

FRONT

PICTURE 1

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EDITION Edition Notice
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Third Edition (October 1991)

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486
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1.0 Product Description

The IBM (*) Personal System/2 (*) Model 90 XP (*) 486 computers use the IBM Micro Channel (*) architecture. The features of the various types of the Model 90 are:

- Security
 - Cover lock
 - Bolt-down capability
 - Power-on password
- System board
 - Processor board (with a connector for L2 Cache)
 - 80486 25-MHz processor board (math capability built in)
 - 80486 33-MHz processor board (math capability built in)
 - 80486 50-MHz processor board (math capability built in)
 - Processor board (without a connector for L2 Cache)
 - 80486SX (**) 20-MHz processor board (without math capability)
 - 80487SX (**) 20-MHz processor board (math capability built in)
 - 80486SX 25-MHz processor board (with an empty socket for an 80487SX processor with math capability)
 - 64 byte complementary metal-oxide semiconductor (CMOS) random access memory (RAM) with real-time clock and 2KB (KB = 1024 bytes) CMOS RAM extension
 - Two memory-riser cards: one card blank and one card with 4MB (MB = 1 048 576 bytes) random access memory (RAM) (64MB total system memory capacity)
 - Graphics array
 - Extended graphics array (XGA) (*) with 512KB expandable to 1MB
 - Video graphics array (VGA) compatible
 - Four expansion slots
 - Three 32-bit expansion slots with matched memory extension
 - One 32-bit expansion slot with auxiliary video extension
 - Two serial ports
 - Parallel port
 - Diskette-drive controller
 - Battery (to keep CMOS RAM active when power is off)
 - Keyboard connector
 - Initial Machine Loading (IML) supported
 - Pointing-device connector
- Power supply
 - Automatically switches to the 100-125 V ac or the 200-240 V ac range
 - 50 or 60 Hz
- Speaker and switch assembly
- 101/102-key keyboard
- Small Computer System Interface (SCSI) adapter with internal and external connectors
- SCSI fixed disk drive (hard disk drive)
- Diskette drive.

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Subtopics

- 1.1 Security
- 1.2 System Features
- 1.3 System Memory

1.1 Security

Subtopics

1.1.1 Cover Lock

1.1.2 Bolt-down Capability

1.1.3 Power-On Password

1.1.1 Cover Lock

The cover lock is in the middle of the rear panel of the system unit; the cover can't be removed without the cover-lock 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* for the system you are servicing).

1.1.2 Bolt-down Capability

The bolt-down capability allows you to attach the system unit to a table or desk.

The table or desk must have holes drilled through it, and the bolts must be inserted from below (the table or desk) into the holes in the base of the system unit. There are three holes 1. The distance between the two holes on the right side of the base is 165 mm (6.5 in.).

Use 6 mm bolts. The length of the bolts should be 15 mm (0.60 in.) plus the thickness of the table or desk.

PICTURE 2

1.1.3 Power-On Password

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 (which resembles a small key) appears on the screen each time the system is powered-on (except when the system is in the Unattended Start Mode). Access to the system occurs when the proper password is entered.

To service a system with an active and unknown power-on password, power-off the system and do the following:

1. Locate connector J10 on the system board (see "System Board" in topic 8.5 for connector location).
2. Move the jumper on J10 so that it connects the center pin and the pin on the opposite end of the connector.
3. Power-on the system.

The system detects the change and the password is erased from memory. Leave the jumper in that position until the next time you need to reset the password.

To reinstall a password, the user must start the system, select **Set features** from the Main Menu, and follow the instructions.

1.2 System Features

The major features of the system include:

- Processor board
- CMOS RAM and CMOS RAM Extension
- Initial Machine Load (IML)
- Power-On Self-Test (POST)
- Basic Input/Output System (BIOS)
- Graphics array (VGA and XGA)
- Serial ports (2)
- Parallel port
- Diskette-drive controller
- Keyboard connector
- Pointing-device connector.

Subtopics

- 1.2.1 Processor Board
- 1.2.2 CMOS RAM and CMOS RAM Extension
- 1.2.3 IML, POST, and BIOS
- 1.2.4 Graphics Array
- 1.2.5 Serial Ports
- 1.2.6 Parallel Port
- 1.2.7 Diskette-Drive Controller
- 1.2.8 Keyboard Connector and Pointing Device Connector

1.2.1 Processor Board

The processor board is connected to the system through two dedicated in-line system-board connectors. The major components on the processor board are the system microprocessor, the system clock, the direct memory access (DMA) controller, and the memory controller.

