

FRONT

PICTURE 1

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1.0 Product Description (Model 90 XP 486)

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 a cache option) (with extended math capability)
 - 80486 25-MHz
 - 80486 33-MHz
 - 80486 50-MHz
 - Processor board (without a connector for a cache option)
 - 80486SX 20-MHz (without extended math capability)
 - 80487SX 20-MHz (with extended math capability)
 - 80486SX 25-MHz (without extended math capability) (with a second socket for an option processor)
 - 80486DX2 25/50 25-MHz (with extended math capability) (runs internally at 50-MHz)
 - 80486 50-MHz (with extended math capability and cache)
 - 64 byte complementary metal-oxide semiconductor (CMOS) random access memory (RAM) with real-time clock and 8KB (KB equals approximately 1 000 bytes) CMOS RAM extension
 - Two memory-riser cards: one card shipped blank and one card shipped with a minimum of 4MB (MB equals approximately 1 000 000 bytes) of random access memory (RAM). (64MB total system memory capacity.) Minimum required memory is 2MB.
 - Video
 - 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 port connectors
 - Parallel port connector
 - Diskette-drive controller
 - Battery (to keep CMOS RAM active when power is off)
 - Keyboard connector
 - Pointing-device connector
- Initial Machine Load (IML) support
- 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
- 101/102/122-key keyboard
- Small Computer System Interface (SCSI) adapter with internal and external connectors (occupies one of the four expansion slots)
- SCSI fixed disk drive (hard disk drive)
- Diskette drive.

(*) Trademark of the International Business Machines Corporation.

2.0 Product Description (Model 95 XP 486)

The IBM (*) Personal System/2 (*) Model 95 XP 486 computers use the IBM Micro Channel (*) architecture. The features of the various types of the Model 95 are:

- Security
 - Cover lock
 - Power-on password
- System board
 - Processor board (with a connector for a cache option) (with extended math capability)
 - 80486 25-MHz
 - 80486 33-MHz
 - 80486 50-MHz
 - 80486DX2 33/66 33-MHz (runs internally at 66-MHz)
 - Processor board (without a connector for a cache option)
 - 80486SX 20-MHz (without extended math capability)
 - 80487SX 20-MHz (with extended math capability)
 - 80486SX 25-MHz (without extended math capability) (with a second socket for an option processor)
 - 80486DX2 25/50 25-MHz (with extended math capability) (runs internally at 50-MHz)
 - 80486 50-MHz (with extended math capability and cache)
 - 64 byte complementary metal-oxide semiconductor (CMOS) random access memory (RAM) with real-time clock and 8KB (KB equals approximately 1000 bytes) CMOS RAM extension.
 - Shipped with a minimum of 4MB (MB equals approximately 1 000 000 bytes) of random access memory (RAM). (64MB total system memory capacity.) Minimum required memory is 2MB.
 - Video
 - Extended graphics array (XGA (*)) with 512KB expandable to 1MB (occupies one of the eight expansion slots)
 - Video graphics array (VGA) compatible
 - Eight 32-bit expansion slots
 - Six 32-bit expansion slots with matched-memory extension
 - One 32-bit expansion slot with auxiliary-video extension
 - One 32-bit expansion slot with base-video extension
 - Serial-port connector
 - Parallel-port connector
 - Diskette-drive controller
 - Battery (to keep CMOS RAM active when power is off)
 - Keyboard connector
 - Pointing-device connector
- Initial Machine Load (IML) support
- Power supply
 - Switchable to the 100-125 V ac or the 200-240 V ac range
 - 50 or 60 Hz
- Speaker
- Information panel
- Small Computer System Interface (SCSI) adapter with internal and external connectors (occupies one of the eight expansion slots)
- 101/102/122-key keyboard
- SCSI fixed disk drive (hard disk drive)
- Diskette drive.

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Subtopics

- 2.1 Security
- 2.2 Override Jumper
- 2.3 System Features
- 2.4 System Memory
- 2.5 Resolving Memory-Address Conflicts
- 2.6 Selectable Drive-Startup Sequence

2.1 Security

Subtopics

2.1.1 Cover Lock

2.1.2 Bolt-down Capability (Model 90)

2.1.3 Power-on Password

2.1.1 Cover Lock

Model 90: the cover lock is in the middle of the rear panel of the system unit. The cover cannot be removed without the cover-lock key.

Model 95: the cover lock is on the front panel of the system unit. The front bezel and side cover cannot be removed without the user's key.

If the keys for the cover lock are lost, order a new cover-lock assembly (see "Parts" in the *Hardware Maintenance Service* pamphlet).

2.1.2 Bolt-down Capability (Model 90)

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

PICTURE 2

2.1.3 Power-on Password

A power-on password denies access to the system by an unauthorized user when the system is powered-on. If 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. Access to the system occurs when the proper password is entered.

Note: In the Unattended Start Mode, the power-on password prompt does not appear on the screen.

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

1. Locate connector J10 (Model 90) or J16 (Model 95) on the system board.
2. Move the override 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 programs, select **Set features** from the Main Menu, and follow the instructions.

2.2 Override Jumper

The override jumper J10 (Model 90) or J16 (Model 95) on the system board is most often used to erase a power-on password. However, the same jumper also has multiple purposes. If you move the jumper *with the system powered-off*, then power-on the system, it has the following effects on the system:

Power-on Password: If the system has a power-on password, that password is erased the first time the system is powered-on (after moving the jumper).

Unattended Start Mode (server mode): If the Unattended Start Mode is activated, then you power-off the system, move the jumper, then power-on the system, the system bypasses that mode. After the first power-on, the Unattended Start Mode is restored. (Power-on password is required to run in the Unattended Start Mode).

Initial Program Load (IPL): If the startup sequence is customized via the Selectable startup sequence utility, then you power-off the system, move the jumper, then power-on the system, the system bypasses the customized settings and starts with the default settings. After the first power-on, the customized startup settings are restored.

Initial Machine Load (IML): The system loads the IML from the System Partition by default. If the Reference Diskette is in the diskette drive, then you move the jumper, then power on the system, the system default is bypassed and the system loads the IML image from the Reference Diskette. After the first power-on, the system loads the IML from the System Partition.

To activate the override feature, move the override jumper so that it connects the center pin and the pin on the opposite end of the connector. The next time you power-on the system, the override is activated (for that one power-up). Leave the override jumper in that position until the next time you need to use the override feature.

2.3 System Features

The major features of the system are:

- Processor board
- CMOS RAM
- Initial Machine Load (IML)
- Basic Input/Output System (BIOS)
- Power-on Self-Test (POST)
- Video (VGA and XGA) adapter
- Serial-port connector
- Parallel-port connector
- Diskette-drive controller
- Keyboard connector
- Pointing-device connector.

Subtopics

- 2.3.1 Processor Boards
- 2.3.2 CMOS RAM and CMOS RAM Extension
- 2.3.3 IML, POST, and BIOS
- 2.3.4 Video
- 2.3.5 Serial Ports
- 2.3.6 Parallel Port
- 2.3.7 Diskette-Drive Controller
- 2.3.8 Keyboard Connector and Pointing-Device Connector

2.3.1 Processor Boards

The functions of the system can be significantly changed depending on which processor board is installed.

All processor boards plug into the system board through two dedicated in-line connectors. The major components on the processor board are:

- System microprocessor
- System clock
- Direct memory access (DMA) controller
- Memory controller.

Note: Some processor boards have a connector for an optional 256KB cache.

The processor boards fall into one of three types (type 1, 2 or 3) depending on the following:

- Type of DMA controller installed (16 or 32-bit)
- Type of memory error detection supported (ECC or parity)
- Type of memory configurations supported (interleaved or noninterleaved).

For more information, see "System Memory" in topic 2.4.

The microprocessors used are 32-bit. They operate in the real-address or virtual-address (protected) mode. The amount of memory supported and the clock speed varies within each type of processor board.

2.3.2 CMOS RAM and CMOS RAM Extension

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. An 8KB 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, you can restore the data by 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.

2.3.3 IML, POST, and BIOS

The systems use 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. The balance of the POST and BIOS code, called the IML image, is stored in a protected partition on the default hard disk drive. The IML image is loaded onto the default hard disk drive when the system is manufactured.

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

- Checks the 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 default diskette drive is functioning
- Verifies that the IML image is installed in the protected partition of the hard disk drive.

When the first stage of POST is complete, the IML image is loaded into RAM from the System Partition on the default drive, *even if the Reference Diskette is in the diskette drive*. The only time the system attempts to load the IML image from the Reference Diskette is if any of the following conditions exist:

- An error occurred reading the System Partition
- A hardware failure occurred
- The override jumper was moved (prior to power-up).

