drive A, select the **Set features** option, and follow the instructions.

PICTURE 2

1.2 System-Board Features

The major features of the system board are:

- 80286 Microprocessor
- CMOS RAM
- ROM BIOS
- VGA
- Serial port
- Parallel port
- Diskette-drive controller
- Keyboard connector
- Pointing-device connector.

Subtopics

- 1.2.1 Microprocessor
- 1.2.2 CMOS RAM
- 1.2.3 ROM BIOS
- 1.2.4 VGA
- 1.2.5 Serial Port
- 1.2.6 Parallel Port
- 1.2.7 Diskette-Drive Controller
- 1.2.8 Keyboard Connector and Pointing-Device Connector

1.2.1 *Microprocessor*

The microprocessor interprets and carries out instructions. The 80286 Microprocessor is a 16-bit processor and operates in two modes: real-address mode and virtual-address (protected) mode. The microprocessor speed is 10 MHz.

1.2.2 CMOS RAM

The CMOS RAM provides 64 bytes of storage. The first 50 bytes are used to store system-configuration and security information. The real-time clock uses the remaining 14 bytes to track the date, time, and battery level. A 2KB (KB = 1024 bytes) CMOS RAM extension stores additional configuration and system-status information.

The data stored in the CMOS RAM and CMOS RAM extension is kept active by the battery when the system is powered-off. If the stored data is lost due to a depleted or removed battery, the data can be restored using one of the following methods:

- If the user has a customized configuration that uses settings other than the default, run the restore configuration program on the user's backup copy of the Reference Diskette.
- If the configuration uses the default settings, run the automatic configuration program on the Reference Diskette.

1.2.3 ROM BIOS

ROM BIOS contains the instructions and routines that control the keyboard, diskette drives, fixed disk drive, displays, and other major input/output devices in the system. Some adapters have their own ROM modules containing extended BIOS routines that work with the system-board ROM BIOS. The routines for performing the power-on self-test (POST) are also contained in the ROM BIOS.

1.2.4 VGA

The VGA is a graphics controller on the system board. The VGA supports color and monochrome analog direct-drive displays in a variety of modes, including alphanumeric text mode, and all-points-addressable (APA) graphics mode.

The VGA supports a maximum of 720-by-400 picture elements (PELs) in the text mode and 640-by-480 PELs in the graphics mode. The VGA can support 256 colors or 64 shades of gray at one time. Composite video is not supported.

One expansion slot on the system board extends farther to the rear of the system board than the others. This extended expansion slot accommodates video adapters that are designed to interface with the system-board VGA. Some of these adapters have a display connector of their own. The extended expansion slot also supports all adapters designed to be installed in the shorter slots.

1.2.5 Serial Port

The serial port is fully programmable and supports asynchronous communications. The 25-pin, D-shell connector provides the signals to drive a device with a standard 25-contact, RS-232 connector. The connected device is identified by the system configuration as either SERIAL 1 or SERIAL 2.

If adapters with serial ports are installed in the system, they can be configured from SERIAL 1 to SERIAL 8.

Note: Conflicts occur when using multiple communication lines if two or more lines are addressed the same. Select the **Set configuration** option on the Reference Diskette. Select **View configuration** to verify that no lines are addressed the same.

1.2.6 Parallel Port

The parallel port allows the attachment of devices that accept eight bits of parallel data at standard transistor-transistor-logic (TTL) levels. The port has a 25-pin, D-shell connector and is designed primarily for printers. However, the port can be used as an input/output port for any device or application that matches the input/output capabilities of the port. When adapters with additional parallel ports are installed, the system can support three different devices, each addressed separately as PARALLEL 1, PARALLEL 2, or PARALLEL 3.

Note: Conflicts occur when two or more devices have the same address. Select the **Set configuration** option on the Reference Diskette. Select **View configuration** to verify that no lines are addressed the same.