The system microprocessor is a 32-bit microprocessor that operates in the real-address mode or in the virtual-address (protected) mode.

The amount of memory supported and the clock speed vary with the type of processor board installed.

1.2.2 CMOS RAM and CMOS RAM Extension

The CMOS RAM provides 64 bytes of storage. Fifty 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 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 **Restore configuration** from the system programs stored on the default hard disk drive.
- If default configuration settings are used, run **Automatic configuration** from the system programs stored on the hard disk drive.

1.2.3 IML, POST, and BIOS

The Model 90 uses Initial Machine Load (IML) to store the power-on self-test (POST) and Basic Input/Output System (BIOS) code. With IML, some of the code is stored in ROM and is used for preliminary testing during power-on; but the balance of the POST and BIOS code, called the IML image, is stored in a protected partition on the default hard disk drive. This IML image is loaded onto the default hard disk drive at the time the system is manufactured.

At power-on, the first stage of POST is started from ROM. During this first stage, POST performs the following functions:

- Checks some basic system-board and processor-board functions
- Initializes the video function
- Checks the memory subsystem
- Verifies that the default hard disk drive is functioning
- Verifies that the IML image is copied in the protected partition of the default hard disk drive.

When the first stage of POST is complete, the IML image is loaded into RAM from the protected partition on the default drive. The second stage of POST is started from RAM. It performs additional tests of the hardware and initializes the system. When the second stage of POST is complete, system control is given to the operating system.

The partition also includes the system programs and the customer and advanced diagnostic programs. The partition is not affected when the drive is formatted using the operating system Format command.

Errors During POST: If the POST detects a problem, an eight-digit error code is displayed.

Replacing the Default Hard Disk Drive: If you replace the default hard disk drive, you must recopy all of the files onto the replacement hard disk drive. To recopy the files:

1. Start the system using the customer's *backup copy* of the current system partition.

Warning: This will write over all of the files in the system partition. Before you do this, you must either have a *complete current backup copy* of the system partition or all of the option diskettes so you can recopy the option files.

2. Select **Backup/Restore system programs** from the Main Menu.
3. Run **Restore System Partition** to load the IML image, the system programs, and the customer and advanced diagnostic programs onto the system partition.

Notes:

1. If the user's backup copy of the system partition is incomplete, you will not completely restore the system partition. If this is the case, after you have recopied the IML image get the option diskettes and use **Copy an option** to recopy the option files onto the partition.
2. If the IML image has been loaded onto the hard disk drive but the customer's operating system has not been loaded, the Insert Diskette icon will appear on the display.

For information on system programs, see the *Diagnostic Information for Micro Channel Computers* pamphlet.

1.2.4 Graphics Array

The graphics array is located on the system board and operates in two video modes:

1. VGA compatibility mode
2. XGA compatibility mode.

The system comes with at least four video-memory modules (512KB) installed. Four additional sockets are available for installing additional video-memory modules (maximum video memory is 1MB). When the system is powered-on, the graphics array is in the VGA mode. In this mode, all VGA alphanumeric text, and all-points-addressable (APA) graphics video modes are supported. The maximum resolution in VGA compatibility mode is 720-by-400 picture elements (PELS) in the text mode, and 640-by-480 PEELS in the graphics mode. A maximum of 256 colors or 64 shades of gray is supported in VGA mode. Composite video is not supported.

The graphics array is in the XGA mode only when enabled by the DOS Adapter Interface or video device driver (example: MS Windows, OS/2 Presentation Manager device drivers).

The XGA works with monochrome and color-analog direct-drive displays.

XGA supports the following:

System Board Video Memory	Resolution	Colors
Four video modules installed (512KB)	640 x 480 or 1024 x 768	256 16
Eight video modules installed (1MB)	640 x 480	256

The system board has a dedicated 32-bit expansion slot for video adapter cards. This slot (J3) includes the auxiliary video connector (AVC) and connects the VGA compatible video from the XGA (on the system board) to video adapters (example: IBM PS/2 Image Adapter/A - 1MB).