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 POST detects a problem, an eight-digit error code is displayed.

Note: On the *Model 95*, during POST the system displays the letters CP on the information panel, followed by a two-digit code. The code changes as the system progresses through POST. The "CP" codes indicate system status. They do not mean that a failure has occurred. For more information, see "Check Point Codes" in the *Hardware Maintenance Service* pamphlet.

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

1. Start the system using the customer's *backup copy* of the current System Partition.
2. Select **Backup/Restore system programs** from the Main Menu.
3. Run the **Restore the System Partition** option to load the IML image, the system programs, and the customer and advanced diagnostic programs onto the default hard disk drive.

Notes:

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

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

2.3.4 Video

On the Model 90, the video subsystem is on the system board. On the Model 95, the video subsystem is on the XGA Display Adapter/A. The video subsystem operates in two video modes:

1. VGA compatibility mode
2. XGA compatibility mode.

The adapter comes with 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 alpha-numeric 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 PELs in the graphics mode. A maximum of 256 colors or 64 shades of gray are 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 (*), and Presentation Manager (*) device drivers).

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

XGA supports the following:

Video Memory	Resolution	Colors
Four video-memory modules (512KB)	640 x 480 or 1024 x 768	256 16
Eight video-memory modules (1MB)	640 x 480 or 1024 x 768	65536 256

(*) Trademark of the International Business Machines Corporation.

(**) Trademark of the Microsoft Corporation.

2.3.5 Serial Ports

The serial ports are fully programmable and support 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 SERIAL 1 through SERIAL 8. Adapters with serial ports also can be configured from SERIAL 1 to SERIAL 8. Conflicts occur with multiple communication lines if two or more lines have the same address. Select the **Set configuration** option from the system programs on the hard disk drive. Select **View Configuration** to verify that no lines are addressed the same.

2.3.6 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 supports four devices, each addressed separately as PARALLEL 1, PARALLEL 2, PARALLEL 3 or PARALLEL 4. Conflicts occur when using multiple devices if two or more devices are addressed the same. Select the **Set configuration** option from the system programs on the hard disk drive. Select **View configuration** to verify that no lines are addressed the same.

Note: If a conflict occurs, an asterisk appears next to the conflicting address.

2.3.7 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. On the *Model 90*, these signals and voltages can operate a maximum of three devices (one can be a 5.25-inch device). On the *Model 95*, these signals and voltages also can operate a maximum of three devices (one can be a 5.25-inch device).

2.3.8 Keyboard Connector and Pointing-Device Connector

The two 6-pin connectors on 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 keyboard symbol. The pointing device connector is marked with a mouse symbol. The interface logic is the same for both and they are interchangeable.

2.4 System Memory

The figure below shows the location of the *Model 90* four memory-module-kit connectors J4 to J1 on the memory-riser cards. The riser cards plug into system-board connectors J11 and J14.

PICTURE 3

The system supports up to 64MB of memory, but the amount of memory accessed may be limited by the operating system.

The figure below shows the location of the *Model 95* memory-module-kit connectors B1 to A4 on the system board.

PICTURE 4

The system board has eight connectors for system-board memory-module kits. The system supports up to 64MB of memory on the system board, but the amount of memory accessed may be limited by the operating system.

Subtopics

- 2.4.1 Memory Requirements and Limitations
- 2.4.2 Types of Memory Configurations
- 2.4.3 Types of Error Detection
- 2.4.4 Memory Errors

2.4.1 Memory Requirements and Limitations

Whenever memory is added or removed from the system, run **Automatic configuration** from the Main Menu of the system programs.

Note: If memory fails, and the customer runs diagnostics, the defective memory is disabled. When you run diagnostics, the system will indicate the amount of memory that is enabled.

After the defective memory is replaced, run the advanced diagnostic memory test to enable the *replacement* memory.

Memory operation varies 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, go to the Main Menu and select **Display revision levels** (on some models, you must select **More utilities** first). Make note of the *submodel* code displayed on the screen.

The following table converts the *submodel code* to the type of error detection, memory configuration, and processor board installed.

Model 90 Sub- model Code	Model 95 Sub- model Code	Memory (Interleaved) (Non- interleaved) or (Both)	Error Detection (Parity) (ECC) or (Both)	Processor Board Type Installed
2F	2E	Interleaved	Parity	Type 1
11	14	Interleaved	Parity	Type 1
13	16	Interleaved	Parity	Type 1
2B	2A	Interleaved	Parity	Type 1
2D	2C	Interleaved	Parity	Type 1
57	58	Both	Parity	Type 2
59	5A	Both	Parity	Type 2
5B	5C	Both	Parity	Type 2
3F	40	Both	Parity	Type 2
29	28	Interleaved	Both	Type 3

2.4.2 Types of Memory Configurations

- *Interleaved* configurations require matched pairs of memory-module kits (the size and the speed must be the same). The kits must be installed in the following order: pair J1 & J3 (*Model 90*) or A1 & B1 (*Model 95*), then pair J2 & J4 (*Model 90*) or A2 & B2 (*Model 95*), and so forth. This technique of addressing memory in pairs enhances performance.
- *Noninterleaved* configurations do 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 function with mixed sizes of memory.

2.4.3 Types of Error Detection

The systems use *either* parity or Error Correction Code (ECC) to detect memory errors (*but not a combination of both*).

- Memory that uses *parity* can detect (but not correct) memory errors. If an error occurs during POST, an error code is displayed. If an error occurs after POST, the system halts.
- Memory that uses *ECC* can detect and *correct* memory errors. If an error occurs during or after POST, the error is corrected without interfering with the system operation. This error-correcting capability will result in fewer memory-related service calls.

2.4.4 Memory Errors

Type 1 Processor Boards: Systems with a type 1 processor board support only interleaved memory configurations. Only parity memory-module kits (70ns, 80ns, and 85ns) are supported.

Some memory errors will cause a blank display screen. If the display screen is blank, a POST error code cannot be displayed.

- The first 1MB bank of J1 (Model 90) or A1 (Model 95) and the first 1MB bank of J3 (Model 90) or B1 (Model 95) are the first block.
- The second 1MB bank of J1 or A1 and the second 1MB bank of J3 or B1 are the second block.

Any other pairs of memory-module kits, 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		
A1	B1	A1	B1		
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 failure, the system memory diagnostic might not be able to reconfigure the system to remove the failing memory.

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

Type 2 Processor Boards: Systems with a type 2 processor board support interleaved, noninterleaved, or a combination of both memory configurations. Only parity memory-module kits (70ns and 80ns) are supported.

Some memory errors will cause a blank display screen. If the display screen is blank, a POST error code cannot be displayed.

If the memory is installed in an interleaved configuration, the system will operate as described under Type 1 Processor Boards; 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

Memory Errors

2MB	1MB
4MB	4MB
8MB	4MB

Note: If a system with only one 2MB kit or one 4MB kit installed detects a memory failure, the system memory diagnostic cannot reconfigure the system to disable the failing memory. (These are not standard configurations and should be avoided.)

If 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 cannot be used.

Type 3 Processor Boards: Systems with a type 3 processor board support interleaved memory configurations. Parity (70ns, 80ns, and 85ns) or ECC (70ns) memory-module kits are supported, but not a combination of both.

If the system has *parity* memory installed, the system will operate as described under Memory (Type 1 Processor Boards). Some memory errors will cause a blank screen. If the display screen is blank, a POST error code cannot be displayed.

If the system has *ECC* memory installed, the system will display POST errors *only* if the errors are not correctable. When a correctable memory error occurs, the error will be corrected and the system will continue to operate without interruption.

Note: If a system with only two 1MB kits (one 2MB block) or two 4MB kits (one 8MB block) installed detects a memory failure, the system memory diagnostics cannot reconfigure the system to remove the failing memory. (This is not a standard configuration and should be avoided.)

2.5 Resolving Memory-Address Conflicts

The automatic configuration program might change the memory-address space used by some hardware and software options. The new address might conflict with addresses defined for use through the expanded memory specification (EMS). (EMS memory is used only in the DOS environment.)

If a memory conflict exists, one or more of the following could occur:

- The system cannot load the operating system.
- The system is disabled.
- An application does not operate or it returns an error.
- Screen messages indicate that a memory-address conflict exists.

You can resolve these conflicts in one of the following ways:

- Change the software configuration (primary method).
- Change the system configuration (alternative method).

Subtopics

2.5.1 Changing the Software Configuration

2.5.2 Changing the System Configuration

2.5.1 Changing the Software Configuration

The best method of resolving memory-address conflicts is to change the software configuration by changing the addresses defined by the EMS driver.