1.2.7 Diskette-Drive Controller

The controller connects to the diskette drives through a single 40-pin connector on the system board. Signals and voltages are supplied through the diskette-drive cable that plugs into the connector. These signals and voltages can operate two IBM 3.5-inch diskette drives.

1.2.8 Keyboard Connector and Pointing-Device Connector

The two 6-pin connectors at the rear of the system board are for connecting a keyboard and a pointing device (mouse). The keyboard connector is marked with a small keyboard figure molded into the back panel; the unmarked connector is for the pointing device. The interface logic is the same for both. A fuse on the system board protects the system board, keyboard, and pointing device.

2.0 Option Compatibility

The Model 60 uses only those adapters that are specifically designed for it. For supported options, see the parts section in the *Hardware Maintenance Service* pamphlet for the model you are servicing.

Subtopics

- 2.1 Drive and Diskette Compatibility
- 2.2 Fixed Disk Drives
- 2.3 Terminators

2.1 Drive and Diskette Compatibility

The following provides information concerning the identification of diskette drives.

Diskette Drive	Identifying Mark
3.5 Inch - 720KB	None
3.5 Inch - 1.44MB	1.44 on the Eject Button

The following addresses the compatibility of diskettes to diskette drives.

Diskette Capacity	720KB Drive	1.44MB Drive
1.0MB	Read/Write	Read/Write
2.0MB	Not Compatible	Read/Write

Note: For additional information, see "Diskette Drives and Diskettes" in the *IBM Personal System/2 Hardware Maintenance Reference General Information* pamphlet in this manual.

2.2 Fixed Disk Drives

Several fixed disk drives are available for PS/2 systems. The fixed disk drive and fixed-disk-drive interface must be the same. For example, an enhanced small device interface (ESDI) adapter must be used with an ESDI drive. For supported fixed disk drives, see the parts section in the *Hardware Maintenance Service* pamphlet for the model you are servicing.

The Model 60 uses fixed disk drives that automatically position the read/write heads in nondata areas when the system is powered-off. No special precautions are required regarding parking the heads when moving the computer.

2.3 Terminators

Diskette Drives: do not use or require terminators.

Fixed Disk Drives: one or more cables are used to connect the fixed-disk adapters to the fixed disk drives. For each cable used, the last drive on the cable must have a terminator.

The location, quantity, and appearance of the terminator may vary from drive to drive. An identification label or tag (usually "T-RES") is attached to the terminator for easy identification.

Note: For additional information, see "SCSI Devices" in the "Options and Adapters (Micro Channel)" section of this manual.

3.0 Operating Requirements

This section describes the operations that occur from the time the system is powered-on until the minimum operating requirements have been met.

Subtopics

3.1 Power Supply

3.2 Power-On Self-Test (POST)

3.3 System Memory

3.1 Power Supply

The power supply automatically switches to either the 100-125 Vac or the 200-240 Vac range. The ac input is converted to dc outputs that supply the system with proper operating voltages.

When the system is powered-off for 10 seconds or more and then powered-on, the power supply generates a 'power good' signal that resets system logic. The presence of the 'power good' signal indicates that the power supply is operating properly and that the minimum under-voltage sense levels have been established. This means that all system-board power requirements have been met.

Output (Vdc)	Minimum Under-Voltage Sense Level (Vdc)
+ 5.0	+ 4.5
+12.0	+10.8
-12.0	-10.2

The 'power good' signal turns on the green power-good light on the front of the system. If the green light is not on, the power supply is not functioning properly.

3.2 Power-On Self-Test (POST)

The POST is initiated automatically each time the system power is turned on.

The POST is a series of system checks and initializations that verify the correct operation of the system unit. The POST tests only those areas that allow the system to be operational enough to run advanced diagnostics. The POST can detect two types of errors: critical and noncritical.

Critical errors prevent the system from operating or cause incorrect results that are apparent to the user. Examples of critical errors include microprocessor or interrupt-controller errors. If the POST detects a critical error, the microprocessor attempts to display the error and all testing stops.