1.2.5 Serial Ports

The serial ports are fully programmable and support asynchronous communications. The 9-pin and 25-pin D-shell connectors provide the signals to drive devices with a standard RS-232 connector. The connected device is identified by the system configuration as SERIAL 1 through SERIAL 8. Conflicts occur when two or more devices have the same address. Select the **Set configuration** option from the system programs stored on the hard disk drive. 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 these devices, each addressed separately as PARALLEL 1, PARALLEL 2, PARALLEL 3, or PARALLEL 4.

Note: Conflicts occur when two or more devices have the same address. Select the **Set configuration** option from the system programs stored on the hard disk drive. Select **View configuration** to verify that no lines have the same address.

1.2.7 *Diskette-Drive Controller*

The diskette-drive controller is on the system board. The controller connects to the diskette drives through a 34-pin cable connector (the connector on the system board is a 40-pin cable-connector). Signals and voltages are supplied through the diskette-drive cable that plugs into the connector. These signals and voltages can operate a maximum of three devices.

1.2.8 Keyboard Connector and Pointing Device Connector

The two 6-pin connectors in the rear of the system board are for a keyboard and a pointing device (mouse). The keyboard connector is marked on the back panel of the system unit with a small keyboard. The pointing device connector is marked with a mouse symbol. The interface logic is the same for both and they are interchangeable.

1.3 System Memory

The figure below shows the location of the memory-module-kit connectors J4 to J1 on the memory-riser cards.

PICTURE 3

Two memory-riser cards plug into the system board; one in system-board slot J11 and one in J14. Each memory-riser card has four slots numbered J1 through J4, with J1 located at the bottom of the card. The system can support up to 64MB of memory on the memory-riser cards, but the amount of memory accessed may be limited by the operating system.

Memory Requirements and Limitations: Whenever memory is added or removed from the system, run **Set Configuration** from the Main Menu. If memory failed and then the customer runs customer diagnostics, the advanced diagnostics will not detect the failing memory. After defective memory is replaced, run the advanced diagnostic memory test or the system will not recognize the replacement memory.

The memory operates differently depending on which processor board is installed. Systems can be upgraded with a different processor board than the type indicated on the system serial number label. To verify which board is installed, you must start the system programs and select **Display Revision Levels** from the Main Menu. Make note of the submodel code displayed on the screen.

The following indicates the memory configurations supported and which system memory section to refer to.

Submodel Code	Interleaved Supported	Noninterleaved Supported	System Memory Type
11	Yes	No	Type 1
13	Yes	No	Type 1
2D	Yes	No	Type 1
2F	Yes	No	Type 1
2B	Yes	No	Type 1
57	Yes	Yes	Type 2
59	Yes	Yes	Type 2

Interleaved Memory: An interleaved-memory configuration requires matched pairs of memory-module kits (the size and the speed must be the same). The kits must be installed in the following order: (starting with the J11 memory-riser card) pair J1, J3 then pair J2, J4. and so forth. This technique of addressing memory in pairs enhances performance.

Noninterleaved Memory: A noninterleaved-memory configuration *does not* require matched pairs of memory-module kits (the size and speed does not have to be the same). Noninterleaved memory runs less efficiently than interleaved memory but will allow mixed sizes of memory to be used.

Type 1 systems support interleaved-memory configurations only.

Type 2 systems support interleaved, noninterleaved, or a combination of both configurations.

Memory Errors (Type 1 Systems): Some memory errors will cause a blank display screen. If the display screen is blank, a POST error code can't be displayed. The factory-installed 2MB kits (pair J1 and J3 on the memory-riser card in slot J11) are divided into two banks and are addressed as follows:

- The first 1MB bank of J1 and the first 1MB bank of J3 are the first block
- The second 1MB bank of J1 and the second 1MB bank of J3 are the second block.

Any other pairs of memory-module kits (for example J2, J4,) are addressed in the same way; however, the block size depends on the memory kits installed.

When any defective memory is detected in a bank, the entire block is disabled.

The following figure shows an example of how memory disabling (after a memory failure) varies depending on the memory configuration.

Paired Memory Kits		Memory Bank Size		Memory Block Disabled	Memory Now Usable
J1	J3	J1	J3		
1MB	1MB	1MB	1MB	2MB	0MB
2MB	2MB	1MB	1MB	2MB	2MB
4MB	4MB	4MB	4MB	8MB	0MB
8MB	8MB	4MB	4MB	8MB	8MB

Minimum memory-block size is 2MB for 1MB and 2MB memory-module kits and 8MB for larger memory-module kits.