For conflicts caused by XMA2EMS (DOS 4.0) or EMM386 (DOS 5.0) in the CONFIG.SYS file, refer to the DOS documentation. For conflicts caused by an expanded-memory manager other than the one supplied with DOS, refer to the memory manager documentation.

Note: To view the addresses used by the installed hardware and software options, go to the Main Menu, select **Set configuration** then select **Display memory map**.

2.5.2 Changing the System Configuration

An alternate method of resolving memory-address conflicts is to change the address of the conflicting hardware option by using **Change configuration** from the **Set configuration** program. Before changing adapter addresses, identify the addresses used by the EMS driver. Then set the adapter to addresses that do not conflict.

Note: These conflicts can occur because the automatic configuration program sets up only the hardware. It does not consider the operating system or application requirements. If you run automatic configuration after changing an address, the addresses you changed will be set back to their default values.

2.6 Selectable Drive-Startup Sequence

The selectable drive-startup sequence allows the user to control the startup sequence of the drives in the system. Each time the system is powered-on, it checks the drives as it looks for the operating system. The order in which the system checks the drives is the *drive-startup sequence*.

In most cases, there is no need to change the *default* drive-startup sequence. However, if the user is working with multiple hard disk drives, multiple operating systems, different size diskette drives, or they are planning to do remote initial program load (RIPL) from a drive in a network server, they might want to change the drive-startup sequence.

The default sequence checks the primary diskette drive for a startable diskette. If one is present, the operating system or program is loaded from the diskette. If not, the system checks the primary hard disk for an operating system. If one is present, the operating system is loaded from that hard disk drive. If not, the system displays the diskette and F1 prompts.

If the system is started from a diskette, the drive containing the diskette becomes drive A, regardless of the defined sequence. The user can choose the startup order of up to four drives, and also *customize* the startup sequence by changing the order in which the system checks the drives. By making this change, the user decides which four drives are the first drives to be checked, and also the order in which the system checks them. When the startup sequence is changed, the drive letters might also be changed. The operating system assigns the drive letters when the system starts. The assignment of the subsequent drive names will vary with the operating system or the device drivers used.

Warning: If startup sequence is changed, you must be extremely careful when you do write operations (such as copying, saving, or formatting). The customer's data or programs can be overwritten if you select the wrong drive.

To change the startup sequence, do the following:

1. Start the system programs from the hard disk.
2. Select **Set features** from the Main Menu.
3. Select **Set startup sequence** and follow the instructions on the screen.

Subtopics

2.6.1 Example: Default Startup Sequence

2.6.2 Example: Changing the Startup Sequence

2.6.1 Example: Default Startup Sequence

The example below shows the default startup sequence for the system.

Startup Number	Device
1.....	[2.88MB 3.5-inch Diskette Drive 0]
2.....	[SCSI hard disk slot 1 (ID, LUN)...:6,0]
3.....	[Not selected]
4.....	[Not selected]

Note: The number of selections and device types you see on this screen varies with the number of devices installed and the model of the system.

2.6.2 Example: Changing the Startup Sequence

Assume the following drives are installed in the system:

- Diskette Drives
 - 3.5-inch diskette drive (primary diskette drive)
 - 3.5-inch diskette drive (second diskette drive)
 - 5.25-inch diskette drive (third diskette drive)

- Hard Disk Drives
 - 400MB hard disk drive (primary hard disk drive) divided into two 200MB partitions.

If you want to start the system from a 3.5-inch diskette, a 5.25-inch diskette, or the hard disk drive, you can define the startup sequence as follows:

Startup Number	Device
1.....	[2.88MB 3.5-inch Diskette Drive 0]
2.....	[1.2MB 5.25-inch Diskette Drive 2]
3.....	[SCSI hard disk slot 1 (ID, LUN)...:6,0]
4.....	[Not selected]

In this example, the system looks for a startable diskette in the primary 3.5-inch diskette drive, and then looks for a startable diskette in the 5.25-inch diskette drive. If there is not a startable diskette in either drive, the system loads the operating system from the System Partition on the hard disk drive.

3.0 Option Compatibility

The systems support many of the 16-bit and 32-bit adapters that are designed for IBM Personal System/2 Micro Channel architecture computers.

On the *Model 90*, most adapters can be plugged into any of the four expansion slots. The exceptions are adapters that have:

- Matched-memory extension (cannot be installed in slot 3)
- Base-video extension (cannot be installed in slot 3)
- Auxiliary-video extension (*must* be installed in slot 3)

On the *Model 95*, most adapters can be plugged into any of the eight expansion slots. The exceptions are adapters that have:

- Matched-memory extension (cannot be installed in slot 7)
- Base-video extension (cannot be installed in slot 7)
- Auxiliary-video extension (*must* be installed in slot 7)

Notes:

1. The factory-installed SCSI adapter is in slot 1 (Model 90/95).
2. The factory-installed video adapter is in slot 5 (Model 95).

For supported options, see the parts section in the *Hardware Maintenance Service* pamphlet.

Subtopics

- 3.1 Drive and Diskette Compatibility
- 3.2 SCSI Hard Disk Drives and Devices
- 3.3 SCSI ID Numbers
- 3.4 Terminators

3.1 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
3.5-Inch 2.88MB	2.88 on the Eject Button

The following addresses the compatibility of diskettes to diskette drives.

Diskette Capacity	720KB Drive	1.44MB Drive	2.88MB Drive
1.0MB	Read/Write	Read/Write	Read/Write
2.0MB	Not Compatible	Read/Write	Read/Write
4.0MB	Not Compatible	Not Compatible	Read/Write

Notes:

1. On some early type 1 systems, the system board will not support the 2.88MB diskette drive.
2. Install drives designed only for this system. Use of drives not designed for this system might cause intermittent problems.

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

3.2 *SCSI Hard Disk Drives and Devices*

The systems are shipped with at least one Small Computer System Interface (SCSI) hard disk drive and a SCSI adapter. Up to three (Model 90) or five (Model 95) SCSI internal devices can be installed inside the system (all attached to the same SCSI adapter). The default hard disk drive has the IML image preloaded in a protected partition. Up to three additional SCSI adapters can be installed in the system. Each additional SCSI adapter can support up to seven external SCSI devices.

The hard disk drives automatically position and lock the read/write heads in nondata areas when the system is powered-off.

3.3 SCSI ID Numbers

Each SCSI device connected to a SCSI adapter must be assigned, at the time of installation, a unique SCSI identification number (SCSI ID). The SCSI adapter and the SCSI devices attached to that adapter are referred to as a SCSI chain (the system can support more than one SCSI chain). When changing drives, be sure to see "SCSI Device Cabling and Terminators" in topic 3.4.1. For in-depth information about SCSI, refer to the "IBM SCSI Architecture and Implementation" book (form number GG24-3507-00).

Subtopics

- 3.3.1 Selecting a SCSI ID Priority
- 3.3.2 Determining the SCSI ID of an existing device
- 3.3.3 Setting the SCSI ID
- 3.3.4 Motor-Start Jumper

3.3.1 Selecting a SCSI ID Priority

The SCSI ID (6, 5, 4, 3, 2, 1, or 0) available for a device depends on which IDs are already assigned to devices in the same SCSI chain. For example, if there is already one device in the SCSI chain assigned SCSI ID 6, no other SCSI devices (in that chain) can be set to SCSI ID 6.

The ID you choose determines the priority of the device. SCSI Device IDs should be set as follows:

- The SCSI adapter is shipped assigned SCSI ID 7 (highest priority).
- A fixed-media read and write device, such as a hard disk drive, should be assigned a high-priority ID such as 6 or 5.

Note: The default drive with the IML code loaded is usually SCSI ID 6.

- Removable-media devices (CD-ROM, optical drive, or a tape drive), should be assigned a priority ID of 4, 3, 2, 1, or 0 (an ID below that of the fixed-media devices).

In general, a low-priority or mid-priority device should not be assigned a SCSI ID higher than a high-priority device.

3.3.2 *Determining the SCSI ID of an existing device*

At the time of installation, a SCSI device should be labeled indicating the SCSI ID assigned to that device. If the device is not labeled, or you need to verify the SCSI ID, you can either decipher the jumper or switch settings (explained later), or you can do the following:

1. Power-on the system and access the Main Menu of the system programs.
2. Select **Set configuration** from the Main Menu, then select **Set and view SCSI device configuration**.

The SCSI ID for each installed SCSI device is displayed on the line that begins with **Device Address**. The ID appears in a set of two numbers separated by a comma (for example: **6, 0**). The first number (in this example: **6**) is the ID assigned to the installed SCSI device.

The ID for the SCSI adapter begins with the words **SCSI Address** or **SCSI Adapter Address**.