Noncritical errors cause incorrect results that might not be apparent to the user. An example of a noncritical error would be a serial communications failure. If the POST detects a noncritical error, all testing stops and the microprocessor displays an error code. Pressing the F1 key allows testing to continue.

When the Reference Diskette is in drive A, and a noncritical error is detected, the system displays the POST error message along with a message generated from the Reference Diskette. The Reference Diskette message instructs the user to take a specific action to correct the error.

After a successful POST, one short beep occurs. Control is then given to a BIOS routine called the system bootstrap loader. The bootstrap loader attempts to load an operating system or a program from either a diskette or the fixed disk drive. If neither is present in the system, the Insert Diskette icon is displayed (see the *IBM Personal System/2 Micro Channel Diagnostics* pamphlet in this manual). This icon indicates that a diskette should be inserted into drive A. After the diskette is inserted, press the F1 key to resume operation. If the F1 key is pressed when no diskette is in the diskette drive, the IBM Cassette BASIC screen appears.

3.3 *System Memory*

Subtopics

- 3.3.1 System-Board Memory
- 3.3.2 Memory-Expansion Adapters
- 3.3.3 Memory Requirements and Limitations
- 3.3.4 Memory Errors

3.3.1 System-Board Memory

The Model 60 system board has 1MB of memory installed at the time of shipment. Additional memory can be installed by adding memory-expansion adapters. The system can support 16MB of memory.

3.3.2 Memory-Expansion Adapters

An optional memory adapter, the 80286 Memory Expansion Adapter, is available to extend the capabilities of the Model 60. The 80286 Memory Expansion Adapter is shipped with one 80286 Memory Expansion Kit. Three 80286 Memory Expansion Adapters can be installed in the system. The adapters can be installed in any of the 32-bit expansion slots on the system board. Each adapter can have three 80286 Memory Expansion Kits installed. For other supported options, see the parts section in the *Hardware Maintenance Service* pamphlet for the model you are servicing.

3.3.3 Memory Requirements and Limitations

The system board *does not* have to be fully populated before adding 80286 Memory Expansion Adapters, and each memory-expansion adapter *does not* have to be filled to its capacity before adding another memory-expansion adapter. Whenever memory is added or removed from the system, the set configuration program must be run.

3.3.4 Memory Errors

The Model 60 reallocates memory in 1MB blocks.

If the first 1MB of memory on the system board has a memory error, no memory reallocation occurs and an error message is displayed.

If the first 1MB of memory on the system board has no memory errors, but a memory error occurs in either the additional system-board memory or the memory-expansion-adapter memory, reallocation occurs.

Reallocation allows the system to function with up to two noncritical memory errors, however, the memory capacity is reduced. To recover the maximum memory when defects are present, the defective addresses are arranged in a chain at the top of memory. The rest of addressable memory is then available for use.

PICTURE 3

The first time the POST detects an error in memory outside the first 1MB, it displays an error message and gives the user a choice of continuing with memory reallocation or correcting the error. The address of the error is then stored.

The next time POST is run, it reads the stored address and automatically reallocates memory without displaying an error message. When three or more errors occur, memory reallocation does not take place and the system displays an error message. All errors must then be corrected.

Stored memory errors can be detected by running the advanced diagnostic memory tests.

4.0 Specifications

Size

- Depth: 482 mm (19 in.)
- Height: 597 mm (23.5 in.)
- Width: 165 mm (6.5 in.)
- Width (feet extended): 318 mm (12.5 in.).

Weight

- Minimum configuration: 19 kg (42 lb)
- Maximum configuration: 26 kg (58 lb).

Environment

- Temperature:
 - Power on: 16° to 32°C (60° to 90°F)
 - Power off: 10° to 43°C (50° to 110°F).
- Humidity:
 - Power on: 8% to 80%
 - Power off: 5% to 80%.
- Maximum altitude: 2134 m (7000 ft).