Note: If a system with only two 1MB kits (one 2MB block) or two 4MB kits (one 8MB block) installed detects a memory problem, all system-board memory will be disabled. (These are not standard configurations and should be avoided.)

If the POST detects an error in the first block of system-board memory, that block is disabled. If additional system-board memory is installed, the addresses assigned to the deactivated blocks are reassigned to the next usable block of system-board memory and a POST error code is displayed.

If an additional block of system-board memory is installed, the customer-level diagnostic programs (on the default hard disk drive) can be run to deactivate the defective block and reassign the memory addresses. The system can then operate with reduced memory capacity. The defective block will then be ignored by POST during subsequent power-on operations.

If an additional block of system-board memory is *not* installed, no address reassignment can occur and the system can't be used.

Memory Errors (Type 2 Systems): Some memory errors will cause a blank display screen. If the display screen is blank, a POST error code can't be displayed.

If the memory is installed in an interleaved configuration, the system will operate as described under Memory (Type 1 systems); however, memory errors are handled differently. If an error occurs in an interleaved memory configuration, the pair of memory module kits containing the error will automatically be switched to noninterleaved operation to keep the maximum amount of memory active. Only the failing *bank* of memory will be disabled.

The following figure shows how the amount of memory that is disabled varies depending on the size of the memory-module kit installed.

Memory Module Kit installed	Memory Bank Size Disabled
2MB	1MB
4MB	4MB
8MB	4MB

Note: If a system with only one 1MB kit or one 4MB kit installed detects a memory failure, all system-board memory will be disabled. (These are not standard configurations and should be avoided.)

If the POST detects an error in the first bank of system-board memory, that bank is disabled. If additional system-board memory is installed, the addresses assigned to the deactivated banks are reassigned to the next usable bank of system-board memory and a POST error code is displayed.

If an additional bank of system-board memory is installed, the customer-level diagnostic programs (on the default hard disk drive) can be run to deactivate the defective bank and reassign the memory addresses. The system can then operate with reduced memory capacity. The defective bank will then be ignored by POST during subsequent power-on operations.

If additional system-board memory is not installed, no address reassignment can occur and the system can't be used.

2.0 Option Compatibility

The Model 90 can use some adapters that are designed for IBM Personal System/2 systems that use the Micro Channel architecture. For supported options, see the parts section in the *Hardware Maintenance Service* pamphlet for the system you are servicing.

The following types of adapters may plug into the three 32-bit system board expansion slots with the matched memory extension:

- 16-bit adapters
- 32-bit adapters without the matched memory extension
- 32-bit adapters with the matched memory extension.

The fourth 32-bit expansion slot, containing the auxiliary video extension, can support the following adapters:

- Primary display adapters
- 16-bit adapters
- 32-bit adapters without the matched memory extension.

Subtopics

2.1 Drive and Diskette Compatibility

2.2 Hard Disk Drive

2.3 Terminators

2.1 Drive and Diskette Compatibility

The following table 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

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

Note: You must only install drives designed for this system. Use of drives not designed for this system could cause intermittent problems.

2.2 Hard Disk Drive

The Model 90 comes with a Small Computer System Interface (SCSI) hard disk drive and a SCSI adapter. Up to three SCSI devices can be installed inside the system. The default hard disk drive has the IML image preloaded in a protected partition. (For information about the IML image, see "IML, POST, and BIOS" in topic 1.2.3.) For supported hard disk drives, see the parts section in the *Hardware Maintenance Service* pamphlet for the system you are servicing.

The Model 90 XP 486 uses hard disk drives that automatically position and lock the read/write heads in nondata areas when the system is powered-off.

2.3 Terminators

Terminator requirements are:

- Diskette Drives: do not require terminators.
- Hard Disk Drives and other storage devices:
 - The last device in any SCSI chain must have the terminator installed. (Some devices may have more than one terminator.)
 - All other SCSI devices must have the terminators removed.
- SCSI Adapter: Terminator requirements for the SCSI adapter vary depending on the configuration of the system and the type of card.

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

Note: For additional information see "SCSI Devices" in the "Options and Adapters" 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 are met.

Subtopics

3.1 Power Supply

3.1 Power Supply

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

When the system is powered-off for 8 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 turns on the green power-on light on the front of the system indicating that the power supply is functioning correctly.

4.0 Reference Diskette

There are two types of Model 90 Reference Diskettes. The type of processor board installed in the system determines which Reference Diskette is required.