If there are no devices connected to a SCSI adapter, the screen will show only the slot that the SCSI adapter is installed in and the ID assigned to the adapter.

3.3.3 Setting the SCSI ID

SCSI devices have either switches or jumpers to set the SCSI ID. All FRU hard disk drives are shipped preset to SCSI ID 6. The type of hardware used and the location of the jumpers or switches varies from device to device.

To set the SCSI ID on a device that has switches, do the following:

- Refer to the switches in the figure below.
- Refer to the table to determine how the switches should be set for the SCSI ID you selected.
- Using a ballpoint pen, set switches 1, 2, and 3 to correspond to the SCSI ID you selected.
- Switch 4 is always set to "on."

PICTURE 5

The table below shows how switches 1, 2, and 3 are set for IDs 6 through 0.

PICTURE 6

Notes:

1. If present, switch five is always on, and switch six is always off.
2. On external SCSI devices that have a rotary switch to set the SCSI ID, set the switches or jumpers on the FRU device *inside the external cover* to zero (off) to enable the rotary switch.

To set the SCSI ID on a device that has jumpers, do the following:

- Refer to the pins in the figure below.
- Refer to the table to determine where the jumpers should be plugged to set the SCSI ID you chose.
- Move the jumpers to correspond to the SCSI ID you selected.

PICTURE 7

The table below shows how the jumpers are positioned for IDs 6 through 0.

SCSI ID	Jumpers			SCSI ID	Jumpers		
	1	2	3		1	2	3
6	:			2	:		:
5		:		1		:	:
4	:	:		0	:	:	:
3			:				
Value	1	2	4		1	2	4

3.3.4 Motor-Start Jumper

The jumper in position 4 (illustrated above) is the motor-start jumper. If the jumper is in place, the hard disk drive motor starts instantly when you power-on the system. If the jumper is not in place, POST starts the drive (sequentially). Some 320MB and 400MB drives are shipped in the system with the motor-start jumper in place to reduce POST time. If other large-capacity drives are added to the system, and they are set to start instantly (at power-on), the power supply might shut down. If this happens, it means that the total motor start surge current (of a multiple drive start-up) exceeds the reserve-current capacity of the power supply. You may have to remove the motor-start jumper from the option drives so that POST starts them in sequence.

Note: Original Equipment Manufacturer (OEM) drives may have a jumper or a switch to set the motor-start mode.

3.4 Terminators

Even though the system can *appear* to be operating correctly with or without terminators installed, it is *not* actually operating correctly. The SCSI bus can operate at data rates up to 5MB per second. Because of the high speed, the bus must be terminated properly, at *both ends*, with resistors (terminators) or you eventually *will* have problems.

If you do not terminate the SCSI bus correctly, you can experience intermittent errors. For example, if a terminator is *missing*, the result might be poor signal quality or improper (higher) voltages. Intermittent errors can lead to solid failures if the SCSI devices are exposed to continuous excessive voltages.

If you have *too many* terminators installed, for example, three internal hard disk drives, each with a terminator, the result might be a drop in voltages to a point where devices will not operate, or they operate intermittently.

Subtopics

3.4.1 SCSI Device Cabling and Terminators

3.4.2 SCSI Adapter Terminators

3.4.1 SCSI Device Cabling and Terminators

Internal SCSI Devices: Internal SCSI devices attach to a SCSI adapter through a flat ribbon cable 1 . The system supports multiple internal SCSI devices and uses a cable with multiple connectors. If there is only one internal SCSI hard disk drive installed, it is connected to the last connector on the cable. Because that device is the *last* device in the SCSI chain, it is the *only* internal SCSI device that requires a terminator 2 .

Note: Terminators vary depending on the device. You might see a single in-line cable terminator, one or more resistor terminators (in various sizes) on the circuit board of the device, or a pin-jumper on the circuit board. All terminators are labeled T-RES. Store any extra terminators with the system in case they are needed in the future.

External SCSI Devices: External SCSI devices are attached through a series of cables outside of the system. The first external device attaches to the SCSI adapter port through a 60-pin to 50-pin cable 3 . Additional external SCSI devices link together through a 50-pin to 50-pin cable 4 . The last device in the chain requires a 50-pin block terminator 5 (in the lower connector).

PICTURE 8

3.4.2 SCSI Adapter Terminators

Adapter terminator requirements and locations vary depending on the following:

Type of SCSI Adapter Installed: The type 1 SCSI adapter has a connector 1 (on one side) for a 20-pin terminator. Originally, only SCSI adapters without pluggable cache used the 20-pin side terminator. The newest level SCSI adapters use the 20-pin side terminator whether they have pluggable cache or not. Type 1 adapters do not require any other terminator.

The type 2 SCSI adapter *does not* have a connector on one side for a terminator. Instead, type 2 SCSI adapters use a 50-pin internal terminator 2 and a 60-pin external terminator 3 .

SCSI Configuration: Adapter terminator requirements vary depending on whether the SCSI devices installed are internal, external, or both.

Use the figures and the table below to determine SCSI adapter terminator requirements.

PICTURE 9

SCSI Adapter Type Installed	Only Internal Devices Installed	Only External Devices Installed	Internal and External Devices Installed	Terminator Location (as shown above)
1	<input type="checkbox"/>			1
1		<input type="checkbox"/>		1
1			<input type="checkbox"/>	None
2	<input type="checkbox"/>			3
2		<input type="checkbox"/>		2
2			<input type="checkbox"/>	None

Table 1. Adapter Terminator Locations

4.0 *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

4.1 Power Supply

4.1 Power Supply

On the *Model 90*, the power supply automatically switches to the 100-125 V ac range or to the 200-240 V ac range.

On the *Model 95*, the power supply can be *manually* switched to support either the 100-125 V ac range or 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.

5.0 System Diskettes (Reference and Diagnostic)

If the hard disk drive is not operational, you can run the system programs from the System Diskettes (Reference Diskette and the Diagnostic Diskette).

There are three types of Reference Diskettes and three types of Diagnostic Diskettes. The type of processor board (type 1, 2 or 3), installed in the system determines which System Diskettes to use. The System Diskettes are labeled (type 1, 2 or 3), for the type of processor boards they support.

For more information, see "Processor Board Matrix" in the *Hardware Maintenance Service* pamphlet.

The Reference Diskette contains the system programs and the Diagnostic Diskette contains the testing programs. The Diagnostic Diskette is not startable. To run the Advanced Diagnostics from the Diagnostic Diskette, start the system from the Reference Diskette. When the Main Menu appears, press **Ctrl+A** and follow the instructions on the screen.

When you make a backup copy of the System Partition, certain files will not be loaded to the backup copy. The following files will be accessible only from the *original* Diagnostic Diskette, *not* a backup copy of the System Partition:

- KP.COM
- IDP.COM
- DISK386.COM
- RECV35.COM
- UINSTALL.EXE

Note: The program **More utilities** is on the Diagnostic Diskette.

6.0 Updating the IML Image (System Diskettes)

When you install the new System Diskettes onto the hard disk, they write over all existing files (including option files) in the System Partition. The new System Diskettes provide new system programs but they do not have the option files; therefore, after completing the following process, you must reinstall the option files.

Subtopics

- 6.1 Installation Requirements
- 6.2 Backing Up the Current System Partition
- 6.3 Installing a New Version of the Reference Diskette
- 6.4 Making a New Backup Copy of the System Partition

6.1 Installation Requirements

Warning: The power-on password must be removed prior to installing the new IML code.

Notes:

1. Before you install the new version of the System Diskettes, tell the customer that the installation takes up to one hour.
2. Follow all of the instructions in order.

You will need the following:

- A pen or pencil and a blank sheet of paper.
- The original option diskettes for all the options installed in the system. If the customer does not have all of the option diskettes, use a current backup of the System Partition.
- As many as four blank 2.0MB diskettes that are not write protected.

6.2 Backing Up the Current System Partition

In this step, you will be saving any customized configuration information on the System Partition.

Note: This procedure saves a customized configuration (1). It does not save a customized selectable drive-startup sequence. If a customized selectable drive-startup sequence exists on the system, you must reset that sequence after you complete this procedure.