Heat Output

1240 British thermal units (BTUs) per hour (363.4 watts per hour).

Electrical

- Input voltage (Sinewave input is required)
 - Low Range:
 - Minimum: 90 Vac
 - Maximum: 137 Vac.
 - High Range:
 - Minimum: 180 Vac
 - Maximum: 265 Vac.
- Input kilovolt-amperes (kVA)
 - Minimum Configuration (as shipped from IBM): .15 kVA
 - Maximum Configuration: Approximately .53 kVA.

5.0 *Special Tools*

The following special tools are required to service the Model 60.

Subtopics

5.1 Volt-Ohm Meter

5.2 Wrap Plug

5.1 Volt-Ohm Meter

A meter similar to the Triplet Model 310. (1)

(1) Manufactured by Triplet Corporation, Bluffton, Ohio 45817,
U.S.A.

5.2 Wrap Plug

The Tri-Connector wrap plug (IBM part 72X8546) is used during the advanced diagnostic tests of the serial and parallel ports.

The Tri-Connector wrap plug replaces the following:

- (IBM part 8529228) Printer Adapter wrap plug
- (IBM part 8286126) Serial Port wrap plug
- (IBM part 8529280) Communications Adapter wrap plug
- (IBM part 62X1083) Communications wrap plug 25-pin
- (IBM part 62X1084) Communications wrap plug 9-pin.

PICTURE 4

6.0 Service Position

The Model 60 should be upright when being serviced. If necessary, the unit can be placed on the side without the cover after the feet have been folded.

CAUTION:

The system unit with options may weigh as much as 26 kilograms (58 pounds). Be careful when moving or changing the position of the unit. To ensure general safety, do not attempt to lift any object that you think is too heavy for you.

7.0 Removals and Replacements

The arrows in the removals and replacements section show the direction of movement to remove a FRU, to turn a screw, or to press a tab to release the FRU. The arrows are marked in numeric order to show the correct sequence of removal.

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 "Locations" for internal cable connection and arrangement information.

CAUTION:

Before removing any field replaceable unit (FRU), power-off the system, unplug all power cords from electrical outlets, and disconnect any interconnecting cables.

Warning: The system board, adapters, memory modules, and the math coprocessor are sensitive to, and can be damaged by, electrostatic discharge. Establish personal grounding by touching a ground point with one hand before touching these units.

Note: An electrostatic discharge (ESD) strap may be used to establish personal grounding.

Subtopics

- 7.1 1005 Cover
- 7.2 1010 Cover Lock
- 7.3 1015 Adapters
- 7.4 1020 Math Coprocessor
- 7.5 1025 Battery and Speaker Assembly
- 7.6 1030 Feet
- 7.7 1035 Front Bezel
- 7.8 1040 Carrying Handle
- 7.9 1045 Power Supply
- 7.10 1050 Diskette Drive
- 7.11 1055 Diskette-Drive Cable Retainer
- 7.12 1060 Diskette-Drive Support Structure
- 7.13 1065 Fixed Disk Drive (Front Bay)
- 7.14 1070 Fixed Disk Drive (Rear Bay)
- 7.15 1075 Fixed-Disk-Drive Support Structure
- 7.16 1080 Memory-Module Packages
- 7.17 1085 System Board
- 7.18 1090 Fixed-Disk-Drive Support Structure Bracket

7.1 1005 Cover

CAUTION:

Before removing any field replaceable unit (FRU), power-off the system, unplug all power cords from their electrical outlets, and disconnect any interconnecting cables.

PICTURE 5

7.2 1010 Cover Lock

□ Cover (1005)

PICTURE 6

7.3 1015 Adapters

Cover (1005)

Notes:

1. Disconnect any cables attached to the adapter.
2. Before replacing an adapter, note the locations of the adapter and cables. When replacing an adapter, install the replacement adapter in the same slot as the adapter that was removed.