Note: For more information, see "Processor Board and Reference Diskette Matrix" in the *Hardware Maintenance Service* pamphlet

Subtopics

- 4.1 Installing a New Version of the Reference Diskette
- 4.2 Making a Backup Copy of The System Partition
- 4.3 Diagnostic Programs and Information

4.1 Installing a New Version of the Reference Diskette

Note: When you install the new Reference Diskette onto the hard disk, it writes over all the files (including option files) in the system partition. After completing the installation process, you must recopy the option files.

There are two ways to recopy the option files:

- From a backup copy of the current system partition (the easiest way to recopy the option files)
- From the original option diskettes.

If you have a backup copy of the current system partition, continue with the next step. If you *do not* have a backup copy, go to "Making a Backup Copy of The System Partition" in topic 4.2 and then return here.

1. Insert the new version of the Reference Diskette into the default diskette drive and power-on the system.

Warning: Before continuing, you *must* have either a backup copy of the current system partition or all the option diskettes so you can recopy the option files.

2. Go to the Main Menu of the Reference Diskette and select **Backup/Restore system programs**, then select **Restore the System Partition** and follow the instructions on the screen. This transfers all files, programs and the IML image from the new Reference Diskette onto the system partition.
3. When the Main Menu appears again, remove the Reference Diskette from the drive and power-off the system.
4. Wait five seconds and power-on the system.
5. When the POST finishes, press Ctrl+Alt+Del. When the cursor moves to the top-right corner of the screen, press Ctrl+Alt+Ins.
6. If you have a backup copy of the system partition, continue with step 7. If you *do not* have a backup copy of the system partition, but you have the option diskettes, go to step 8.
7. Select **Copy an option diskette** from the Main Menu. When the

Insert your option diskette

message appears, insert the backup copy of the system partition and follow the instructions on the screen. (The backup copy of the system partition is used to recopy the option files onto the system partition.)

Go to step 9.

8. When the Main Menu appears, select **Copy an option diskette** and follow the instructions on the screen. Repeat the procedure with each option diskette until you have copied all the option diskettes.
9. If your configuration is customized, continue with step 10. If not, go to step 11. (If you are not sure if the configuration is customized, continue with step 10.)

Warning: Do not run Automatic Configuration because the customized configuration will be overwritten.

10. Go to the Main Menu and select **Set configuration**. Then select **Set and view SCSI device configuration**. Press F3 to restore the customized configuration onto the system partition and exit from the program.
11. You are finished with the updating process. Make a new backup copy of the system partition. (For information on making a backup copy, see "Making a Backup Copy of The System Partition" in topic 4.2.)

4.2 Making a Backup Copy of The System Partition

Note: You will need a blank 2.0MB diskette (or the old backup copy of the system partition).

1. Power-on the system.
2. When the POST finishes, press Ctrl+Alt+Del. When the cursor moves to the top-right corner of the screen, press Ctrl+Alt+Ins.
3. When the Main Menu appears, select **Backup/Restore system programs**. Then select **Backup the System Partition**.
4. Insert a blank 2.0MB diskette into the default diskette drive and follow the instructions on the screen.

Note: If you receive a message indicating that the diskette is full, it means that the option files combined with the system programs on the system partition will not fit on a single 2.0MB diskette. In this case, you will not be able to make a backup copy of the system partition. Use the new Reference Diskette and the original option diskettes as a backup of these files.

5. When the copy is complete, remove the diskette from the drive and label the diskette "Backup Copy - System Partition."

4.3 Diagnostic Programs and Information

See the *Diagnostic Information for Micro Channel Computers* pamphlet for information on the following:

- System Programs
- Selectable Startup Function
- POST
- Advanced Diagnostic Programs
 - Presence Test
 - Installed Devices List
 - System Checkout
 - Error Log
 - Formatting.

5.0 Specifications

Size

- Width: 440 mm (17.3 in.)
- Depth: 430 mm (16.9 in.)
- Height: 140 mm (5.5 in.).

Weight

- Minimum configuration: 12 kg (26 lb)
- Maximum configuration: 15 kg (33 lb).

Environment

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

Heat Output

1023 British Thermal Units (BTUs) per hour (300 watts).

Electrical

- Input voltage (sinewave input is required)
 - Low Range:
 - Minimum: 90 V ac
 - Maximum: 137 V ac.
 - High Range:
 - Minimum: 180 V ac
 - Maximum: 265 V ac.
- Input kilovolt-amperes (kVA)
 - Minimum Configuration (as shipped from IBM): Approximately 0.15 kVA
 - Maximum Configuration: Approximately 0.48 kVA.