1. If a power-on password is set and your customer did not remove it before you started this procedure you will need to move one of the following jumpers to remove the password:

Model 90 J10

Model 95 J16

2. Power-on the system (without a diskette in the drive).
3. Wait until the POST finishes (system beeps). Press **Ctrl+Alt+Del**. When the cursor moves to the top-right corner of the screen, press **Ctrl+Alt+Ins**.
4. Select **Set configuration** from the Main Menu of the system programs. Then select **Backup configuration**, and press **Enter**.
5. After the backup configuration is completed, continue with the next step.
6. Select **View configuration** and use the **Print Screen** key or pencil and paper to make a note of any option adapters in the system. (This is a precautionary step in case you need this information later.)
7. If the user has not changed the drive-startup sequence of the system, go to step 11. If the user *has* changed the drive-startup sequence (or if you are not sure if it has been changed), continue with the next step.
8. Select **Set features** from the Main Menu of the system programs. Then select **Set startup sequence** and press **Enter**.
9. An informational warning screen appears. Read the information and then press **Enter**.
10. Press the **Print Screen** key if you have a printer, or use a pencil and paper, to record the current selectable drive-startup sequence. Then return to the Main Menu of the system programs.
11. From the Main Menu, select **Backup/Restore system programs**. Then select **Backup the System Partition**, and press **Enter**.
12. Insert a blank 2.0MB diskette into the primary diskette drive (usually drive A) and follow the instructions on the screen. The system prompts you when to insert a blank diskette to copy the Reference Diskette and then the Diagnostic Diskette.

Warning: If the System Partition is larger than 2.0MB, you will receive a message on the screen indicating that the diskette is full (before the backup process is completed). If this is the case, you will not be able to make a backup copy of the entire reference section of the System Partition. Therefore, before you continue, make sure that you have *all* of the option diskettes. If you continue *without* all of the option diskettes, you will write over the existing option files on the hard disk, and you will not be able to reinstall them.

13. When the copy is completed, power-off the system.

Note: Some systems require one diskette (Reference Diskette) and some systems require two diskettes (Reference Diskette and a Diagnostic Diskette). Keep this in mind when labeling these diskettes.

14. Remove the diskette from the diskette drive and label it with the following information:

Note: Label both System Diskettes (Reference and Diagnostic).

- Model number of the system (found on the system unit)
- Type number of the system programs (found under **Display revision levels** in the system programs)

- Version level of the system programs (found on the system program logo screen)
- (1) Customized configuration: A system configuration that users create using the change configuration feature of the system programs. For example, the user may have changed the serial port default value, or changed a token ring address location.

6.3 Installing a New Version of the Reference Diskette

In this step, you will be loading the new initial machine load image (IML), and Diagnostic code onto the System Partition.

1. Insert the new Reference Diskette into the primary diskette drive. This diskette contains the new IML image for the system.
2. Power-on all of the attached options and then the system. (This might take up to two minutes.)
3. Go to the Main Menu of the Reference Diskette.
4. Select **Backup/Restore system programs**. Then select **Restore system partition**, and press **Enter**. A warning appears stating that the System Partition that is currently on the system will be overwritten. This is a normal response for this procedure. Press **Enter** and follow the instructions on the screen.
5. When this process is completed, power-off the system and remove the diskette from the drive.
6. Power-on the system again.
7. After the POST finishes (system beeps), press **Ctrl+Alt+Del**. When the cursor moves to the top-right corner of the screen, press **Ctrl+Alt+Ins**.

Note: In the next step, use the option diskette for each option adapter installed in the system. If you have all the option diskettes for the system, continue with step 8. If you *do not* have all the option diskettes for the system, use the backup of the System Partition that you created at the start of this procedure and go to step 9.

8. Select **Copy an option diskette** from the Main Menu of the system programs. Insert an option diskette into the diskette drive and press **Enter**. When this completes, return to the Main Menu. Repeat this step until you have loaded all the option diskettes.
9. Insert the backup copy of the System Partition into the diskette drive. Select **Copy an option diskette** from the Main Menu and press **Enter**. (If the backup copy of the System Partition consists of more than one diskette, repeat this step with each diskette). When the process is completed, remove the diskette from the drive and continue with the next step. (Customized configuration data is on the backup copy of the System Partition).
10. Return to the Main Menu of the system programs.

Note: If a screen message appears asking you to make a backup copy of the System Partition, ignore the screen message. You will make a backup copy later in this procedure.

11. If you *do not* need to reset a selectable drive-startup sequence, go to step 12. If you *do* need to reset the sequence, do the following:

Note: If you need more information on this subject, see "Selectable Drive-Startup Sequence" in topic 2.6.

- a. Select **Set features** from the Main Menu. Then select **Set startup sequence**.
 - b. Use the information that you recorded in step 10 in topic 6.2, and reset the startup sequence (using the F5 and F6 keys).
 - c. Press the F10 key to save the drive-startup sequence.
12. Select **Set configuration** from the Main Menu. Then select **Restore configuration**. (This restores the customized configuration.)
 13. Press F3. A message appears stating that the configuration is changed.
 14. Press **Enter**. (This restarts the system.)

Note: An error message screen may reappear after the system restarts asking **Automatic configuration - Y/N?** If this occurs, do the following:

- a. Press **N** to bypass the automatic configuration and go to the Main Menu of the system programs.

- b. Select **Set configuration**, and then **View configuration**.
- c. Make sure all settings are correct, and make any changes necessary.
- d. When you are done, return to the Main Menu of the system programs.

The system should now start without any errors. If an error does occur, refer to the *Hardware Maintenance Service* pamphlet.

6.4 Making a New Backup Copy of the System Partition

Note: You will need two blank 2.0MB diskettes (or the old backup copy of the System Partition).

1. From the Main Menu, select **Backup/Restore system programs**. Then select **Backup the System Partition**.
2. Insert a blank 2.0MB diskette into the primary diskette drive (usually drive A) and follow the instructions on the screen.
3. When the copy is completed, remove the diskette from the diskette drive and label it with the following:
 - "Backup Copy of the System Partition - Reference Diskette" (for the first diskette) and "Backup Copy of the System Partition - Diagnostic Diskette" (for the second diskette)
 - Model number of the system (found on the system unit)
 - Type number of the system programs (found under **Display revision level** in the system programs)
 - Version level of the system programs (found on the system program logo screen)

7.0 Using ASCII Terminals (Model 95 XP 486)

The Model 95 supports the following ASCII display stations, when attached to the system board serial connector: 3151, 3161, 3162, 3163, and 3164. However, there are physical differences among the ASCII terminals that affect the system setup.

Notes:

1. Model 90 does not support an ASCII terminal.
2. Not all operating systems will support an ASCII terminal.
3. Beginners All-Purpose Symbolic Instruction Code (BASIC) language is not supported when using an ASCII terminal.
4. High-resolution graphics are not available when using an ASCII terminal.

Subtopics

- 7.1 ASCII Terminal Setup and Menu Selection
- 7.2 ASCII Terminal Configuration

7.1 ASCII Terminal Setup and Menu Selection

Use the setup instructions supplied with the ASCII terminal. As you are using those instructions, you will need to know the following information:

- Use a null-modem cable or a null-modem connector 1 with the communication cable 2 when attaching the ASCII terminal 3 to the serial connector on the computer.

PICTURE 10

- If the ASCII terminal has a test switch next to the keyboard connector, make sure it is in the normal position.

When using the system programs and defining the setup values on the ASCII terminal, be sure the machine mode matches the actual terminal you are installing. For example, if you are installing a 3151 ASCII Display Station, the Machine Mode on the Setup Menu must be set to IBM3151. When the setup values correctly match the terminal type, the machine is considered to be in the *native machine mode*.

Set the Communication values on the terminal as follows:

Line Speed (bps)	9600
Word Length (bits)	8
Parity	No
Stop Bit	1

Notes:

1. When using the system programs, do not install an emulation cartridge unless it will support native machine mode.
2. The terminals designed for countries where English is not the native language must support the ISO 8859/1.2 code page. Some of the terminals require a cartridge to support this code page. Check the documentation that came with the terminal to see if the terminal requires a cartridge.

7.2 ASCII Terminal Configuration

When using an ASCII terminal, you must define the setup values so that the display station can correctly communicate with the system.

Subtopics

7.2.1 Console Selection

7.2.2 Error Messages

7.2.3 Operations

7.2.1 Console Selection

The Model 95 has a Set Console utility program that lets you tell the system you are using an ASCII terminal.

Without the Set Console utility program, the system will use the default values shown. The ASCII terminal values must match these values. Complete the following steps to use an ASCII terminal.

Before you make these selections in the Set Console utility program, make sure that you have an ASCII terminal *attached* to the system.

1. Start the system programs.

Note: If you start the system programs from an ASCII terminal, power-on the terminal then the system. Press and hold **Ctrl**. Then press and release **C+A+D**. When the cursor moves to the top-right corner of the screen, press **Ctrl+i**.

2. Select **Set features** on the system programs Main Menu.
3. Select **Set console** on the Set Features Menu.
4. Select **ASCII terminal** on the Set Console Menu.

The values must be:

Baud rate	9600
Bits per character	8
Parity	None
Stop bits	1

Note: These instructions assume that you have already set the terminal to the same values described in "ASCII Terminal Setup and Menu Selection" in topic 7.1.

Any time you change the ASCII terminal values, you also must update the system values to match it. The baud rate should always be 9600 or above. If you set the baud rate below 9600, system performance will be slow.

7.2.2 *Error Messages*

If you get a 161 or 173 error during POST, the selection you made in the Set Console utility program is no longer valid. When this happens, the system will look for a video adapter. If it finds one, the keyboard and display will be used as a console. If it does not find one, the ASCII terminal will be used as a console.

7.2.3 Operations

Some of the ASCII terminal operations are listed below.

Communication When using an ASCII terminal, the communication parameters will appear on the information panel (for example **96-8N1**). This information is not an error message.

Configuration When you run the system programs or diagnostic programs from the ASCII terminal, the terminal values might change. Check the terminal values. If they have changed, reset them.

Utilities To start the system programs when using an ASCII terminal, follow the instructions that came with the operating system. When the cursor moves to the top-right corner of the screen, press **Ctrl+i**.

Diagnostics When an ASCII terminal is selected as the system console, the following will not appear on the diagnostic installed device list:

- Keyboard
- Mouse
- System board async port
- Video displays.

8.0 System Error Log

Systems with a 50 Mhz type 3 processor board (submodel code 28 or 29) maintain a system error log. On these systems, the BIOS nonmaskable interrupt (NMI) handler writes an entry to the error log each time an error is detected.

Note: If the system halts during POST, nothing will be logged.

Subtopics

- 8.1 Viewing the Error Log
- 8.2 Types of Errors Detected
- 8.3 Error Storage
- 8.4 Application
- 8.5 Dumping Extended Diagnostic Data Information

8.1 Viewing the Error Log

To view the error log, start the system programs and select **More utilities** from the Main Menu, then select **Display system error log**. For any error that is displayed, help screens guide you through the actions to take.

8.2 Types of Errors Detected

The error log can contain many different types of hardware or application-program related errors. The most probable cause of the failure is always indicated on the help screen. Listed below are some common errors and causes that might be displayed.

Application Program Errors

- Watchdog timeout
- DMA programming.

Processor Board Errors

- System parity
- Processor board cache
- Voltage
- Processor board was changed (information only).

Each processor board has a unique vital product data (VPD) code stored in the nonvolatile memory on the system board. After you change the processor board, run *Automatic configuration* to store the new processor board VPD code in nonvolatile memory. If you do not run "Automatic configuration," POST displays a 01299000 error.

System Memory Errors

- Parity memory
- ECC memory (multi-bit)
- ECC memory (single-bit trigger level)
- POST-detected memory.

Micro Channel Adapter Errors

- I/O Channel check
- DMA timeout.

On DMA timeout errors, note the arbitration level displayed on the screen. Go to the "View configuration" screen and see which device has that same arbitration level. Suspect that device is defective.

8.3 Error Storage

The error log stores up to three unique errors (for example three parity errors at three different addresses). The multiple log counter (on the screen) displays the number of additional times each unique error occurred. You can page forward or backward to view the stored error logs. The date and time of the most recent occurrence also is displayed. If POST finds that the error log has stored three unique errors, POST displays a 00017900 error.

Note: If the system configuration is changed, the system clears any logged errors associated with the hardware that is changed. (For example, if the memory configuration was changed, memory errors are cleared from the error log). The conditions under which errors are automatically cleared vary with the type of hardware and level of microcode installed.

8.4 Application

If the system does not display a POST error, (or if diagnostics run error-free) but you still suspect a problem, look at the error log. If errors are detected, they are displayed. Press the help key and follow the instructions on the screen to help you determine what might be causing the failure.

8.5 Dumping Extended Diagnostic Data Information

In cases where the system appears to have an undetectable intermittent failure, analyzing the extended data information will help find the cause of the failure. The support center may request that you dump this information onto a diskette. Dump only the extended data by request of the support center. To dump the extended data, do the following:

- Format a scratch 2MB diskette.
- Restart the system from the Reference Diskette (*do not* start from the System Partition or you will copy the data to the System Partition).
- From the Main Menu, select **Set Configuration** and choose **Change configuration**.
- Remove the Reference Diskette from the drive.
- Insert the scratch 2MB diskette into the primary diskette drive.
- Press F10 (this starts the bit-dump and writes two files onto the diskette).
- After the screen message indicates that the process is complete, remove the diskette from the drive and insert the Reference Diskette.
- Send the diskette to the support center that requested it.

9.0 Miscellaneous System-Related Information

This section contains miscellaneous system-related system information that will aid you in trouble shooting.

PS/2 Displays: If you experience problems with a PS/2 (*) display, and the Advanced Diagnostic video test and the display self-tests do not indicate a problem, consider the location of the display and any surrounding devices. Certain fluctuating low-frequency magnetic fields can cause the screen to distort, jitter, or roll. These magnetic fields are generally present around transformers, small appliances and even nearby florescent lighting fixtures. If you experience this problem, you may have to move the device or the display. Displays that are too close to each other (less than 12 inches) could cause similar problems.

Note: Because of the differences in the Earth's magnetic fields, displays are designed to be used in a specific hemisphere. For example, if a display marketed for use in the Southern Hemisphere is relocated to far northern latitudes (Australia to Norway) the colors will probably be distorted. The parts catalog in the Hardware Maintenance Service pamphlet lists FRU numbers and model numbers for Northern and Southern Hemisphere displays.

You should avoid moving a color display *while it is powered-on*. The movement can result in some screen discolorations. If this happens, to correct the colors, power-off the display for twenty minutes (the display automatically degausses the screen after it is off for twenty minutes).

It is possible for a display to cause diskette drive read/write errors if the drive and the display are too close. Distance between displays and diskette drives should be at least 3 inches.

Surge Suppressors: External surge suppressors are not required on PS/2 systems. The systems are designed to resist typical power surges. More severe surge levels are possible, but the probability is quite low. A defective external surge suppression device can cause intermittent system failures. No design or performance standards have been established for these devices and there is no easy way to test them. If the system has undetectable intermittent failures and there is a surge suppressor installed, try operating the system without the surge suppressor.

Uninterruptible Power Devices: Uninterruptible power devices are designed to supply continuous power to the system in the case of a power outage. They are usually used only when the potential loss of data or use is unacceptable.

Numerous devices of this type are available, but not all of them produce an AC sine-wave voltage. U.S. PS/2 systems require sine-wave. If the uninterruptible power device is defective or the wrong type, the result could be undetectable intermittent failures.

(*) Trademark of the International Business Machines Corporation.

10.0 Specifications (Model 90 XP 486)

Size

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

Weight

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

Environment

- Temperature:
 - System on: 10° to 35° C (50° to 95° F) 0 to 914m (0 to 3000 ft.)
 - System on: 10° to 32° C (50° to 90° F) 0 to 2133m (0 to 7000 ft.)
 - System 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

- Approximate heat output in British Thermal Units (BTU) per hour
 - Minimum configuration - 297 BTU (87 watts)
 - Maximum configuration - 1125 BTU (329 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) - Approximately 0.15 kVA
 - Maximum Configuration - Approximately 0.51 kVA.

11.0 Specifications (Model 95 XP 486)

Size

- Height: 501 mm (19.75 in.)
- Depth: 508 mm (20.0 in.)
- Width: 203 mm (8.0 in.)

Weight

- Minimum configuration: 22 kg (50 lb)
- Maximum configuration: 30 kg (67 lb)

Environment

- Temperature
 - System on: 10° to 35° C (50° to 95° F) 0 to 914m (0 to 3000 ft.)
 - System on: 10° to 32° C (50° to 90° F) 0 to 2133m (0 to 7000 ft.)
 - System off: 10° to 43° C (50° to 110° F)
- Humidity
 - System on: 8% to 80%
 - System off: 8% to 80%
- Maximum altitude: 2134 m (7000 ft)

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour
 - Minimum configuration - 358 BTU (105 watts)
 - Maximum configuration - 1903 BTU (558 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 0.18 kVA
 - Maximum Configuration - Approximately 0.83 kVA.

12.0 Special Tools

The following special tools are required to service the systems:

Wrap Plug

Use the Tri-Connector Wrap Plug during advanced diagnostic tests of the parallel and serial ports.

PICTURE 11

Volt-Ohm Meter

Use a meter similar to the Triplet Model 310 to test voltages. (2)

Video-Memory Tools (Model 90)

Use the video-memory insertion tool 1 to install the video-memory modules on the system board. See "Video Memory" on page 14.14 for information on how to install video memory. Use the video-memory removal tool 2 to remove the video-memory modules.

PICTURE 12

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

13.0 Handling Electro-Static Discharge (ESD) Sensitive Devices

These are general instructions for handling ESD sensitive parts. Any part containing transistors or ICs should be considered ESD Sensitive. Use *product specific ESD procedures when they exceed the requirements noted here*. ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat and the person handling the part are all at the same charge. Ground is desirable but not required to protect against ESD damage. The wrist band must be worn against the skin. Select the grounding cord system to provide protection for the specific service requirement. If an ESD sensitive part is swapped, the mat must be used to provide an ESD safe work surface to protect the part removed from the system. The mat might not be required for a simple insertion. The mat can be used as a ESD protective container for swapping parts between systems. Use the mat with the BLACK side up.

The ESD ground clip can be attached to any frame ground, ground braid or green wire ground. For systems that are double insulated, or battery operated, an ESD common ground or reference point should be used. The round ground-prong on the AC plug, can be used on AC-operated systems. Coax or connector outside shells can be used on double insulated or battery operated systems.

ESD sensitive parts must not touch any part of your clothing. Most clothing is insulative and retains a charge *even when you are wearing a wrist strap*. Avoid contact with other people when handling ESD sensitive parts. Keep ESD sensitive parts in protective packages until they are inserted into the product.

14.0 Removals and Replacements (Model 90 XP 486)

The arrows in the removal and replacement procedures show the direction to remove a field replaceable unit (FRU), or the direction 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 to remove the failing FRU, they will be listed at the top of the page. Go to the removal procedure for each FRU listed, remove it, then continue with the failing FRU removal.

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 math coprocessor can be damaged by electrostatic discharge. See "Handling Electro-Static Discharge (ESD) Sensitive Devices" in topic 13.0 if you have not already done so.

Subtopics

- 14.1 1005 Cover
- 14.2 1010 Cover Lock
- 14.3 1015 Fan / Air Baffle
- 14.4 1020 Power Switch / Speaker Assembly
- 14.5 1025 Diskette Drive
- 14.6 1030 Hard Disk Drive
- 14.7 1035 Adapters
- 14.8 1040 Option Processor
- 14.9 1045 Memory Riser Card Bracket
- 14.10 1050 Memory Riser Card
- 14.11 1055 Power Supply
- 14.12 1060 Battery
- 14.13 1065 System Board
- 14.14 1070 Video Memory

PICTURE 13

14.2 1010 Cover Lock

□ Cover (1005)

PICTURE 14

14.3 1015 Fan / Air Baffle

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

Note: If the replacement fan is larger than the fan installed, replace the card-guide structure that is supplied with the larger fan FRU.

PICTURE 15

14.4 1020 Power Switch / Speaker Assembly

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

PICTURE 16

14.5 1025 Diskette Drive

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

Warning: The clip on the diskette-drive cable reduces noise on the cable. Be sure that it is replaced after service.

Notes:

1. Drives not designed for the Model 90 might cause intermittent problems.
2. See "Internal Cables" on page 15.4 for cable information.

PICTURE 17

14.6 1030 Hard Disk Drive

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

Notes:

1. The last drive on the cable requires a terminator. See "Internal Cables" on page 15.4 for cable information.
2. Load the IML image onto the replacement default drive. For more information, see "IML, POST, and BIOS" in topic 2.3.3.
3. If the drive you are replacing has a motor-start jumper installed, transfer the jumper to the replacement drive. For more information see "Motor-Start Jumper" in topic 3.3.4.

PICTURE 18

14.7 1035 Adapters

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

Note: Before you replace an adapter, note the slot location on the system board. Put the replacement adapter into that slot. If you have to install the replacement adapter in a different slot, run **Automatic configuration** from the hard disk drive.

PICTURE 19

14.8 1040 Option Processor

You can install an optional processor on a 20 or 25 MHz processor board.

On the 20-MHz board (below left), the jumper 2 must be in positions 1 and 2 if a 487SX processor (with extended math capability) is installed in connector 3 . If there is not a 487SX processor in connector 3 , the jumper must be in positions 2 and 3.

The 25-MHz processor board (below right) has a *second* processor connector 3 for either an optional 487SX processor (with extended math capability) or an 80486SX 25/50 MHz processor. If you install an option processor in connector 3 , of the 25 MHz board, you *do not* have to remove the existing processor (it is overridden).

- 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 20

Notes:

1. On the 20-MHz board (left), the jumper 2 must be in positions 1 and 2 if an option processor is installed in connector 3 . If there is not a processor in connector 3 , the jumper must be in positions 2 and 3.
2. The processor connector 3 is in a different location on the 20-MHz board (left), than it is on the 25-MHz board (right).
3. A slight gap between the processor and the connector is normal.

14.9 1045 Memory Riser Card Bracket

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

PICTURE 21

14.10 1050 Memory Riser Card

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

Notes:

1. If memory is added or removed, run **Automatic configuration** from the hard disk drive.
2. If memory is replaced because it failed, run the advanced diagnostic memory test. Otherwise the system might not recognize the replacement memory.

PICTURE 22

14.11 1055 Power Supply

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

PICTURE 23

14.12 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. Use of a battery other than FRU No. 33F8354 might result in ignition or explosion of the battery.

Note: After you replace the battery, run **Automatic configuration** from the hard disk drive.

PICTURE 24

14.13 1065 System Board

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

Notes:

1. Transfer the memory and riser cards to the replacement system board. After you replace the system board, run **Restore configuration** from the hard disk drive. Reset the start-up sequence.

PICTURE 25

14.14 1070 Video Memory

Note: See "System Board" in topic 15.5 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 26

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

15.0 Locations

Subtopics

- 15.1 Front View
- 15.2 Rear View
- 15.3 Interior View
- 15.4 Internal Cables
- 15.5 System Board

15.1 Front View

- 1 Power switch
- 2 Hard-disk-drive in-use light
- 3 Power-on light
- 4 Diskette drive in-use light
- 5 Diskette drive (bay 0)
- 6 Diskette-eject button
- 7 Option SCSI or non-SCSI device (bay 1)
- 8 Type, model and serial number
- 9 Option SCSI device bays

PICTURE 27

15.2 Rear View

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

PICTURE 28

15.3 Interior View

- 1 Diskette-drive-cable connector
- 2 Processor board
- 3 Expansion-slot covers
- 4 Memory-riser-card bracket
- 5 Power supply
- 6 Power-supply cable (P2)
- 7 Power-supply cable (P1)
- 8 Power-supply cable (P3 and P4)
- 9 SCSI internal cable
- 10 Memory riser cards (J11 & J14)
- 11 Option SCSI or non-SCSI device (bay 1)
- 12 Option SCSI device bays
- 13 Diskette drive (bay 0)
- 14 Power switch/speaker assembly
- 15 Base fan
- 16 SCSI adapter.

PICTURE 29

15.4 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 (signal)
- 4 SCSI device power cables
- 5 Hard disk drive
- 6 Diskette drive
- 7 Diskette-drive cable (signal & power)
- 8 Fan cable
- 9 Power switch/speaker cable
- 10 SCSI adapter
- 11 External SCSI device connector.

PICTURE 30

15.5 System Board

- 1 Power switch/speaker assembly (J2)
- 2 Battery (BT1)
- 3 Adapter slots
- 4 Processor-board slot (J8)
- 5 Memory-riser-card slot (J11)
- 6 Video port
- 7 Serial port (25-pin)
- 8 Serial port (9-pin)
- 9 Diskette-drive-cable connector (J15)
- 10 Parallel port
- 11 Pointing-device connector
- 12 Keyboard connector
- 13 Power-supply connector (J25)
- 14 Power-supply connector (J26)
- 15 Video-memory connectors (1-8)
- 16 Memory-riser-card slot (J14)
- 17 Override jumper connector (J10)
- 18 Fan connector (J5).

PICTURE 31

16.0 Grounds

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

PICTURE 32

17.0 Removals and Replacements (Model 95 XP 486)

The recommended service position of the Model 95 is upright. If necessary, you may place the system on its left side for servicing.

CAUTION:

The system unit with options may weigh as much as 30 kilograms (67 pounds). Be careful when moving or changing the position of the unit. Do not attempt to lift any object that you think is too heavy for you.

The arrows in the removal and replacement procedures show the direction to remove a field replaceable unit (FRU), or the direction 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 to remove the failing FRU, they will be listed at the top of the page. Go to the removal procedure for each FRU listed, remove it, then continue with the failing FRU removal.

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 math coprocessor can be damaged by electrostatic discharge. See "Handling Electro-Static Discharge (ESD) Sensitive Devices" in topic 13.0 if you have not already done so.

Subtopics

- 17.1 1005 Cover and Front Bezel
- 17.2 1010 Cover Lock
- 17.3 1015 Drive Retainer and Bezels
- 17.4 1020 Information Panel Assembly
- 17.5 1025 Diskette Drive
- 17.6 1030 Hard Disk Drive
- 17.7 1035 Option Hardware Trays
- 17.8 1040 Adapters and Adapter Guide
- 17.9 1045 Option Processor
- 17.10 1050 Power Supply
- 17.11 1055 Memory Module Kit
- 17.12 1060 Battery
- 17.13 1065 System Board
- 17.14 1070 Adapter Retainer and Ground Assembly
- 17.15 1075 Rear Bezel
- 17.16 1080 Drive Support Structure
- 17.17 1085 Access Cover Fan
- 17.18 1090 Access Cover Fan Cable
- 17.19 1095 Pedestal

17.1 1005 Cover and Front Bezel

PICTURE 33

17.2 1010 Cover Lock

- Cover and Front Bezel (1005)

PICTURE 34

17.3 1015 Drive Retainer and Bezels

- Cover and Front Bezel (1005)

PICTURE 35

17.4 1020 Information Panel Assembly

- Cover and Front Bezel (1005)
- Drive Retainer and Bezels (1015)
- Disconnect any cables necessary for removal.

PICTURE 36

17.5 1025 Diskette Drive

- Cover and Front Bezel (1005)
- Drive Retainer and Bezels (1015)
- Disconnect any cables necessary for removal.

Notes:

1. Drives not designed for the Model 95 might cause intermittent problems.
2. See "Internal Cables on "page 18.4, for cable connections.

PICTURE 37

17.6 1030 Hard Disk Drive

- Cover and Front Bezel (1005)
- Drive Retainer and Bezels (1015)
- Disconnect any cables necessary for removal.

Notes:

1. The last drive on the cable requires a terminator. See "Internal Cables" on page 18.4 for cable information.
2. Load the IML image onto the replacement default drive. For more information, see "IML, POST, and BIOS" in topic 2.3.3.
3. If the drive you are replacing has a motor-start jumper installed, transfer the jumper to the replacement drive. For more information see "Motor-Start Jumper" in topic 3.3.4.

PICTURE 38

17.7 1035 Option Hardware Trays

- Cover and Front Bezel (1005)
- Drive Retainer and Bezels (1015).

The option hardware trays contain cables and rails needed to install option devices. The trays also help direct air flow when no options are installed in the option bay. Leave the trays in place until options are installed.

Note: The location and quantity of the trays varies depending on the configuration of the system.

PICTURE 39

17.8 1040 Adapters and Adapter Guide

Cover and Front Bezel (1005)

Note: Before you replace an adapter, note the slot location on the system board. Put the replacement adapter into that slot. If you have to install the replacement adapter in a different slot location, run **Automatic configuration** from the hard disk drive.

PICTURE 40

17.9 1045 Option Processor

You can install an optional processor on a 20 or 25 MHz processor board.

On the 20-MHz board (below left), the jumper 2 must be in positions 1 and 2 if a 487SX processor is installed in connector 3 . If there is not a 487SX processor in connector 3 , the jumper must be in positions 2 and 3.

The 25-MHz processor board (below right) has a *second* processor connector 3 for either an optional 487SX processor (extended math capability) or an 80486SX 25/50 MHz processor. If you install an option processor in connector 3 , of the 25 MHz board, you *do not* have to remove the existing processor (it is overridden).

- 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 41

Notes:

1. On the 20-MHz board (left), the jumper 2 must be in positions 1 and 2 if an option processor is installed in connector 3 . If there is not a processor in connector 3 , the jumper must be in positions 2 and 3.
2. The processor connector 3 is in a different location on the 20-MHz board (left), than it is on the 25-MHz board (right).
3. A slight gap between the processor and the connector is normal.

17.10 1050 Power Supply

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

PICTURE 42

17.11 1055 Memory Module Kit

- Cover and Front Bezel (1005)
- Power Supply (1050) (Steps 2 and 3 only)

Notes:

1. If memory is added or removed, run **Automatic configuration** from the hard disk drive.
2. If memory is replaced because it failed, run the advanced diagnostic memory test. Otherwise, the system might not recognize the replacement memory.

PICTURE 43

17.12 1060 Battery

- Cover and Front Bezel (1005)
- Power Supply (1050).

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. Use of a battery other than FRU No. 33F8354 might result in ignition or explosion of the battery.

Note: After you replace the battery, run **Automatic configuration** from the hard disk drive.

PICTURE 44

17.13 1065 System Board

- Cover and Front Bezel (1005)
- Adapters and Adapter Guide (1040)
- Power Supply (1050)
- Hard Disk Drives (1030) (if necessary)
- Disconnect any cables necessary for removal.

Notes:

1. Transfer the memory to the replacement system board.
2. After you replace the system board, run **Restore configuration** from the hard disk drive. Reset the start-up sequence.

PICTURE 45

17.14 1070 Adapter Retainer and Ground Assembly

- Cover and Front Bezel (1005)
- Adapters and Adapter Guide (1040)
- Power Supply (1050)
- System Board (1065)
- Disconnect any cables necessary for removal.

Note: Carefully loosen and remove the expansion slot covers before removing the rear bezel.

PICTURE 46

17.15 1075 Rear Bezel

- Cover and Front Bezel (1005)
- Adapters (1040)
- Power Supply (1050)
- System Board (1065)
- Disconnect any cables necessary for removal.

Note: Carefully loosen and remove the expansion slot covers before removing the rear bezel.

PICTURE 47

17.16 1080 Drive Support Structure

Warning: As you remove or replace the drive support structure, be careful not to bend the ground spring. A damaged ground spring can result in intermittent noise problems.

- Cover and Front Bezel (1005)
- Drive Retainer and Bezels (1015)
- Diskette Drives (1025)
- Hard Disk Drives (1030)
- Power Supply (1050)
- System Board (1065)
- Disconnect any cables necessary for removal.

PICTURE 48

17.17 1085 Access Cover Fan

The access cover fan is on the inside of the system access cover.

- Cover and Front Bezel (1005)

PICTURE 49

17.18 1090 Access Cover Fan Cable

- Cover and Front Bezel (1005)
- Power Supply (1050)
- Disconnect the fan cable from connector J28 on the system board.

PICTURE 50

17.19 1095 Pedestal

Note: Pull out on the tabs just far enough to release the pedestal.

PICTURE 51

18.0 Locations

Subtopics

- 18.1 Front View
- 18.2 Rear View
- 18.3 Interior View
- 18.4 Internal Cables
- 18.5 System Board

18.1 Front View

- 1 Power switch
- 2 Power-on light
- 3 Information panel
- 4 Type, model and serial number
- 5 Diskette drive (bay 0)
- 6 Diskette drive in-use light
- 7 Diskette-eject button
- 8 Option diskette drive (bay 1)
- 9 Option SCSI or non-SCSI device (bay 2)
- 10 Option SCSI device bay
- 11 Option SCSI device bay
- 12 Cover lock.

PICTURE 52

18.2 Rear View

- 1 Expansion slots
- 2 Serial port
- 3 Parallel port
- 4 Pointing-device connector
- 5 Keyboard connector
- 6 Power-cord connector
- 7 Type, model and serial number
- 8 Voltage-select switch.

PICTURE 53

18.3 Interior View

- 1 SCSI device internal cable
- 2 SCSI adapter
- 3 Adapter retainer and ground assembly
- 4 Processor board
- 5 Access cover fan cable
- 6 System board
- 7 Power supply
- 8 Internal SCSI Device power cable
- 9 SCSI or non-SCSI option device (bay 2)
- 10 Option SCSI device bays
- 11 SCSI hard disk drive
- 12 Drive retainer
- 13 Option diskette drive (bay 1)
- 14 Diskette drive (bay 0).

PICTURE 54

18.4 Internal Cables

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

- 1 Information-panel cable
- 2 External SCSI device cable connector
- 3 System board
- 4 Access Cover Fan
- 5 Power supply
- 6 Device power cables
- 7 SCSI-internal cable (signal)
- 8 Diskette-drive cable (signal & power).

PICTURE 55

18.5 System Board

- 1 32-bit expansion slots (video extensions J9, J11)
- 2 Processor-board slot
- 3 Serial port
- 4 Parallel port
- 5 Access cover fan connector (J28)
- 6 Pointing-device connector
- 7 Keyboard connector
- 8 Memory-module connectors
- 9 Power-supply connector
- 10 Override jumper connector (J16)
- 11 Battery connector
- 12 Diskette-drive cable connector
- 13 Information-panel cable connector.

PICTURE 56

19.0 Grounds

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

PICTURE 57