Stored configuration information depends on the location of the adapter. If the replacement adapter is installed in a different location, run the set configuration program on the user's Reference Diskette to reset the system-configuration information.

PICTURE 7

7.4 1020 Math Coprocessor

- Cover (1005)
- Adapters in expansion slots 1 and 2, if installed (1015).

Warning: Remove the math coprocessor carefully. Do not bend the pins when removing the math coprocessor. The math coprocessor can be damaged by electrostatic discharge, prying between the module and connector, or prying between the connector and system board. Establish personal grounding by touching a ground point with one hand before touching the math coprocessor.

Notes:

1. When replacing the math coprocessor, align the notch on the math coprocessor toward the rear of the system unit. If the math coprocessor is not installed correctly, the system will not operate.
2. The Model 60 uses a 10-MHz math coprocessor. Use of the wrong math coprocessor could cause intermittent errors. For the proper part number, see the parts section in the *Hardware Maintenance Service*, pamphlet for the model you are servicing.

PICTURE 8

7.5 1025 Battery and Speaker Assembly

CAUTION:

The lithium battery presents a fire, explosion, or severe burn risk. Do not recharge it, remove the polarized connector from it, disassemble it, heat it above 100°C (212°F), incinerate it, or expose the cell contents to water. Dispose of the battery as required by local ordinances or regulations. When replacing the battery, use only Part No. 72X8498. Use of another battery could result in ignition or explosion of the battery. Replacement batteries can be ordered from IBM or IBM Authorized Dealers.

Warning: To avoid accidentally discharging the battery, remove it before disconnecting the battery and speaker assembly cable. Connect the cable before replacing the battery.

Cover (1005)

PICTURE 9

7.6 1030 Feet

- Cover (1005)
- Remove any adapters (1015) that are in the way.

PICTURE 10

7.7 1035 Front Bezel

PICTURE 11

7.8 1040 Carrying Handle

- Front bezel (1035)

PICTURE 12

7.9 1045 Power Supply

- Cover (1005)
- Front bezel (1035).

Note: Disconnect all cables from the power supply.

PICTURE 13

7.10 1050 Diskette Drive

- Cover (1005)
- Front bezel (1035).

Note: Some models require that you unplug the diskette-drive cable before removing the drive.

PICTURE 14

7.11 1055 Diskette-Drive Cable Retainer

- Cover (1005)
- Front bezel (1035)
- Diskette drives (1050).

Notes:

1. Disconnect the diskette-drive cable.
2. Not all models have diskette-drive cable retainers.
3. See "Locations" for cable connection and arrangement information.

PICTURE 15

7.12 1060 Diskette-Drive Support Structure

- Cover (1005)
- Front bezel (1035)
- Diskette drive (1050)
- Diskette-drive cable retainer (1055).

PICTURE 16

7.13 1065 Fixed Disk Drive (Front Bay)

Warning: Improper shipping or handling can result in permanent loss of all data and formatting on the fixed disk drive. Have the user back up all information on the fixed disk drive.

- Cover (1005)
- Front bezel (1035).

Notes:

1. Remove the terminator on the fixed disk drive in the front bay.
2. See "Locations" for cable connection information.
3. Disconnect any ground wires and cables from the fixed disk drive.

PICTURE 17

7.14 1070 Fixed Disk Drive (Rear Bay)

Warning: Improper shipping and handling can result in permanent loss of all data and formatting on the fixed disk drive. Have the user back up all information from the fixed disk drive.

Cover (1005)

Notes:

1. Remove the fixed disk drive (front bay), if installed (1065)
2. The fixed disk drive in the rear bay must have the terminator installed.
3. See "Locations" for cable connection and arrangement information.
4. Disconnect any ground wires and cables from the fixed disk drive.