6.0 Special Tools

The following special tools are required to service the system:

Volt-Ohm Meter

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

Wrap Plug

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

PICTURE 4

Video-Memory Installation Tool

The video memory insertion tool is used to install the video memory modules on the system board. See "Video Memory" on page 7.14 for information on how to install video memory.

PICTURE 5

Video-Memory Removal Tool

The video-memory removal tool is used to remove the video-memory modules from the system board.

PICTURE 6

Hard-Disk-Drive Removal Tool

The hard-disk-drive removal tool is used to remove a hard disk drive from the system unit and is attached to the frame of the system unit.

PICTURE 7

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

7.0 Removals and Replacements

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. 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 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 processor 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.

Subtopics

- 7.1 1005 Cover
- 7.2 1010 Cover Lock
- 7.3 1015 Fan / Air Baffle
- 7.4 1020 Power Switch / Speaker Assembly
- 7.5 1025 Diskette Drive
- 7.6 1030 Hard Disk Drive
- 7.7 1035 Adapters
- 7.8 1040 487SX Processor (extended math capability)
- 7.9 1045 Memory-Riser-Card Bracket
- 7.10 1050 Memory-Riser Card
- 7.11 1055 Power Supply
- 7.12 1060 Battery
- 7.13 1065 System Board
- 7.14 1070 Video Memory

PICTURE 8

7.2 1010 Cover Lock

□ Cover (1005)

PICTURE 9

7.3 1015 Fan / Air Baffle

- Cover (1005)
- Disconnect any cables necessary for removal.

PICTURE 10

7.4 1020 Power Switch / Speaker Assembly

- Cover (1005)
- Disconnect any cables necessary for removal.

PICTURE 11

7.5 1025 Diskette Drive

- Cover (1005)
- Disconnect any cables necessary for removal.

Warning: When you reinstall the drive, you *must* reinstall the clip on the diskette-drive cable.

Note: Drives not designed for the Model 90 might cause intermittent problems.

PICTURE 12

7.6 1030 Hard Disk Drive

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

- Cover (1005)
- Disconnect any cables necessary for removal.

Notes:

1. The last drive in the chain requires a terminator.
2. See "Internal Cables," on page 8.4 for cable information.
3. Load the IML image onto the replacement default drive. For more information, see "IML, POST, and BIOS" in topic 1.2.3.

PICTURE 13

7.7 1035 Adapters

Note: When replacing the processor board, be sure to push the levers in toward the expansion slot until they lock into place.

- Cover (1005)
- Disconnect any cables necessary for removal.

Note: Before replacing an adapter or processor board, note the slot location. Install the replacement FRU into the same slot.

Stored configuration information depends on the location of the adapter. If you must install the replacement adapter in a different location, run the set configuration program from the hard disk drive to reset the system-configuration information.

PICTURE 14

7.8 1040 487SX Processor (extended math capability)

- Cover (1005)
- Disconnect any cables necessary for removal.

Carefully insert the tip of a screwdriver between the processor and the connector edge and *gently* twist the screwdriver (around all edges) until the processor raises up.

When you reinstall the processor, align the beveled corner 1 with the beveled corner marked on the board.

PICTURE 15

On the 20-MHz board (left), the jumper 2 must be in positions 1 and 2 if a 487SX processor is installed.

Note: A slight gap between the processor and the connector is normal.

7.9 1045 Memory-Riser-Card Bracket

- Cover (1005)
- Disconnect any cables necessary for removal.

PICTURE 16

7.10 1050 Memory-Riser Card

Warning: The memory-riser cards are sensitive to static discharge. Maintain personal grounding by touching a ground point with one hand before handling this FRU.

Note: When you add or remove memory, run the set configuration program from the hard disk drive.

- Cover (1005)
- Memory-riser-card bracket (1045).
- Disconnect any cables necessary for removal.

PICTURE 17

7.11 1055 Power Supply

- Cover (1005)
- Memory-riser-card bracket (1045)
- Disconnect any cables necessary for removal.

PICTURE 18

7.12 1060 Battery

- Cover (1005)
- Air baffle (1015)
- Adapters (1035) (from system-board slots J1, J3, J4, and J6).
- Disconnect any cables necessary for removal.

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. When replacing the battery, use only Part No. 33F8354. 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: The battery is located on the system board. Be careful when removing or replacing the battery. If the battery clip is broken the system board must be replaced.

Note: After you replace the battery, run the set configuration program from the hard disk drive.

PICTURE 19

7.13 1065 System Board

- Cover (1005)
- Adapters (1035)
- Air baffle (1015)
- Memory-riser-card bracket (1045)
- Memory-riser cards (1050)
- Power supply (1055)
- Hard disk drives (1030).
- Disconnect any cables necessary for removal.

Note: When a new system board is installed, run the restore configuration program from the hard disk drive to restore time, date, and any unique configuration data. Reset the start-up sequence.

PICTURE 20

7.14 1070 Video Memory

Note: See "System Board" in topic 8.5 for the location of the video memory on the system board.

To replace video memory do the following:

1. Place the video-memory installation tool 1 (supplied with the video-memory kit) over the video-memory socket.
2. With the beveled corner 2 facing the rear of the system, carefully align the pins of the memory module with the openings in the socket and *firmly* snap the module into place.

PICTURE 21

To remove video memory, pull straight up on the module with the video-memory removal tool.

8.0 Locations

Subtopics

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

8.1 Front View

- 1 Power switch
- 2 Hard-disk-drive in-use light
- 3 Power-good light
- 4 Diskette drive in-use light
- 5 Diskette drive (Bay A)
- 6 Diskette-eject button
- 7 Bay B
- 8 Serial number
- 9 Bay D
- 10 Bay C.

PICTURE 22

8.2 Rear View

- 1 Keyboard connector
- 2 Power-cord connector
- 3 Pointing-device connector
- 4 Parallel port
- 5 Serial port (9-pin)
- 6 Cover lock
- 7 Serial port (25-pin)
- 8 Video port
- 9 Expansion slots
- 10 SCSI Terminator
- 11 Cover screws.

PICTURE 23

8.3 Interior View

- 1 Diskette-drive-cable connector
- 2 Processor board
- 3 Expansion-slot covers
- 4 Memory-riser-card bracket
- 5 Hard-disk-drive-removal tool
- 6 Power supply
- 7 Power supply/system board cable-connector (P2)
- 8 Power supply/system board cable-connector (P1)
- 9 Power supply cable-connectors (P3 and P4)
- 10 SCSI-internal cable
- 11 Memory-riser card
- 12 Bay B
- 13 Bay D
- 14 Bay C
- 15 Bay A
- 16 Memory-riser card
- 17 Power switch/speaker assembly
- 18 Cooling fan
- 19 SCSI adapter.

PICTURE 24

8.4 Internal Cables

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

- 1 Power supply
- 2 Power supply cables
- 3 SCSI-internal cable
- 4 Hard-disk-drive power cable
- 5 Hard disk drive
- 6 Diskette drive
- 7 Diskette-drive cable
- 8 Fan cable
- 9 Power switch/speaker cable.
- 10 SCSI adapter

PICTURE 25

8.5 System Board

- 1 Power switch/speaker assembly (J2)
- 2 Battery (BT1)
- 3 SCSI adapter slot (J1)
- 4 Adapter slots (J1, J3, J4, and J6)
- 5 Processor-board slot (J8)
- 6 Memory-riser-card slot (J11)
- 7 Memory-riser-card slot (J14)
- 8 Video-memory connectors
- 9 Diskette-drive-cable connector (J15)
- 10 Power-supply connector (J25)
- 11 Power-supply connector (J26)
- 12 Power-on password connector (J10)
- 13 Fan connector (J5).

PICTURE 26

8.6 Processor Board

Use the following information to locate the connectors and jumpers on the various processor boards, and to identify the purpose of those connectors and jumpers.

Note: The locations may vary slightly.

1 Processor connector (all boards).

2 Option Processor connector (25-MHz boards without Cache) is for a 487SX processor with math capability.

3 Jumper (20-boards MHz). If a 487SX processor (labeled 487SX) is installed, the jumper must be in positions 1 and 2. If a 487SX processor is *not* installed, the jumper must be in positions 2 and 3.

Note: On the 20-MHz board, if a 487SX processor is installed, it is in connector 1.

4 Cache connector (all boards that support Cache).

PICTURE 27

9.0 Grounds

- 1 Screws
- 2 Expansion-slot screws
- 3 Chassis ground
- 4 Safety ground.

PICTURE 28