PICTURE 18

7.15 1075 *Fixed-Disk-Drive Support Structure*

- Cover (1005)
- Fixed disk drive (front bay), if installed (1065)
- Fixed disk drive (rear bay) (1070).

PICTURE 19

7.16 1080 Memory-Module Packages

- Cover (1005)
- Fixed disk drive (front bay), if installed (1065).

PICTURE 20

7.17 1085 System Board

Warning: To avoid accidentally discharging the battery, remove it before disconnecting the battery and speaker assembly cable. Connect the cable before replacing the battery.

- Cover (1005)
- Adapters (1015)
- Math coprocessor, if installed (1020)
- Fixed disk drive (front bay), if installed (1065)
- Fixed disk drive (rear bay) (1070)
- Fixed-disk-drive support structure (1075)
- Memory-module packages (1080).

Notes:

1. Disconnect all cables from the system board.
2. When a new system board is installed, run the restore configuration program, using the user's Reference Diskette to restore time, date, and any unique configuration data.

PICTURE 21

7.18 1090 Fixed-Disk-Drive Support Structure Bracket

- Cover (1005)
- Adapters (1015)
- Front bezel (1035)
- Power supply (1045)
- Fixed disk drive (front bay), if installed (1065)
- Fixed disk drive (rear bay) (1070)
- Fixed-disk-drive support structure (1075)
- System board (1085).

Note: When you remove the four screws that hold the bracket, the labels on the outside of the system will be destroyed. Replace these labels with new labels after reassembly. For the correct part number of the labels, see the *Hardware Maintenance Service* pamphlet for the model you are servicing.

PICTURE 22

8.0 Locations

Subtopics

- 8.1 Front View
- 8.2 Rear View
- 8.3 Interior View
- 8.4 Internal Cables
- 8.5 System Board

8.1 Front View

- 1 Carrying handle
- 2 Cover lock
- 3 Power-good light
- 4 Fixed-disk-drive in-use light
- 5 Power switch
- 6 Diskette-drive in-use light
- 7 Diskette drive A
- 8 Diskette-eject button
- 9 Diskette drive B (if installed)
- 10 Serial number.

PICTURE 23

8.2 Rear View

- 1 Power-cord connector
- 2 Keyboard connector
- 3 Pointing-device connector
- 4 Parallel port
- 5 Serial port
- 6 Display connector
- 7 Expansion slots.

PICTURE 24

8.3 Interior View

- 1 Power supply
- 2 Diskette drive A
- 3 Diskette drive B (if installed)
- 4 Fixed disk drive (if installed)
- 5 Battery and speaker assembly
- 6 System board
- 7 Fixed-disk-drive adapter (in expansion slot 8)
- 8 Memory-module packages (hidden by drive)
- 9 Fixed disk drive (rear bay).

PICTURE 25

8.4 Internal Cables

This diagram shows the arrangement of the cables that connect the various devices.

- 1 Power supply
- 2 Fixed disk drive (rear Bay)
- 3 Fixed disk drive (front Bay)
- 4 Diskette drive A
- 5 Diskette drive B
- 6 System board
- 7 Speaker/battery
- 8 Data cable
- 9 Fixed-disk-drive adapter
- 10 Controller cable.

PICTURE 26

8.5 System Board

- 1 Fuse
- 2 Power-supply cable connector
- 3 Diskette-drive cable connector
- 4 Memory-module package connectors
- 5 Battery and speaker assembly cable connector
- 6 80287 Math Coprocessor connector
- 7 Expansion slots
- 8 Extended video-adaptor slot
- 9 Fixed-disk-drive adapter slot
- 10 Display connector
- 11 Serial connector
- 12 Parallel connector
- 13 Pointing-device connector
- 14 Keyboard connector.

PICTURE 27

9.0 Safety Grounds

- 1 Power-cord connector
- 2 Primary ground
- 3 Chassis ground
- 4 Expansion-slot screws
- 5 Screws.

PICTURE 28

Notes: