IBM PC Servers

Hardware Maintenance Manual

March 1996

**Use this manual with the
PS/2 Hardware Maintenance Manual**

IBM

Second Edition (March 1996)

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About This Supplement

This supplement contains diagnostic information, Symptom-to-FRU Indexes, service information, error codes, error messages, and configuration information for the following PC Servers and Expansion Enclosures.

- 300 Type 8640
- 310 Type 8639
- 320 Type 8640
- 500 Type 8641
- 500 System/390 Type 8641
- 520 Type 8641
- 720 Type 8642
- SCSI Multi-Storage Enclosure Type 3517
- Enterprise Expansion Enclosure Type 3518

This supplement should be used with the advanced diagnostic tests and the information in the IBM *Personal System/2 Hardware Maintenance Manual* (part number 83G8990, form number S52G-9971) to troubleshoot problems effectively.

Important

This manual is intended for trained servicers who are familiar with IBM PC Server products.

Before servicing an IBM product, be sure to review "Safety Information" on page 456.

Related Publications

The following publications are available for IBM products. For more information, contact IBM or an IBM Authorized Dealer.

For Information About	See Publication
PS/2 Computers	IBM Personal System/2 Hardware Maintenance Manual (S52G-9971)
PS/ValuePoint Computers	IBM PS/ValuePoint Hardware Maintenance Service and Reference (S61G-1423)
Laptop, Notebook, Portable, and ThinkPad Computers (L40, CL57, N45, N51, P70/P75, ThinkPad 300, 350, 500, 510, 710T, Expansion Unit, Dock I, Dock II)	IBM Mobile Systems Hardware Maintenance Manual Volume 1 (S82G-1501)
ThinkPad Computers (ThinkPad 340, 355, 360, 370, 700, 701, 720, 750, 755)	IBM Mobile Systems Hardware Maintenance Manual Volume 2 (S82G-1502)
ThinkPad Computers (ThinkPad 365, 760)	IBM Mobile Systems Hardware Maintenance Manual Volume 3 (S82G-1503)
Monitors (Displays) (February 1993)	IBM PS/2 Display HMM Volume 1 (SA38-0053)
Monitors (December 1993)	IBM Color Monitor HMM Volume 2 (S71G-4197)
IBM Monitors (P Series) (February 1996)	IBM Monitor HMM Volume 3 (S52H-3679)
IBM 2248 Monitor (February 1996)	IBM Monitor HMM Volume 4 (S52H-3739)
Disk Array technology overview and using the IBM RAID Configuration Program	Configuring Your Disk Array booklet (S82G-1506)
Installation Planning for Personal System/2 computers	Personal System/2 Installation Planning and Beyond (G41G-2927)
Installation Planning for Advanced Personal System/2 Servers	Advanced PS/2 Servers Planning and Selection Guide (GG24-3927)

Contents

General Checkout/Diagnostics QAPlus/PRO

The following Maintenance Analysis Procedure (MAP) and diagnostic information should be used to isolate problems on servers that are supported by the QAPLus/PRO Diagnostics test.

General Checkout (QAPlus/PRO)

This general checkout procedure is for computers that are supported by the QAPlus/PRO Diagnostics test.

Diagnostic error messages appear when a test program finds a problem with a hardware option. For the test programs to properly determine if a test *Passed*, *Failed*, or *Aborted*, the test programs check the error-return code at test completion. (See "Return Codes" on page 7.)

General error messages appear if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.

Notes

1. If multiple error codes are displayed, diagnose the first error code displayed.

2. If the computer hangs with a POST error, go to the "Symptom-to-FRU Index" for the system you are servicing.

3. If the computer hangs and no error is displayed, go to "Undetermined Problems" on page 552.

4. If a device cannot be select from the Module Test menu, that device may be defective.

001

– Power-off the computer and all external devices.
– Check all cables and power cords.
– Set all display controls to the middle position.
– Insert the QAPlus/PRO Diagnostics diskette into drive A.
– Power-on all external devices.
– Power-on the computer.
– Check for the following responses:

1. One beep.
2. Readable instructions or the Main Menu.

DID YOU RECEIVE THE CORRECT RESPONSES?
Yes No

> **002**
>
> Find the failure symptom in the "Symptom-to-FRU Index" for the system you are servicing.

003

Run the Advanced Diagnostics Test. If necessary, refer to "Diagnostics (QAPlus/PRO)" on page 5.
If you receive an error, go to the "Symptom-to-FRU Index" for the system you are servicing.

Diagnostics (QAPlus/PRO)

The following tools are available to help identify and resolve hardware-related problems:

- Power-on self-test (POST)
- POST Beep Codes
- Test programs
- Error messages
- Diagnostics Diskette

Power-On Self-Test (POST)

Each time you turn on the system, it performs a series of tests that check the operation of the system and some options. This series of tests is called the *power-on self-test*, or *POST*. POST does the following:

- Checks some basic system-board operations
- Checks the memory operation
- Starts the video operation
- Verifies that the diskette drives are working
- Verifies that the hard disk drive is working

If the POST finishes without detecting any problems, a single beep sounds and the first screen of your operating system or application program appears.

If the POST detects a problem, an error message appears on your screen. A single problem can cause several error messages to appear. When you correct the cause of the first error message, the other error messages probably will not appear on the screen the next time you turn on the system.

POST Beep Codes

The Power On Self-Test generates a beeping sound to indicate successful completion of POST or to indicate that the tests detect an error.

One beep and the appearance of text on the display indicates successful completion of the POST. More than one beep indicates that the POST detects an error.

Test Programs

The QAPlus/PRO test programs, developed by DiagSoft for IBM, are the primary method of testing the PC Server. You can use them to test the IBM components of the system and some external devices. The amount of time required to test all components depends on the number of components. The more optional adapters and devices you have attached to your system, the longer the testing takes.

The test programs on the Diagnostic Diskette include the following features:

Feature	Description
Advanced Diagnostic Tests	Identifies most problems associated with the following major components: • System board • Hard disk drives • Diskette drives • CD-ROM drives • RAM • Serial and parallel ports • Video adapter • Printer • Keyboard • Mouse
Flexible Test Control	Allows you to: • Run groups of tests in batch • Specify parameters to use for each test (for example, video modes, disk cylinders, port addresses, and so on) • Specify the number of passes you want to run (one to continuous) • Log the test results to a text dBase (DBF) format file • Save all test settings for future use • View System Information • View the server's configuration information. (For example, you can view the IRQ/DMA assignments, memory usage, device drivers, and so on.) • Select System Utilities • Run a low-level format also contains system utilities. • Format a diskette

Error Messages

Messages generated by the software—the operating system or application programs—generally are text messages, but they also can be numeric. Basically, there are five types of error messages.

- POST error messages
- Diagnostic error messages
- POST beep codes
- Software generated messages.
- Multiple messages

Error Message	Description
POST Error Messages	Displayed when POST finds problems with the hardware or detects a change in the hardware configuration.
POST Beep Codes	Sounds emitted from the speaker if POST finds a problem. One beep indicates POST completed successfully. Multiple beeps indicate a problem was found by the POST.

Error Message	Description
Diagnostic Error Messages	Displayed when a test program finds a problem with a hardware option.
Software Generated Error Messages	Displayed if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.
Multiple Messages	The first error that occurs can causes additional errors. Follow the suggested action of the first error displayed. In this case, the system displays more than one error message. Always follow the suggested action instructions for the *first* error message displayed.

Return Codes

For the test programs to properly determine if a test *Passed*, *Failed*, or *Aborted*, the test programs check the error-return code at test completion. To register the test properly in the test log, the test programs must generate one of the following return codes:

Return Code	Description
0	Indicates that the device passed its test.
1	Indicated that the device failed its test.
2 or greater	Indicates that the test stopped or was aborted.

Using the Test Programs

The test programs provide advanced functions and utilities for power users and service or support professionals to troubleshoot even the most difficult problems.

Program Navigation: You can maneuver within the test programs by typing the first letter of a menu choice, using the function keys, or using command-line options.

Using the First Letter of a Menu Choice

Throughout the test programs, pressing the first letter of an option on a menu is the same as moving to that item with the cursor and pressing Enter; however, this function is not enabled on Test Group Screens.

Using the Function Keys

Use the following keys to maneuver throughout the test programs:

Keys	Action
Enter	Select an item, run the test module, or run the test
Down Arrow (↓)	Moves the cursor down
Up Arrow (↑)	Moves the cursor up
F1	Calls up the appropriate Help information. Use the up arrow key (↑) or the down arrow key (↓) to scroll through the information. Pressing F1 from within a Help screen provides a help index from which you can select different categories. One of the important help categories is function key usage. Pressing Esc exits Help and returns to where you left off.
Esc	Go back to the previous menu

Additional functions are available in the Test Module Selection screen and the Test Group screen using the following keys:

Keys	Action
Tab	Move to test group (or move to parameters)
Spacebar	Toggle modules on/off (or toggle tests on/off)
F2	View test results log
F10	Local menu
+	Next logical unit number (for example, LUN 1, LUN 2, and so on)
–	Previous logical unit number

Command Line Options

The following Command Line Options are available when initially starting the diagnostic program from within its directory.

Type **QAPLPRO/XXX** (where **/XXX** represents one of the following from the list below) then press Enter.

Command	Action
/B&W	The **/B&W** command line option forces the program to load in Black and White (Monochrome) mode, which is often more readable on laptop computers.
/LOG=file	The **/LOG=file** command line option directs the test programs to start using a specified Error Log file.
/INT10	The **/INT10** command line option forces the test programs to use the BIOS for screen writes.
/OXXX	The **/OXXX** command line option, where XXX=test group (for example, MBD/MEM/VID/HDU/FDU/KBD/COM/LPT, and so on), omits the designated test group from testing.
/USRCONFIG =file	The **/USERCONFIG=file** command line option tells the test programs to look for a user diagnostic configuration file other than the default USERDIAG.CFG.
/SCRIPT =file[,R]	The **/SCRIPT=file[,R]** command line option with the ",R" runs the selected script. Please see "Scripting" on page 10 for a description of scripting.
	Note: You can use a "–" instead of a "/" as the command line switch.

Viewing the Test Groups: As you move the cursor bar up or down in the Test Module Selection window, the right hand screen changes to show the attributes, parameters, and the selected tests of the corresponding Test Group. The diamond "♦" mark indicates a module selected for testing.

The indicated attributes are characteristics of the selected test module that are used by the test programs to determine which tests to run or how to run selected tests. Attributes are also used to limit the allowable range of parameters (for example, – ending cylinder).

Parameters are values you select to establish the scope of tests. For example, you can select Extended Memory testing parameters and limit the testing to a specific range of test blocks by specifying the starting and ending memory block. This might be appropriate if prior experience indicates that problems are likely to exist in a

specific area of memory. By selecting these limiting parameters, you reduce memory testing time.

Scripting: Scripting allows you to select specific groups of tests, testing parameters, and options. Your selection is saved for later use as a test *Script*. To set up a test script, first select all the appropriate test groups and specific tests you want to run from the Module Testing section under Diagnostics. You should also select appropriate testing parameters and options. See "Program Navigation" on page 8, for instructions to save a test script.

Changing Logical Unit Numbers: In some instances, you can have more than one logical unit number (LUN) for a particular module. LUNs represent individual devices within a test group or module. For example, you might have two diskette drives or two hard disk drives; or, you might have base, extended, shadow, and cache memory installed in the computer. This configuration might result in as many as four or five different LUNs in the Memory Test Group. Or you might have base, extended, shadow, and cache memory installed in the system which might result in as many as four or five different LUNs in the Memory Test Group.

From either the Module Test Menu or the Test Group window, you can change to a different LUN (where applicable) by pressing the plus (+) key (next LUN), or the minus (−) key (previous LUN).

Test Group Specifications: In the upper-right-hand portion of the testing screen (or just the upper portion if you switched to an individual test group screen) are the specifications for the related test group.

Note: In the Hard Disk Test Group specification area, if a software program was to compress your drive, the indicated size is the compressed size of the logical drive.

Starting the QAPlus/PRO Diagnostics Diskette

1. Insert the QAPlus/PRO Diagnostics Diskette into drive A.
2. Power-on the computer.
3. When the QAPlus/PRO Diagnostics **Main Menu** is displayed, press **Ctrl+A**.
4. Select Diagnostics; then, press **Enter**.
5. Follow the instructions that appear on your screen. If an error is displayed, go to the "Symptom-to-FRU Index" for the system you are servicing.

Module Testing Mode

If the test programs do not find a problem, or you want to perform in-depth testing, the Module Testing mode provides a method to run individual tests on a single module. For example, you can run an individual test for the diskette drive, or you can run groups of tests for several modules.

In the Module Testing mode, you can define how many times each test should run and how the test program should log the errors.

To start the Module Testing mode:

1. Start the diagnostics diskette. See "Starting the QAPlus/PRO Diagnostics Diskette" on page 10.
2. Select **Diagnostic** from the Main Menu.
3. Select **Module Tests** from the next menu.
4. Use the up and down arrow keys (↑ and ↓) to move the highlight bar from one selection to the next.
5. Follow the instructions on the screen.

Note: As you scroll down the selection menu, the Test Group window to the right changes to correspond to the highlighted Module.

Running Selected Module Tests

To run all selected tests for a test group:

1. Use the up and down arrow keys (↑ and ↓) to move the cursor to your selection.
2. Press **Enter**.

Note: A "♦" appears next to your selection.

Running All Selected Modules

To run all selected test modules:

1. Use the down arrow key (↓) to move the cursor to the last choice, **Run All Selected Modules**.
2. Press **Enter**.

Note: A "♦" appears next to your selection.

Changing Selected Tests in Test Groups

To change selected tests in a Test Group:

1. In the Module Tests Menu, use the up and down arrow keys (↑ and ↓) to move the cursor to your selection.
2. Press **Tab** to move into the expanded Test Group window.
3. Scroll to the test you want to select or deselect.

   Warning: Items indicated by a directly adjacent "*" (**red** text on color screens) are destructive tests.

4. Press the spacebar at the highlighted test to toggle between select (indicated by a "♦") and deselect.

Note: Pressing the first letter of a test does not activate the test, unlike menu operation.

5. Press **Enter**.

Running an Individual Test

To run an individual test:

1. Use the up and down arrow keys (↑ and ↓) to move to the highlighted bar to the test you want to run.
2. Press **Enter** to run the test.

   Note: The results of the test appear in the lower-right-hand Test Log window. Also, if you enabled Test Logging, the results are recorded in the Test Log.

3. When the test completes, press Esc to return to the Test Group Menu.

Stopping the Tests: To stop running a specific test or stop testing after you have started a test, press Esc while the test is running. The test pauses at the first possible opportunity, and the Skip/Abort Test Menu appears with the following options:

Option	Action
Continue	The test program begins testing where it left off.
Skip to next test	The test program skips the current test, but remaining tests for the selected Test Module continue.
Skip to next group	The test program skips the remaining tests in the current test group.
Abort all tests	The test program stops and returns to the previous menu.

QAPlus/PRO Diagnostics Control Keys: The following is a list of the QAPlus/PRO Diagnostics Control Keys, when used and a description of the diagnostics response.

Control Keys	When Used	Diagnostics Response
Ctrl+A	Main Menu	Allows you to select test from the sub menus that are highlighted with red letters. ⎯ **Attention** ⎯ If selected, these tests will erase the information stored on the diskette or hard disk drive.

Control Keys	When Used	Diagnostics Response
Up and Down Arrow Keys	Main Menu Module Test Menu Test Group Menu	Highlights an item you want to select.
Space Bar	Module Test Menu Test Group Menu	Adds a diamond to the left of the highlighted test. The test will run when **Run All Selected** is highlighted and the Enter key is pressed. Also removes the diamond to the left of the item. The test will not run when **Run All Selected** is highlighted and the Enter key is pressed.
Tab Key	Main Menu Module Test Menu	Selects the additional test for the menu you are in.
+/− Keys	Test Group Menu	Selects additional test. The LUN displayed on the top right Test Group Menu shows which test is selected and how and remain (example LUN 1 of 2).

PC Server 300 - Type 8640

Features

The following table contains the features for PC Server 300 - Type 8640 computers.

Machine Type	Feature	Description
8640-0N0, 1N0	Processor Video Slots/Bays Memory Selectable Startup Hard Disk Drive	486DX2-66MHz VGA/SVGA [1] 8/9 8/128MB Yes Shipped to order or without a drive
8640-0NJ, 1NJ	Processor Video Slots/Bays Memory Selectable Startup Hard Disk Drive	486DX2-66MHz VGA/SVGA [1] 8/9 8/128MB Yes 728MB IDE
8640-0P0, 1P0	Processor Video Slots/Bays Memory Selectable Startup Hard Disk Drive	Pentium-60MHz VGA/SVGA [1] 8/9 16/192MB Yes Shipped to order or without a drive
8640-0PT, 1PT	Processor Video Slots/Bays Memory Selectable Startup Hard Disk Drive	Pentium-60MHz VGA/SVGA [1] 8/9 16/192MB Yes 1GB SCSI
[1] SVGA for AP and EMEA only.		

Diagnostics and Test Information

The following list contains problems and references for diagnosing a PC Server 300 Type 8640.

> **Notes**
>
> - The QAPlus/PRO diagnostic program recognizes the primary processor as LUN 1 and the secondary processor as LUN 2. During testing the program automatically tests LUN 1. You must select LUN 2 if you want the program to test the secondary processor.
> - The type of DASD diagnostics required to test the hard disk controller (adapter) and drives is determined by the type of hard disk adapter installed in the computer.
> - Always start with "General Checkout (QAPlus/PRO)" on page 4.

Problem	Reference
Error Codes/Error Messages	"Symptom-to-FRU Index" on page 32.
DASD Adapter Problems	For non-disk-array models, see "SCSISelect Utility Program" on page 547. SCSI-2 Fast/Wide PCI-Bus RAID Adapter, see "Disk Array Configuration" on page 461.
Memory	"Symptom-to-FRU Index" on page 32.
Power Supply Voltages	"Power Supply Voltages" on page 20.
Miscellaneous	"Symptom-to-FRU Index" on page 32.

Additional Service Information

The following additional service information is for the PC Server 300 Type 8640.

- "Adapters Supported"
- "Memory" on page 19
- "Power Supply Voltages" on page 20
- "Setup (BIOS Utility)" on page 21
- "System Utilities" on page 21
- "System Board Replacement" on page 24

Adapters Supported

The PC Server 300 - Type 8640 supports Industry Standard Architecture (ISA), Extended Industry Standard Architecture (EISA), and Peripheral Component Interconnect (PCI) adapters.

The connectors and the location of the components on the supported adapters are shown below.

Memory

The PC Server 300 - Type 8640 has four, 36-bit (72-pin) SIMM sockets on the system board. The system board can accommodate memory from 8MB up to 128MB (192MB on some models).

The following are the memory requirements for the PC Server 300 - Type 8640 computer:

- At least two SIMM sockets must be filled. Start with bank 0, then work your way up.
- The SIMMs must be rated at 70NS or better.
- Recommended that the SIMMs have tin-lead contacts.
- Banks 0 and 1 must have the same size memory installed.
- If memory is installed in banks 2 and 3, the memory for Banks 2 and 3 be the same size.

Power Supply Voltages

Note: Verify that the voltage-select switch (if applicable) is set for the correct voltage.

If the power-on indicator is not on, and if the power-supply fan is not running, check the power cord for proper installation and continuity.

If the power cord is OK, either the power supply is defective or a defective device is causing the power supply to shut off. Check the power supply voltages.

If the voltages are incorrect, replace the power supply. If the voltages are correct, and the Symptom-to-FRU index does not solve the problem, go to "Undetermined Problems" on page 552.

P1

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
5, 6	1	Power Good	
5, 6	2	+4.8V	+5.25V
5, 6	3	+11.52V	+12.60V
5, 6	4	−10.8V	−13.2V

P2

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
1, 2	3	−4.5V	−5.5V
1, 2	4	+4.8V	+5.25V
1, 2	5	+4.8V	+5.25V
1, 2	6	+4.8V	+5.25V

P3

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
4, 5, 6	1, 2, 3	+4.8V	+5.25V

P4 and P6

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2, 3	1	+4.8V	+5.25V
2, 3	4	+11.52V	+12.6V

P5, P7, and P8

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2, 3	1	+11.52V	+12.6V
2, 3	4	+4.8V	+5.25V

Setup (BIOS Utility)

You can start the Setup Utility program during the POST or in any DOS Full Screen. However, the procedure for starting the Setup Utility program during the POST depends on the machine type of the computer you are servicing.

Notes:

1. If a configuration error occurs during POST, press **F1** to bypass the error. (A configuration error message appears before the operating system loads.)

2. **Do not** start the Setup Utility while using the EISA Configuration diskette.

3. The EISA Configuration diskette must be used to configure computers that have a EISA configuration. For information on how to use the EISA Configuration diskette, refer to the documentation shipped with the system.

4. The procedure for starting the Set Utility will not work in an OS/2 DOS Window.

Starting Setup During the POST: To start the program during the POST do the following.

1. Power-On the computer.
2. During the POST memory test, press and then release the **Spacebar**; then press and release the **CTR+ALT+S** keys simultaneously.

System Utilities

The Diagnostic Diskette contains utilities for formatting diskettes, performing a low-level format on a hard disk, and editing.

Formatting Diskettes: To format a diskette within the Diagnostic programs, select one of the following options:

Format A: high density — 1.44MB

Format A: low density — 720KB

Format B: high density — 1.44MB

Format B: low density — 720KB

After selecting one of the above options to format a diskette, follow the instructions that appear on the screen.

Using the Low-Level Format Program:

Depending on the hard disk capacity, the Low-Level Format program could take up to two hours.

When To Use the Low-Level Format Program

Use the Low-Level Format program:

- When you are installing software that requires a low-level format

- When you get recurring messages from the test programs directing you to run the Low-Level Format program on the hard disk

- As a last resort before replacing a failing hard disk drive

Hard Disk Drive Preparation: When the Low-Level Format program is finished, restore to the hard disk all the files that you previously backed up.

1. Partition the remainder of the hard disk for your operating system. (The commands vary with the operating system. Refer to your operating-system manual for instructions.)

2. Format the hard disk using your operating system. (The commands vary with the operating system. Refer to your operating-system manual for instructions.)

3. Install the operating system.

You are now ready to restore the files.

File Editor: The File Editor is an ASCII text editor that uses simple function key commands.

To access the File Editor:

1. Select **File Editor** from the *Utility Menu*; then press **Enter**.

2. Insert a diskette into Drive A or Drive B before selecting the file you want to edit, then select the file you want to edit from the Files selection box.

3. Make your changes. The arrow keys move the cursor, and the function keys perform search and block editing functions. (See "File Edit Function Key Usage" on page 23.)

4. When you are done, press **F10** to update the file with the changes you made, or press **Esc** to quit the editing process without saving the changes.

File Edit Function Key Usage The following information describes the function of the function keys and keyboard keys when you are using the File Editor.

Key	Description
Arrows	Move the cursor to the place in the text where you want to make changes.
Home	Press **Home** once, to move the cursor to the start of the current line. Press **Home** twice, to move to the beginning of the file. Press **Home** three times, to move to the beginning of the file.
End	Press **End** once, to move the cursor to the end of the current line. Press **End** twice, to move the cursor to the end of the current screen. Press **End** three times, to move the end of the file.
F2	Press **F2**. to be in search mode, You are prompted to enter the search word or words on a reverse highlighted line at the bottom of the File Edit Screen. After typing in the search word, press **Enter.**
F3	Press F3, to find the next occurrence of a search word.
F4	Press **F4**, to mark the start of a block of text (if you have not previously marked it). If you previously marked the block of text, pressing this key unmarks the text block.
F5	Press F5, to complete the block marking (started with F4). If you did not previously press **F4** to start marking a block of text, **F5** is ignored.
F6	Press **F6** while the cursor is within the active block to move an active (marked) block of text. Move the cursor to the new location where the active block is to be moved, then press **F6** again. If there is no active block of text, **F6** is ignored.
F7	To copy an active (marked) block of text to a new location, move the cursor to the new location and then press **F7**. If there is no active block of text **F7** is ignored.
F8	To delete an active (marked) block of text, move the cursor within the active block and press **F8.** If there is no active block of text, **F8** is ignored.

Key	Description
F10	Press **F10**, to save all changes and exit the file.

Notes:

1. Always make a backup copy on a self-starting diskette of the AUTOEXEC.BAT and CONFIG.SYS files *before* making any changes.

2. The default text editing mode of the File Editor is the insert mode. To toggle between overtype and insert modes, press Insert.

System Board Replacement

Type 8640 computers have one or two processors, and other components installed on the system board. When replacing the system board, remove all of the installed components from the old system board and install them on the new system board. If the problem remains, check the following:

- The primary processor is installed and seated correctly in socket U2 on the system board.
- If installed, the secondary processor is seated correctly in socket U3 on the system board.
- All other components removed from the old system board are installed and seated correctly on the new system board.

- **Note**

If the processor(s) are not seated correctly, intermittent problems can occur.

Locations (486DX2 System Board)

1	Memory connectors (U31, U32, U33, and U34)
2	Processor socket
3	ISA-IDE hard disk drive LED jumper (W46)
4	PCI-IDE hard disk drive LED jumper (W39)
5	Power LED pins 1-3 (W12)
6	Speaker connector (J5)
7	EISA slots (J12, J13, J14, 15, and J16)
8	PCI slots (J18, J19, and J20)
9	Mouse port (J2)
10	PCI-IDE hard disk drive connector (J21)
11	Keyboard port (J1)
12	Serial port, COM1 (J11)
13	Power supply connector, P2 (J7)
14	Power supply connector, P1 (J6)
15	Serial port, COM2 (J10)
16	Parallel port (J8)
17	Diskette drive connector (J9)
18	Real-time clock socket
19	IDE 2 hard disk drive connector (J22)

Jumper Settings (486DX2 System Board)

A label (diagram) showing the following jumper locations is located on the top of the base frame assembly inside the system unit.

Jumper Settings (Central Processing Unit (CPU) Selection)

Jumper	Configuration	Setting
W2	486SX All other CPUs (Default)	Pins 2-3 1-2 & 3-4
W3	P24T CPU All others CPUs (Default)	Not installed Installed
W16	25MHz 33MHz (Default)	Not installed Installed
W20	25MHz 33MHz (Default)	Installed Not installed
W33	DX4 DX4 internal double clock 468SX, DX2, DX, and DX4 internal clock tripler (Default)	Pins 1-2 Pins 2-3 Not installed

ISA IDE Selection

Jumper	Configuration	Setting
W42	ISA IDE uses ISA IRQ 14 ISA IDE uses ISA IRQ 15	Pins 1-2 Pins 2-3
W43	ISA IDE uses DMA channel 6 ISA IDE uses DMA channel 7 ISA IDE uses P10 transfer (Default)	Pins 1-2 Pins 2-3 Not installed

Keyboard Selection

Jumper	Configuration	Setting
W10	PS/2 Mouse installed (Default) PS/2 Mouse not installed	Installed Not installed

Tag Selection

Jumper	Configuration	Setting
W24	7-Bit Tag 8-Bit Tag 9-Bit Tag (Default) Illegal	Not installed Installed Installed Not installed
W26	7-Bit Tag 8-Bit Tag 9-Bit Tag (Default) Illegal	Installed Installed Not Installed Not installed

BIOS Mode Selection

Jumper	Configuration	Setting
W6	BIOS in normal mode (Default) BIOS in boot recovery mode	Pins 2-3 Pins 1-2

DPU Selection

Jumper	Configuration	Setting
W17	DPU generate parity CPU generate parity	Pins 1-2 Pins 2-3
W18	DPU forces parity error DPU does not force parity error (Default)	Pins 1-2 Pins 2-3

PCI Port Selection

Jumper	Configuration
J20	PCI #1 (master/slave shared with EISA slot J17)
J19	PCI #2 (master/slave)
J18	PCI #3 (master/slave)

PCI Compilant IRQ Jumper Header

Jumper	Setting
J101	Open (Default) Pin 2: Route to ISA IRQ1 Pin 3: Route to ISA IRQ3 Pin 4: Route to ISA IRQ4 Pin 5: Route to ISA IRQ5 Pin 6: Route to ISA IRQ6 Pin 7: Route to ISA IRQ7 Pin 8: Route to ISA IRQ8 Pin 9: Route to ISA IRQ9 Pin 10: Route to ISA IRQ10 Pin 11: Route to ISA IRQ11 Pin 12: Route to ISA IRQ12 Pin 13: Route to ISA IRQ14 Pin 14: Route to ISA IRQ15

Cache Selections

Jumper	Configuration	Setting
W1	Secondary cache in write-through mode Secondary cache in write-back mode (Default)	Pins 1-2 Pins 2-3
W4	Internal cache in write-through mode (Default) Internal cache in write-back mode	Not installed Installed
W5	128KB of secondary cache 256KB of secondary cache (Default)	Not installed Installed

Jumper	Configuration	Setting
W21	Secondary cache not installed Secondary cache installed (Default)	Installed Not installed
W22	128KB of secondary cache 256KB of secondary cache (Default)	Installed Not installed
W23	128KB of secondary cache 256KB of secondary cache (Default)	Not installed Installed

PCI IDE Selection

Jumper	Configuration	Setting
W35	PCI IDE uses ISA IRQ 14 (Default) PCI IDE does not use ISA IRQ 14	Installed Not Installed
W37	PCI IDE uses PCI INTR_A (Default) PCI IDE does not use PCI INTR_A (Default)	Installed Not Installed
W38	PCI uses ISA IRQ 15 PCI does not use ISA IRQ 15 (Default)	Installed Not Installed

Reserved Jumpers

Jumper	Setting
W8	Installed

Locations (Pentium System Board)

1	Memory connectors (J7, J8, J9, J10, J33, and J34)
2	IDE hard disk drive LED connector (W10)
	IDE hard disk drive adapter connector
3	Power LED connector (W9)
4	Speaker connector (J11)
5	Processor socket
6	EISA slots (J23, J24, J25, J26, J27, J28)
7	PCI slots (J30, J31, and J32)
8	Mouse port (J15)
9	Keyboard port (J14)
10	Serial port, COM1 (J20)
11	Power supply connector P1 (J12)
12	Power supply connector, P2 (J17)
13	Serial port, COM2 (J21)
14	Parallel port (J18)
15	Real-time clock socket
16	Diskette drive connector (J19)
17	Power supply connector, P3 (J37)
18	IDE 2 hard disk drive connector (J22)
	IDE hard disk drive adapter connector

Jumper Settings (Pentium System Board)

A label (diagram) showing the following jumper locations is located on the top of the base frame assembly inside the system unit.

Parity Check Selections

Jumper	Configuration	Setting
J1	Pentium parity check enabled (Default)	Installed
	Pentium parity check disabled	Not installed

DRQ Selection

Jumper	Configuration	Setting
W14	DRQ6	Pins 1-2
	DRQ7	Pins 2-3

Secondary Cache Selection

Jumper	Configuration	Setting
J40	5 volts for the Pentium	Installed: Jumper blocks (all pins)
	5.3 volts for the Pentium	Installed: Power module

Jumper	Configuration	Setting
J41	5.3 volts for ground	Installed: Power module (ground)
J42	5.3 volts for ground	Installed: Power module (ground)

Default Settings

Jumper	Default Setting
J3	Pins 2-3
J4	Pins 1-2
J35	Pins 1-2

Cache Selections

Jumper	Configuration	Setting
J2	Pentium write-through cache Pentium write-back cache (Default)	Installed Not installed

DACK Selection

Jumper	Configuration	Setting
W16	DACK 6 DACK 7	Pins 1-2 Pins 2-3

Keyboard Selection

Jumper	Configuration	Setting
W6	PS/2 Mouse installed (Default) PS/2 Mouse not installed	Installed Not installed

Clock Selection

Jumper	Configuration	Setting
J5	66MHz clock speed (Default) 50MHz clock speed	Installed Not installed

Pentium Clock Selection

Jumper	Configuration	Setting
J6	Oscillator for U15 (Default) Clock synthesizer	Pins 1-2 Pins 2-3

BIOS Mode Selection

Jumper	Configuration	Setting
W2	BIOS in boot recovery mode	Pins 1-2
	BIOS in normal mode (Default)	Pins 2-3

Secondary Cache Selection

Configuration	J3	J4	J35
No secondary cache	Pins 1-2	Pins 1-2	—
Reserved	Pins 1-2	Pins 2-3	—
256KB secondary cache	Pins 2-3	Pins 1-2	Pins 1-2
512KB secondary cache	Pins 2-3	Pins 2-3	Pins 2-3

W17 IRQ Selection

Selection	Setting
Redirect modified PCI interrupt to IRQ 5	Pins 1-2
Redirect modified PCI interrupt to IRQ 9	Pins 3-4
Redirect modified PCI interrupt to IRQ 10	Pins 5-6
Redirect modified PCI interrupt to IRQ 11	Pins 7-8
Redirect modified PCI interrupt to IRQ 15	Pins 9-10
Redirect modified PCI interrupt to IRQ 14	Pins 11-12

Reserved Jumpers

Jumper	Setting
W20	Pins 2-3
J5	Installed
J6	Pins 1-2

Symptom-to-FRU Index

This index supports the PC Server 300.

Always start with "General Checkout (QAPlus/PRO)" on page 4.

The Symptom-to-FRU Index lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this index to help you decide which FRUs to have available when servicing the computer.

In the following error codes, X can be any number or letter.

> **Note**
>
> For IBM devices not supported by the QAPlus/PRO diagnostics code, refer to the manual for that device.

For information on:	Go to:
Additional service help. (For example 0S/2 Trap errors)	"Related Service Information" on page 453)
Possible software and hardware mismatch problems. (Not repairable by replacing FRUs).	"Software/Hardware Mismatch Problems" on page 550
Power supply problems.	"Power Supply Voltages" on page 20

No Beep Symptoms

No Beep/Symptom	FRU/Action
No beep, fan runs, and 000**215**XX is displayed. (Check memory)	1. **System Board Memory** 2. Processor 3. System Board
No beep, fan runs, and 000**258**XX is displayed. (Check memory)	1. **System Board**
No beep and the computer is otherwise functional.	1. **Speaker Assembly** 2. Processor 3. System Board
No beep and the computer is not functional See "Undetermined Problems" on page 552.	1. **System Board** 2. Power Supply
No beep, fan runs, power-on LED lights, memory may or may not count, and blinking cursor continuously loops.	1. **Processor** 2. System Board
No beep, power-on indicator does not come on, and fan does not run.	1. **Switch Assembly** 2. Power Supply 3. Processor 4. System Board 5. Any Device or Adapter
No beep, fan runs, power-on indicator is on, and computer hangs during POST. (See "Undetermined Problems" on page 552.)	1. **System Board** 2. Processor 3. Power Supply

Beep Symptoms

Beeps symptoms are short tones or a series of short tones separated by pauses (intervals without sound). (X can be any number.)

Examples:

Beeps	Description
4	Four continuous beeps
1-2-X	• One beep • A pause (or break) • Two beeps • A pause (or break) • Any number of beeps

Beep/Symptom	FRU/Action
4	1. **Video Adapter** 2. System Board
1-1-3 CMOS read/write error	1. **Run Setup. (See, "Setup (BIOS Utility)" on page 21)** 2. System Board
1-1-4 ROM BIOS check error	1. **System Board**
1-2-X DMA error	1. **System Board**
1-3-1 RAM refresh verification error	1. **System Board**
1-3-X (not listed above) The first 64KB RAM module failed.	1. **Memory Module** 2. System Board
1-4-X An error was detected in the first 64KB of RAM.	1. **Memory Module** 2. System Board
2-1-X The first 64KB of RAM failed.	1. **Memory Module** 2. System Board
2-2-X The first 64KB of RAM failed.	1. **Memory Module** 2. System Board
2-3-X The first 64KB of RAM failed.	1. **Memory Module** 2. System Board
2-4-X The first 64KB of RAM failed.	1. **Memory Module** 2. System Board
3-1-X The DMA register failed.	1. **System Board**

Beep/Symptom	FRU/Action
3-2-4 The keyboard controller failed.	1. **System Board** 2. Keyboard
3-3-4 Screen initialization failed.	1. **Video Adapter** 2. System Board 3. Display
3-4-1 The screen retrace test detected an error.	1. **Video Adapter** 2. System Board 3. Display
3-4-2 POST is searching for video ROM.	1. **Video Adapter** 2. System Board

Error Codes

Error Code/Symptom	FRU/Action
0000 SCSI Adapter not enabled.	1. Be sure the adapter Device and Bus Master fields are enabled in the PCI configuration program. Refer to the documentation that was shipped with the computer.
002X	1. **SCSI Adapter**
008X Check for proper installation of SCSI terminators.	1. **Check SCSI terminators for proper installation** 2. SCSI Cable 3. SCSI Terminator 4. SCSI Device 5. SCSI Adapter
0115 Protected mode cannot be enabled.	1. **System Board**
0164 POST detected a base memory or expansion memory size mismatch.	1. **Run Setup and ensure the memory size is correct. (See, "Setup (BIOS Utility)" on page 21)** 2. Run the Expanded Memory Diagnostic tests.
0601 Diskette configuration error	1. **Set Configuration**
0610 Cannot find diskette controller for drive A.	1. **Diskette Drive** 2. Diskette Drive Cable 3. Diskette Drive Adapter, if installed 4. System Board
0612 Cannot find diskette controller for drive B.	1. **Diskette Drive** 2. Diskette Drive Cable 3. Diskette Drive Adapter, if installed 4. System Board
0616 Diskette drive reset failed.	1. **Diskette Drive Adapter**
0632 Diskette drive 0 seek failure	1. **Diskette Drive A**
0642 Diskette drive 1 seek failure	1. **Diskette Drive B**
0653 Diskette not formatted or defective	1. **Format diskette** 2. Diskette

Error Code/Symptom	FRU/Action
0655 Diskette drive controller failed.	1. **Diskette Drive** 2. Diskette Drive Cable 3. Diskette Drive Adapter, if installed 4. System Board
107X Check for proper installation of SCSI terminators.	1. **Check SCSI terminators for proper installation** 2. SCSI Cable 3. SCSI Terminator 4. SCSI Device 5. SCSI Adapter
1701 Hard disk drive failed. Press F1 to restart the system.	1. **Hard Disk Drive**
1702 Hard disk drive controller error.	1. **Hard Disk Drive Adapter, if installed** 2. System Board
1704 Hard disk drive configuration error, controller failed.	1. **Hard Disk Drive Adapter, if installed** 2. System Board
1715 The Hard Disk Drive Configuration information is not correct.	1. **Run Setup and enter the correct hard disk drive information.. (See, "Setup (BIOS Utility)" on page 21**
1726 Hard disk drive read error Press F1 to restart the system.	1. **Hard Disk Drive**
182X	1. **SCSI Adapter**
190X Ensure that each SCSI device is properly installed and powered-on.	1. **SCSI Cable** 2. SCSI Terminator 3. SCSI Device 4. SCSI Adapter
1XXX (not listed above)	1. **SCSI Adapter**
221X Ensure that each SCSI device is properly installed and powered-on.	1. **SCSI Cable** 2. SCSI Terminator 3. SCSI Device 4. SCSI Adapter
222X, 224X	1. **SCSI Adapter**
2401 The monochrome/color switch is not set correctly.	1. **Correct the switch setting** 2. Display Adapter
3XXX Check for proper installation of SCSI terminators.	1. **Check SCSI terminators for proper installation** 2. SCSI Cable 3. SCSI Terminator 4. SCSI Device 5. SCSI Adapter

Error Code/Symptom	FRU/Action
4XXX Ensure that each SCSI device is properly installed and powered-on.	1. **SCSI Cable** 2. SCSI Terminator 3. SCSI Device 4. SCSI Adapter
6XXX	1. **SCSI Device**
GP_COM The serial port test detected an error.	1. **System Board**
GP_FDU The diskette drive test detected an error.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable 4. Diskette
GP_HDU The hard disk drive test detected an error.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
GP_KBD The keyboard test detected an error.	1. **Keyboard** 2. System Board
GP_MBD The system board test detected an error.	1. **System Board** 2. Processor 3. Real-Time Clock Assembly
GP_MEM The memory test detected an error.	1. Memory Module Kit 2. System Board
GP_PDV The mouse test failed.	1. **Mouse** 2. System Board
GP_PRT The printer test detected an error.	1. **Printer** 2. System Board 3. Printer Cable
GP_VID The video test detected an error.	1. **Video Adapter** 2. System Board 3. Color Display
GRPCDR The CD-ROM test detected an error.	1. **CD-ROM**

Error Messages

Error Message/Symptom	FRU/Action
Arithmetic Functions Failed An error was detected during the CPU Test.	1. **Microprocessor** 2. System Board
Base Memory Test Failed An error was detected in base memory.	1. **Memory Module** 2. System Board
Battery Error	1. **Replace the battery and run Setup.** 2. System Board
Boot Sector Unreadable A boot sector read error was detected on the hard disk drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
Bus Noise Test Failed The RAM Test detected an error in the memory bus.	1. **Memory Module** 2. System Board
Butterfly Cylinder Access Test Failed The Hard Disk Drive Test detected mismatch between the data read and the data stored on the drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
Clock Stopped The real-time clock has stopped working.	1. **Real-Time Clock Assembly** 2. System Board
CMOS Clock Test Failed The Time and Date Settings for CMOS and DOS **do not** Match.	1. **Real-Time Clock Assembly** 2. System Board
COM Port Tests Failed Test failed with wrap plug attached.	1. **Serial Cable** 2. System Board
Controller Diagnostic Test Failed An error was detected while testing the Hard Disk Controller (Adapter).	1. **Hard Disk Drive Adapter (if installed)** 2. Hard Disk Drive 3. System Board
Cylinder 0 errors The test detected an error reading the first cylinder of the hard disk drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
Device is Not Ready Ready the Device... **or** **Press Any Key**	1. **Ensure the device is powered-on** 2. Replace failing device 3. Device Adapter (if installed) 4. System Board

Error Message/Symptom	FRU/Action
Disk Error Encountered Opening Output File Press Any Key To Continue.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
DMA #X Failed The Main Components Test detected an error while testing the DMA controller.	1. **System Board**
DMA Page Register Failed An error was detected while outputting all possible values to the DMA Page Register.	1. **System Board**
Door Is Open	1. **Close door on device being tested.** 2. Device being tested 3. System Board
Drive (x) Media (y) Mismatch The capacity listed for the drive in the File Allocation Table ID does not match the calculated capacity of the drive.	1. **Check diskette and diskette drive capacity.** 2. Diskette Drive 3. System Board
EISA Configuration NVRAM Bad	1. Replace battery, then run Setup. 2. System Board
Error in video buffer. Bad bits The video memory test failed.	1. **Video Adapter** 2. System Board 3. Display
Exception Interrupt In Protected Mode Diags Cannot Continue Server error, all system tests will stop. Remove one adapter at a time until the symptom goes away.	1. **Any Adapter** 2. System Board 3. Processor
Extended Memory Test Failed An error was detected in Extended Memory.	1. **Memory Module** 2. System Board
FF Stuck Key Keyboard error	1. **Keyboard** 2. System Board
Floppy Drive Failed One or more diskette drives failed.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable
General Function Failed Remove one adapter at a time until the symptom goes away.	1. **Any Adapter** 2. System Board 3. Processor

Error Message/Symptom	FRU/Action
Hard Drives Failed One or more of the Hard Disk Drive tests detected an error.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
Incorrect DOS version	1. **Ensure you are using DOS version 3.0 or higher.**
Insert A Data Disk	1. **Insert a known good data disk into the CD-ROM.** 2. CD-ROM Drive 3. System Board 4. CD-ROM Cable
INT Mask Register Failed The INT Mask Register tests detected an error.	1. **Microprocessor** 2. System Board
Invalid Date The back-up clock and DOS dates do not match.	1. **Real-Time Clock Assembly** 2. System Board
Invalid Time The back-up clock and DOS time of day settings do not match.	1. **Real-Time Clock Assembly** 2. System Board
Keyboard Error One or more keys do not operate correctly.	1. **Keyboard** 2. System Board
Linear Cylinder Access Test Failed Hard disk drive error. The redundancy check of the sectors read does not match the information on the drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
Logic Function Failed The CPU Logic Test has detected an error.	1. **Microprocessor** 2. System Board
Loopback Error An error occurred during the COM Port Test or Parallel Port Test. **Note:** A wrap plug must be installed to successfully complete these tests.	1. **System Board** 2. Wrap Plug
Main Components Failed A component failure was detected on the system board.	1. **System Board** 2. Processor
Memory test cannot run at this location in memory Not enough free memory available to start the memory test.	1. **Memory Module** 2. System Board

Error Message/Symptom	FRU/Action
Missing QAPlus/PRO Files(s) One or more Diagnostic support files are missing.	1. **Diagnostic Diskette**
NO LOOP-BACK PLUG. Skipping External loopback test No wrap plug installed.	1. **Install wrap plug on the serial port, rerun test.** 2. System Board
Not ready Printer not on-line or not ready.	1. **Ready Printer** 2. Printer 3. Printer Cable 4. System Board
Not ready error, ready drive A DMA Transfer test error	1. **Ensure that a known good formatted diskette is in drive a, then rerun the test.** 2. System Board
No 'type-amatic' repeat **Note:** At least one repeat key must be tested during this test or an error will occur. The Type-amatic test detected an error.	1. **Keyboard** 2. System Board
Not used by any standard device The IRQ is not currently being used by a non-standard device.	1. **System Board**
Numeric Proc Failed The NPU TEST detected an error.	1. **Microprocessor** 2. System Board
Parallel Ports Failed Test Report Summary message.	1. **System Board**
Pass (N): ** Errors ** Drive (X) Failed The read/write test failed on the diskette drive.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable
Pass (N) Drive Not Ready The diskette drive door is open or defective.	1. **Ensure diskette drive is ready.** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Pass (N): Drive (X) Write Protected or Unformatted	1. **Insert a non-write protected, formatted diskette into the diskette drive; the rerun the test** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable

| Error Message/Symptom	FRU/Action
Pass (N): Unknown Media Drive (X) Diskette Drive Test error. The File Allocation Table ID on the diskette is invalid.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Place Hi-density Media in Drive The capacity of the diskette installed in the diskette drive is less then the capacity of the drive.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Printer Failed Ensure the printer is powered-on and ready.	1. **Printer** 2. Printer Cable 3. System Board
Printer Fault Ensure the printer is powered-on and ready.	1. **Printer** 2. Printer Cable 3. System Board
Printer Not Selected Ensure the printer is powered-on and ready.	1. **Printer** 2. Printer Cable 3. System Board
Program or File Not Found **Press Any Key** The diagnostics cannot find the USER(N).COM file.	1. **Diagnostic Diskette** 2. Diskette Drive 3. System Board
Program Too Big To Fit In Memory Too many Terminate and Stay Resident programs in memory while loading diagnostics.	1. **Reboot the system from the Diagnostic Diskette**
QAPlus/PRO Cannot Be Re-run Because Of Error In Relocating Program Diagnostics failed to relocate the Diagnostics Test programs so the memory space it resides in was not tested.	1. **Diagnostic Diskette** 2. Memory Module 3. System Board
RAM Memory Error in Block n. Bad bits n An error was detected in RAM.	1. **Memory Module** 2. System Board
RAM Test Failed Test Result Summary message, Memory Test failed.	1. **Memory Module** 2. System Board
Read error on cylinder n Hard disk drive physical format error.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board

Error Message/Symptom	FRU/Action
Read Errors Diskette drive read error.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Receive Error Serial Port loopback test error.	1. **Serial Port Cable** 2. System Board
Refresh Failure The Diagnostics Test detected an error while testing the DMA controller's RAM refresh cycle.	1. **Memory Module** 2. System Board
RTC Interrupt Failure The Diagnostics Test cannot detect the Real-Time clock interrupt.	1. **Real-Time Clock Assembly** 2. System Board
Serial Chip Error COM Port error, general.	1. **Serial Port Cable** 2. System Board
Serial Compare Error COM Port error, information transmitted is not the same as information received.	1. **Serial Port Cable** 2. System Board
Serial Time-out Error COM Port error, time interval is too long between transmitted and received data.	1. **Serial Port Cable** 2. System Board
Serious Memory Error — **Diags Cannot Continue** Memory Test error.	1. **Memory Module** 2. System Board
Sorry You Need A Mouse The mouse or mouse driver was not detected.	1. **Mouse** 2. System Board
System Hangs (while loading a diagnostic test)	1. System Board
System Hangs Go to "Undetermined Problems" on page 552.	1. **Any device** 2. Any adapter 3. System Board
Too Many Errors — Test Aborted Too many errors, the Diagnostics Test cannot continue.	1. **Microprocessor** 2. System Board
Transmit Error Internal or external serial port loopback test failure.	1. **Serial Port Cable** 2. System Board
Unable To Detect CD-ROM	1. CD-ROM Drive 2. System Board 3. CD-ROM Cable

Error Message/Symptom	FRU/Action
Video Adapter Failed Test Result Summary, displayed if "Fail" was at the Quit/Fail/Pass menu of any video test.	1. **Video Adapter** 2. System Board 3. Display
Write error on cylinder n Hard disk drive write error.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed)
Write Errors Diskette drive write error.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Write Protected or Unformatted The diskette is Write Protected or not formatted.	1. **Insert a non-write protected, formatted diskette into the diskette drive; then rerun the test** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable

Miscellaneous Error Messages

Message/Symptom	FRU/Action
The Address Exceeds The Size Of Your Memory An invalid memory address was entered. The Diagnostics Tests display this message during the Locate Bad Chips option under the interact menu if an invalid memory address was entered at the at the "Enter Memory Address Of Bad Chip" prompt.	1. **Enter correct address** 2. Memory Module 3. System Board
That Number is Out Of Range An invalid bit number was entered. The Diagnostics Tests display this message during the Locate Bad Chips option under the interact menu if an invalid bit number was entered at the "Enter the Bad Bit" prompt.	1. **Enter correct number** 2. Memory Module 3. System Board
You Cannot Delete the Motherboard The "Remove Board" option was selected. The Diagnostics Tests display this message during the Locate Bad Chips option under the interact menu if the "Remove Board" option was selected while the system board was displayed.	1. **Make the correct selection** 2. Memory Module 3. System Board 4. Processor

Parts Listing
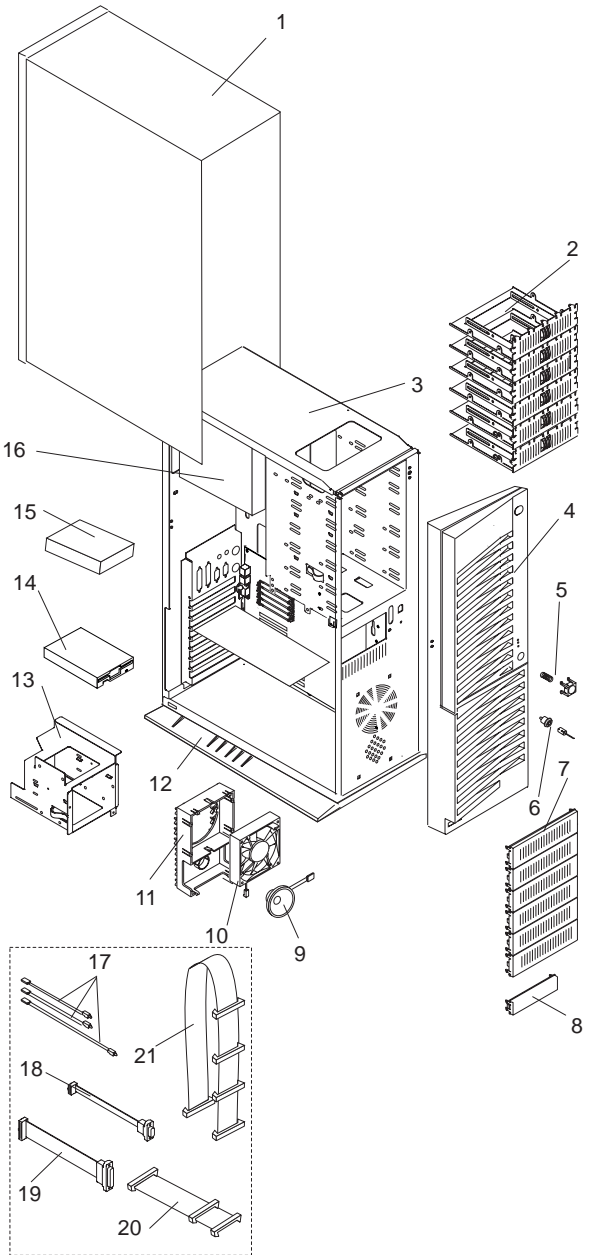
System

Index *System Unit (PC Server 300 - Type 8640)*

1	Access Cover	06H8930
2	3.5" Hard Disk Drive Tray(s) (1 each)	06H2652
3	Base Frame Assembly	06H8933
4	Front Bezel/Door Assembly	06H8935
	PC Server 300 Label	06H6003
5	Power Button (with spring)	06H2191
6	Keylock Assembly (with keys)	33F8433
7	Bezel (5.25" Blank)	71G0771
8	Bezel (3.5" Blank)	71G0770
9	Speaker	06H2649
10	Fan Assembly (with Connector)	06H2647
11	Card Guide	71G0757
12	Pedestal	96G2412
13	DASD 3-Drive Cage	06H8938
14	Diskette Drive (see DASD)	
15	Hard Disk Drive (see DASD)	
16	300W Power Supply with Switch	71G0044
	System Board, Pentium without Memory and Processor (Models 0P0, 0PT, 1P0, 1PT)	71G0747
	Processor Chip, Pentium 60MHz (Models 0P0, 0PT, 1P0, 1PT)	06H2680
	System Board, 486DX2-66 without Memory and Processor (Models 0N0, 0NJ, 1N0, 1NJ)	71G0033
	Processor Chip, 486DX2-66 (Models 0N0, 0NJ, 1N0, 1NJ)	06H2679
	4MB Memory SIMM, Parity (Models 0N0, 0NJ, 1N0, 1NJ)	73G3233
	8MB Memory SIMM, Parity (Models 0P0, 0PT, 1P0, 1PT)	73G3234
	16MB Memory SIMM (Parity)	60G2950
	32MB Memory SIMM (Parity)	73G3235
	486 Real-Time Clock with an internal battery (Models 0N0, 0NJ, 1N0, 1NJ), see "Battery Notice" on page 461	06H3397
	Pentium Real-Time Clock with internal battery (Models 0P0, 0PT, 1P0, 1PT), see "Battery Notice" on page 461	06H3398
	486 Heat Sink with Clip (Models 0N0, 0NJ, 1N0, 1NJ)	06H2179
	Pentium Heat Sink with Clip (Models 0P0, 0PT, 1P0, 1PT)	06H2180
	Keyboard with Cable, see "Keyboards (101/102 Key)" on page 50	
	Key/Lock Cable	06H8766

Keyboards (101/102 Key)

Arabic	1391490
Belgium-Dutch	1391414
Belgium-French	1391526
Bulgarian	1399583
Czech	1399570
Danish	1391407
Dutch	1391511
Finnish	1391411
French	1391402
German	1391403
Greek	1399046
Hebrew	1391408
Hungarian	1399581
Iceland	1391495
Italy	1393395
Latvia	1391406
Norwegian	1391409
Polish	1399580
Portuguese	1391410
Romanian	1399582
Russian-Cyrillic	1399579
Serbian-Cyrillic	1399578
Slovak	1399571
Slovenia/Croatia/Bosnia	1393669
South Africa	1396790
Spanish	1391405
Swedish	1391411
Swiss-French	1391412
Swiss-German	1391412
Turkish 179	8125409
Turkish 440	1393286
U.K. English	1391406
U.S. English	71G4646
U.S. English (E/ME/A use only)	1396790

Power Cords

Power Cords

Arabic	14F0033
Belgium	1339520
Bulgaria	1339520
Czech Republic	1339520
Denmark	13F9997
Finland	1339520
France	1339520
Germany	1339520
Hungary	1339520
Israel	14F0087
Italy	14F0069
Latvia	1339520
Netherlands	1339520
Norway	1339520
Poland	1339520
Portugal	1339520
Serbia	1339520
Slovakia	1339520
South Africa	14F0015
Spain	1339520
Switzerland	1339520
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	1339520

PC Server 310 - Type 8639

Features

> **Note**
>
> All PC Server computers have Selectable Startup.

Microprocessor

- Pentium microprocessor with 16KB of internal cache; clock rate varies by model

Cache Memory

- 256KB of level-2 cache

Memory

- Standard: 16MB (min.), expandable to 192MB
- 70 ns, parity
- Six single inline memory-module sockets in three banks

Diskette Drives

- Standard: One 3.5-inch, 1.44MB
- Optional (internal):
  - 3.5-inch, 2.88MB
  - 3.5-inch, 1.44MB

Hard Disk Drives

- Number and capacities of hard disk drives varies by model
- Supports up to three internal hard disk drives

CD-ROM Drive

- Standard: SCSI-2

Keyboard and Auxiliary Device

- 101-key keyboard
- Mouse

Expansion Slots

- Two 32-bit PCI slots; five 32-bit Micro Channel slots or five 16-bit ISA slots, depending on model. (The PCI slots and adjacent Micro Channel or ISA slots are shared slots.)
- The number of slots available for expansion varies by model.

Expansion Bays

- Two 5.25-inch drive bays
- Three 3.5-inch drive bays
- The number of bays available for expansion varies by model.

Video

- Super video graphics array (SVGA) controller
- Compatibility:
  - Video graphics adapter (VGA)
  - Color graphics adapter (CGA)

Security Features

- Bolt-down capability
- Door lock
- LogicLock security feature set
- Power-on and administrator passwords
- Selectable drive-startup

Upgradable POST and BIOS

- Upgradable EEPROM on the system board
- POST/BIOS upgrades (when available)

Input/Output Connectors

- Video port
- Two serial ports
- Parallel port
- Auxiliary device port
- Keyboard port
- SCSI-2 Fast/Wide PCI Adapter
    - One external port (8-bit)
    - One internal port (8-bit)
- Ethernet Adapter
    - 10Base-T
    - 10Base2
    - 10Base5

Power Supply

- 200 W with voltage switch (115–230 V ac)
- +3.3 V, ±5 V, and ±12 V outputs
- Built-in overload and surge protection

Diagnostics and Test Information

The diagnostic procedure required for servicing a PC Server 310 Type 8639 is determined by the architecture of the server.

- For ISA Models 0D0, 0DT, OXT, 0Z0, and OZT go to "General Checkout (Models 0XT, 0Z0, 0ZT, 0D0, 0DT)" on page 57.
- For Micro Channel Models MDT, MXT, and MZT to "General Checkout (Models MDT, MXT, MZT)" on page 59.

General Checkout (Models 0XT, 0Z0, 0ZT, 0D0, 0DT)

This general checkout procedure is for Type 8639 (Model 0XT, 0Z0, 0ZT, 0D0, 0DT) servers.

If you are servicing a Type 8639 (Models MDT, MXT, MZT) server, see "General Checkout (Models MDT, MXT, MZT)" on page 59.

Attention

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

Diagnostic error messages appear when a test program finds a problem with a hardware option. For the test programs to properly determine if a test *Passed*, *Failed*, or *Aborted*, the test programs check the error-return code at test completion. See "Return Codes" on page 72.

General error messages appear if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.

Notes

1. Before replacing any FRUs, ensure the latest level of BIOS is installed on the system. A down-level BIOS may cause false errors and unnecessary replacement of the system board. For more information on how to determine and obtain the latest level BIOS, see "BIOS Levels" on page 68.
2. If multiple error codes are displayed, diagnose the first error code displayed.
3. If the computer hangs with a POST error, go to "Symptom-to-FRU Index Supplement" on page 95.
4. If the computer hangs and no error is displayed, go to "Undetermined Problem" on page 83.
5. If a device is not highlighted on the Module Test menu, that device may be defective.

001

– Power-off the computer and all external devices.
– Check all cables and power cords.
– Set all display controls to the middle position.
– Insert the Diagnostics diskette into drive A.
– Power-on all external devices.

(Step **001** continues)

001 (continued)

- Power-on the computer.
- Check for the following responses:

    1. One beep.
    2. Readable instructions or the Main Menu.

DID YOU RECEIVE THE CORRECT RESPONSES?
Yes No

> **002**
>
> If Rapid Resume is displayed, do the following:
>
> 1. Disable Rapid Resume, See "Running Rapid Resume Manager" on page 73.
> 2. Run the Diagnostics tests.
> 3. Enable Rapid Resume after service is complete.
>
> – or –
>
> If the computer hangs during Rapid Resume, do the following:
>
> 1. Power-off; then, power-on the computer.
> 2. When the hard-disk drive activity light comes on, press **Ctrl+Alt+Del** to exit Rapid Resume and restart the computer. (Rapid Resume is now turned off.)
>
> – or –
>
> Go to the "Symptom-to-FRU Index Supplement" on page 95.

003

ARE ALL ADAPTERS AND DEVICES INSTALLED IN THE COMPUTER HIGHLIGHTED ON THE MODULE TEST MENU?
Yes No

> **004**
>
> Go to "Module Test Menu" on page 67.

005

Run the Advanced Diagnostics test. If necessary, refer to "Additional Service Information" on page 67.

- If you receive an error, go to "Symptom-to-FRU Index Supplement" on page 95.
- If the test stops and you cannot continue, replace the last device tested.
- If the computer has incorrect keyboard responses, go to "Keyboard" on page 515.
- If the printer has incorrect responses, go to "Printer" on page 524.
- If the display has problems such as jittering, rolling, shifting, or being out of focus, go to "Display" on page 490.

General Checkout (Models MDT, MXT, MZT)

This general checkout procedure is for Type 8639 (Models MDT, MXT, MZT) servers.

On Type 8639 (Models MDT, MXT, MZT) Micro Channel computers, you can start the advanced diagnostics programs in one of three ways:

1. From the PC Server 310 (Models MDT, MXT, MZT) Reference Diskette
2. From the PC Server 310 (Models MDT, MXT, MZT) Diagnostics Diskette
3. From the System Partition.

From the Reference Diskette: The Reference Diskette is bootable. Starting the diagnostic programs from the Reference Diskette allows you to test the options installed in the computer or test the base system.

To Test Options

> **Notes**
>
> 1. Ensure that Rapid Resume is disabled before starting this procedure.
> 2. If Rapid Resume is displayed during this procedure, see "Running Rapid Resume Manager" on page 73.
> 3. Re-run the Diagnostics tests.

To test the options installed in the computer, do the following.

1. Power-off the computer and all external devices.
2. Check all cables and power cords.
3. Set all display controls to the middle position.
4. Insert the Reference Diskette into drive A.
5. Power-on all external devices.
6. Power-on the computer.
7. Check for the following responses:
   a. One beep
   b. IBM Logo
   c. Readable instructions or the Main Menu
8. If you received the correct responses, press **Ctrl+A** (Test the Computer screen appears). Select **Options diagnostics** and follow the instructions on the screen.
9. If you **did not** receive the correct responses, go to "Symptom-to-FRU Index Supplement" on page 95.

To Test the Base System

```
- Notes ────────────────────────────

  1. Ensure that Rapid Resume is disabled before
     starting this procedure.
  2. If Rapid Resume is displayed during this
     procedure, see "Running Rapid Resume
     Manager" on page 73.
  3. Re-run the Diagnostics tests.
```

To test the base system, do the following:

1. Power-off the computer and all external devices.
2. Check all cables and power cords.
3. Set all display controls to the middle position.
4. Insert the Reference Diskette into drive A.
5. Power-on all external devices.
6. Power-on the computer.
7. Check for the following responses:
     a. One beep
     b. IBM Logo
     c. Readable instructions or the Main Menu
8. If you received the correct responses, do the
   following.
     a. Press **Ctrl+A**
        (Test the Computer screen appears).
     b. Select **System board diagnostics** and follow
        the instructions on the screen.
     c. When the QAPlus/Pro Main Menu appears,
        press **Ctrl+A**.
     d. Select **Diagnostics**.
     e. Select **Module Test**.
          • If the Module Test Menu is correct, run
            diagnostics.
          • If the Module Test Menu is not correct, go
            to "Module Test Menu" on page 67.
9. If you **did not** receive the correct responses, go to
   "Symptom-to-FRU Index Supplement" on page 95.

From the Diagnostics Diskette

Important

If the diagnostic program is started from the
diagnostics diskette, you **will not** have the option to
test the Micro Channel options installed in the
computer.

The Diagnostics Diskette is bootable. The procedure
for starting the Diagnostics Diskette when servicing a
Type 8639 server is the same for all models. See
"General Checkout (Models 0XT, 0Z0, 0ZT, 0D0,
0DT)" on page 57.

From the System Partition: Starting the
diagnostic programs from the System Partition gives you
the option of testing the options installed in the computer
or testing the base system.

To Test Options

Notes

---

1. Ensure that Rapid Resume is disabled before
   starting this procedure.
2. If Rapid Resume is displayed during this
   procedure, see "Running Rapid Resume
   Manager" on page 73.
3. Re-run the Diagnostics tests.

To test the options installed in the computer, do the
following.

 1. Power-off the computer and all external devices.
 2. Check all cables and power cords.
 3. Set all display controls to the middle position.
 4. Remove all media from the drives.
 5. Power-on all external devices.
 6. Power-on the computer.
 7. Check for the following responses:
    a. One Beep
    b. IBM Logo
 8. When the F1 prompt appears in the lower left-hand
    corner of the screen, press **F1** (the IBM logo appears,
    then the System Programs Main Menu).
 9. Press **Ctrl+A**
    (Test the Computer screen appears).
10. If you received the correct responses, select **Options**
    and follow the instructions on the screen.
11. If you **did not** receive the correct responses, reinstall
    the System Partition on the hard disk drive from the
    Reference Diskette.

To Test the Base System

> ---- **Notes** ----
> 1. Ensure that Rapid Resume is disabled before starting this procedure.
> 2. If Rapid Resume is displayed during this procedure, see "Running Rapid Resume Manager" on page 73.
> 3. Re-run the Diagnostics tests.

To test the base system, do the following.

1. Power-off the computer and all external devices.
2. Check all cables and power cords.
3. Set all display controls to the middle position.
4. Remove all media from the drives.
5. Power-on all external devices.
6. Power-on the computer.
7. Check for the following responses:
   a. One Beep
   b. IBM Logo
8. When the F1 prompt appears in the lower left-hand corner of the screen, press **F1** (a second IBM logo appears followed by the System Programs Main Menu).
9. If you received the correct responses, do the following:
   a. Press **Ctrl+A**
      (Test the Computer screen appears).
   b. Select **System board diagnostics** and follow the instructions on the screen.
   c. When the QAPlus/Pro Main Menu appears, press **Ctrl+A**
   d. Select **Diagnostics**.
   e. Select **Module Test**.
   f. If the Module Test Menu is correct, run diagnostics.
   g. If the Module Test Menu is not correct, go to "Module Test Menu" on page 67.
10. If you **did not** receive the correct responses, reinstall the System Partition on the hard disk drive from the Reference Diskette.

System Programs: The system programs are utility programs for Micro Channel computers that allow you to:

- Change the system configuration
- Set passwords
- Change the date and time
- Set power management features
- Test the computer

The programs are installed in a special protected area of the hard disk drive called the System Partition.

The System Partition appears on the FDISK and FDISKPM screens for DOS and OS/2, so that the partition can be

deleted and the disk space (about 6MB) can be used for other programs. Before you delete the System Partition, you must first use the **Back up/Restore system programs** option on the system programs Main Menu to make current copies of the Reference, Diagnostic, and QAPlus/Pro diskettes. Without the System Partition, you must use these diskettes to configure and diagnose the computer.

If the computer was manufactured without a hard disk drive, the system programs were provided on three diskettes:

- Reference Diskette
- Diagnostics Diskette
- QAPlus/PRO for IBM Diskette

Starting the System Programs: You can start the system programs from the hard disk drive or from the Reference Diskette.

If an error occurs during startup, the computer automatically starts the system programs to help you isolate and correct the problem. If you **do not** want the system programs to automatically start when an error occurs, change the **Bypass System Programs on error** setting in the system programs.

From the Hard Disk Drive: To start the system programs from the hard disk drive, do the following:

1. Remove all media from all the drives.
2. Power-off the computer; then, power it back on. (The IBM logo appears on the screen.)
3. When the F1 prompt appears, press **F1**. (A second IBM logo appears, followed by the system programs main menu.

From the Reference Diskette: To start the system programs from the Reference Diskette, do the following:

1. Power-off the computer.
2. Remove all media from the drives.
3. Insert the Reference Diskette into the primary diskette drive.
4. Power-on the computer.

After a few seconds, the IBM logo appears on the screen; then a second IBM logo screen appears, followed by the system programs main menu.

System Programs Main Menu: The following tables contain a listing of the System Programs Main Menu items followed by a description of the item.

Item	Description
Start operating system	Exits from the system programs and loads the operating system.
Back up/Restore system programs: • **Back up the system diskettes**	Makes a backup copy of the Reference, Diagnostic, and QAPlus/PRO diskettes.
• **Back up the System Partition**	Copies the system programs from the System Partition to the backup diskettes. Also creates backup Reference, Diagnostic, and QAPlus/PRO diskettes. You need at least three 2MB diskettes for the backup procedure.
• **Restore the System Partition**	Reinstalls the system programs from backup diskettes to the System Partition. Use this program to rebuild the System Partition in case of accidental loss or damage.
Update System Programs	Copies a new version of the system programs to the System Partition from an updated set of system diskettes.
Set Configuration	Views, changes, backs up, or restores the configuration information stored in the battery-backed memory. The configuration information consist of: • The amount of memory installed • The built-in features and their assignments • The installed options with their location and assignments
• **View configuration**	Displays the present configuration information for Micro Channel adapters and built-in features.
• **Change configuration**	Allows you to change the configuration of the Micro Channel adapters. You can also change the **Bypass System Programs** setting from this menu.
• **Back up configuration**	Copies the configuration information from the battery-backed memory to the hard disk drive.

Item	Description
• **Restore Configuration**	Retrieves the Micro Channel configuration copied by the Back up Configuration program and restores that information to the battery-backed memory.
• **Run Automatic Configuration**	Verifies and updates the configuration information for the Micro Channel adapters and built-in features.
• **Display memory map**	Displays the memory address assigned to the adapters.
• **Set and View Micro Channel SCSI devices**	Displays the existing Micro Channel device settings and allows you to make limited modification to some devices. Only the information enclosed in brackets ([...]) can be changed.
• **View PCI configuration**	Displays the current configuration of Peripheral Component Interconnect devices and adapters. Because PCI components are automatically configured each time the computer starts up, you cannot change these settings.
Set Features	
• **Set date and time**	Changes the date and time in battery-backed memory.
• **Set password and security features**	Helps prevent the use of the computer by unauthorized persons. Two types of passwords are available from this program: a power-on password and a privileged-access password.
• **Set keyboard speed**	Changes the speed at which a character repeats when a key is held down.
• **Set console**	Select this choice if the computer is going to be used as a server, without a keyboard.
• **Set startup sequence**	Allows you to specify the sequence of the drives that the computer will attempt to start from when you power it on.

Item	Description
• **Set power management features** **Note:** If similar power management features are set in the operating system, they will override these settings.	Allows you to change the settings for the following: • Rapid Resume • Standby Timeout • Wake Up on Ring • Wake Up on Alarm
Copy an option diskette	Copies configuration and diagnostic files from a diskette that comes with an optional device.
Test the Computer	Allows you to test the base computer by selecting **System board diagnostics,** or test the Micro Channel options by selecting **Option diagnostics.**
More Utilities • **Display revision levels**	Displays updates and changes.
• **Display system error log**	Displays entries in the error log. Any memory and privileged-access password errors are recorded in this log.
• **Stand alone utility information**	Describes how to use the UINSTALL program to get information about additional utility programs available on the Diagnostics Diskette. Some of these programs can be used only with specific operating systems. Make sure you read all of the information before installing any of these utility programs.
• **Set and view system identification**	Records the computer serial number and displays the identification numbers for the system unit, processor board, and system board. This information is also know as the vital product data (VPD).
• **Set video display information**	Allows you to choose the display type and set a horizontal frequency and refresh rate.

Module Test Menu

> **Attention**
>
> A customized setup configuration (other than default settings) might exist on the computer you are servicing. Running the Setup Utility program might alter those settings. Note the current configuration settings and verify that the settings are in place when service is complete. To start the Setup Utility program see "Setup Program" on page 73.

At the start of the diagnostic tests, the Module Test Menu is displayed. Normally, all adapters and devices installed in the computer are highlighted on the menu.

- If an adapter or device that is not installed in the computer is highlighted on the menu, use the procedure in "Undetermined Problem" on page 83 to find the problem.
- If an adapter or device is installed in the computer and is not highlighted on the menu, you have one of the following conditions:
  - The diagnostic code for the adapter or device is not on the diagnostic diskette. Run the diagnostics provided with that device.
  - The SCSI controller failed (on the system board or SCSI adapter).
  - An unrecognizable adapter is installed.
  - The missing device is defective or it requires an additional diskette or service manual.
  - A defective adapter caused the device not to be highlighted on the menu.

If a device is missing from the list, replace it. If this does not correct the problem, use the procedure in "Undetermined Problem" on page 83.

Additional Service Information

The following information and tools are available to help identify and resolve hardware-related problems:

- "BIOS Levels" on page 68.
- "Error Messages" on page 68.
- "Flash (BIOS/VPD) Update Procedure" on page 69.
- "Power-on Password" on page 70.
- "Power-On Self-Test (POST)" on page 70.
- "Power Supply" on page 71.
- "Processor Replacement" on page 72.
- "Return Codes" on page 72.
- "Setup Program" on page 73.
- "Specifications" on page 80.
- "System Board Replacement" on page 81.
- "Test Programs" on page 81.
- "Undetermined Problem" on page 83.

BIOS Levels

An incorrect level of BIOS can cause false error and unnecessary FRU replacement. Use the following information to determine the current level of BIOS installed in the computer, the latest BIOS available for the computer, and where to obtain the latest level of BIOS.

- Current Level BIOS information.
    - Run the Configuration Utility to determine the level of BIOS installed.
- Sources for determining the latest level BIOS available.
    1. RETAIN
    2. Bulletin board system (BBS)
    3. HelpCenter
    4. Levels 1 and 2 Support.
- Sources for obtaining the latest level BIOS available.
    1. Bulletin board system (BBS)
    2. HelpCenter
    3. Levels 1 and 2 Support

To update (flash) the BIOS, see "Flash (BIOS/VPD) Update Procedure" on page 69.

Error Messages

Messages generated by the software—the operating system or application programs—generally are text messages, but they also can be numeric. Basically, there are five types of error messages.

- POST error messages
- POST beep codes
- Diagnostic error messages
- Software generated messages
- Multiple messages

Error Message	Description
POST Error Messages	Displayed when POST finds problems with the hardware or detects a change in the hardware configuration.
POST Beep Codes	Sounds emitted from the speaker if POST finds a problem. One beep indicates POST completed successfully. Multiple beeps indicate a problem was found by the POST.
Diagnostic Error Messages	Displayed when a test program finds a problem with a hardware option.

Error Message	Description
Software Generated Error Messages	Displayed if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information supplied with that software package.
Multiple Messages	The first error that occurs can cause additional errors. Follow the suggested action of the first error displayed. In this case, the system displays more than one error message. Always follow the suggested action instructions for the *first* error message displayed.

Flash (BIOS/VPD) Update Procedure

1. Power-off the computer and all external devices.
2. Insert the Flash/VPD diskette into diskette drive A.
3. Power-on all external devices, then power-on the computer.
4. When the POST/BIOS Update Utility appears; type the number for your country/language, then press **Enter**.
5. If the computer serial number was previously recorded, the serial number is displayed with the option to update it. Press **Y** to update the serial number.
6. Type the 7 digit serial number of the computer you are servicing; then, press **Enter**.
7. Follow the instructions on the screen to complete the flash (BIOS/VPD) update procedure.

POST Beep Codes

The Power On Self-Test generates a beeping sound to indicate successful completion of POST or to indicate that the tests detect an error.

One beep and the appearance of text on the display indicates successful completion of the POST. More than one beep indicates that the POST detects an error.

Power-on Password

To service Type 8639 computers with an active and unknown power-on password, power-off the computer and do the following:

Note

This procedure will not remove the Administrator Password.

---

1. Unplug the power cord and remove the top cover.
2. Refer to "System Board" on page 92 for the jumper location.
3. Move the password jumper to connect the center pin and the pin on the opposite end of the connector.
4. Power-on the computer. The system senses the change in the position and erases the password.
   - It is not necessary to move the jumper back to the previous position.
5. Remind the user to enter a new password when service is complete.

Power-On Self-Test (POST)

Each time you power-on the system, it performs a series of tests that check the operation of the system and some options. This series of tests is called the *power-on self-test*, or *POST*. POST does the following:

- Checks some basic system-board operations
- Checks the memory operation
- Starts the video operation
- Verifies that the diskette drive is working
- Verifies that the hard disk drive is working

If the POST finishes without detecting any problems, a single beep sounds and the first screen of your operating system or application program appears.

If the POST detects a problem, an error message appears on your screen. A single problem can cause several error messages to appear. When you correct the cause of the first error message, the other error messages probably will not appear on the screen the next time you turn on the system.

Power Supply

If the power-on indicator is not on, the power-supply fan is not running, or the computer will not power-off, do the following.

Check/Verify	FRU/Action
1. Verify that the voltage-selector switch is set for the correct voltage.	**Correct the voltage-selector switch setting.**
2. Check the following for proper installation. • Power Cord • On/Off Switch connector • On/Off Switch Power Supply connector • System Board Power Supply connectors	**Reseat**
3. Check the power cord for proper continuity.	**Power Cord**
4. Check the power-on switch for continuity.	**Power-on Switch**

If these are correct, check the following voltages.

System Board Connections

Note: These voltages must be checked with the power supply cables connected to the system board.

If the voltages are not correct, and the power cord is good, replace the power supply.

If the voltages are correct, and the computer you are servicing has a power supply connector on the riser card, check the following riser card voltages.

Riser Card Connections

Note: These voltages must be checked with the power supply cable connected to the riser card.

If the voltages are not correct, and the power cord is good, replace the power supply.

Processor Replacement

Looking from the front of the computer, install all processors with the beveled corner located at the right-rear corner of the processor socket.

Important

If the processor is not installed correctly, the system board and the processor can be damaged.

Return Codes

For the test programs to properly determine if a test *Passed*, *Failed*, or *Aborted*, the test programs check the error-return code at test completion. To register the test properly in the test log, the test programs must generate one of the following return codes:

Return Code	Description
0	Indicates the device passed its test.
1	Indicated the device failed its test.
2 or greater	Indicates the test stopped or was aborted.

Setup Program

The Setup Utility (configuration) program is stored in the permanent memory of the computer. This program includes setting for the following:

- Devices and I/O Ports
- Date and Time
- Security
- Start Options
- Advanced Setup
- ISA Legacy Resources
- Rapid Resume Manager

To run the Setup Utility program, do the following:

1. Power-off the computer and wail for a few seconds until all in-use lights go off.
2. Power-on the computer.
3. When the Setup Utility prompt appears on the screen during start-up, press **F1**. The Setup Utility menu appears.
4. Follow the instructions on the screen.

Rapid Resume Manager Personal computers come with built-in energy-saving capabilities. If the computer you are servicing was shipped with DOS and Windows preinstalled, Rapid Resume Manager is available. Rapid Resume Manager reduces the power consumption of the computer. The following are features of Rapid Resume Manager:

- Rapid Resume
- Standby
- Scheduler
- Wake Up on Ring

Rapid Resume: With Rapid Resume activated, the computer saves its current state when you power it off with the power switch. Rapid Resume retains all current settings, remembers which programs were active, and saves the position and size of windows and other objects on the screen. When the computer is restarted (with the power-on switch, the Scheduler, or Wake-Up on Ring), it quickly returns to full-power operation in exactly the same state. The programs that were being used will reappear in the state they were in when you suspended operation of the computer.

Running Rapid Resume Manager: To select and activate, deactivate, or change Rapid Resume Manager do the following.

1. From the Windows Program Manager, select **IBM Management Plus**.
2. Select **Rapid Resume Manager**.
3. View or change settings.
4. Follow the instructions on the screen.

Standby: When the Standby feature is enabled, it initiates reduced power modes for the display, microprocessor, and hard disk drive after a specified period of inactivity. The default setting for automatically initiating standby is 20 minutes. The display is blanked and the hard disk drive "spins down' (enters a reduced-power state). Any use of the keyboard, mouse, or hard disk drive causes the computer to exit standby and return to full-power operation. For example, if 40 minutes is selected as the specified period, the computer goes into standby state if the mouse, keyboard, or microprocessor is not active for more than 40 minutes.

To select and activate, deactivate, or change the Standby feature, see "Running Rapid Resume Manager" on page 73.

Scheduler: Use the Scheduler to set a time for the computer to do the following:

- Start a program
- Display a message
- Power-off the computer

If the computer will not already be power-on when it is time to start a program or display a message, a setting can be selected to power-on the computer at the appropriate time.

To select and activate, deactivate, or change the Scheduler feature, see "Running Rapid Resume Manager" on page 73.

Wake Up on Ring: You can select settings so that, if the modems receives a call the computer is in the suspend state, the computer "wakes up" on the first ring; that is, it returns to full-power.

To select the Wake Up on Ring settings, feature, see "Running Rapid Resume Manager" on page 73.

Formatting Diskettes: To format a diskette within the Diagnostic programs, select one of the following options:

Format A: high density — 1.44MB

Format A: low density — 720KB

Format B: high density — 1.44MB

Format B: low density — 720KB

After selecting a diskette format option, follow the instructions that appear on the screen.

Hard Disk Drive Boot Error: A hard disk drive boot error (error codes 1996 and I999030X) can be caused by the following:

Cause	Actions
The start-up drive is not in the boot sequence in configuration.	Check the configuration and ensure the start-up drive is in the boot sequence.
No operating system installed on the boot drive.	In stall an operating system on the boot drive.
The boot sector on the start-up drive is corrupted.	The drive must be formatted, do the following: 1. Attempt to access and recover (back-up) the failing hard disk drive. 2. Using the operating systems programs, format the hard disk drive. 3. Go to "Preparing the Hard Disk Drive for Use" on page 75.
The drive is defective.	Replace the hard disk drive.

When To Use the Low-Level Format Program

> **Note**
>
> Before formatting the hard disk drive, make a back-up copy of the files on the drive to be formatted.

Use the Low-Level Format program:

- When you are installing software that requires a low-level format
- When you get recurring messages from the test programs directing you to run the Low-Level Format program on the hard disk
- As a last resort before replacing a hard disk drive

Preparing the Hard Disk Drive for Use

When the Low-Level Format program is finished, restore to the hard disk all the files that you previously backed up.

1. Partition the remainder of the hard disk for your operating system. (The commands vary with the operating system. Refer to your operating-system manual for instructions.)
2. Format the hard disk using your operating system. (The commands vary with the operating system. Refer to your operating-system manual for instructions.)
3. Install the operating system.

You are now ready to restore the files.

File Editor: The File Editor is an ASCII text editor that uses simple function key commands.

To access the File Editor:

1. Select **File Editor** from the *Utility Menu*; then press **Enter**.
2. Insert a diskette into Drive A or Drive B before selecting the file you want to edit, then select the file you want to edit from the Files selection box.
3. Make your changes. The arrow keys move the cursor, and the function keys perform search and block editing functions. (See "File Edit Function Key Usage.")
4. When you are done, press **F10** to update the file with the changes you made, or press **Esc** to quit the editing process without saving the changes.

File Edit Function Key Usage The following information describes the function of the function keys and keyboard keys when you are using the File Editor.

Key	Description
Arrows	Move the cursor to the place in the text where you want to make changes.
Home	Press **Home** once, to move the cursor to the start of the current line. Press **Home** twice, to move to the beginning of the file. Press **Home** three times, to move to the beginning of the file.
End	Press **End** once, to move the cursor to the end of the current line. Press **End** twice, to move the cursor to the end of the current screen. Press **End** three times, to move the end of the file.
F2	Press **F2** to be in search mode, You are prompted to enter the search word or words on a reverse highlighted line at the bottom of the File Edit Screen. After typing in the search word, press **Enter.**
F3	Press **F3** to find the next occurrence of a search word.

Key	Description
F4	Press **F4** to mark the start of a block of text (if you have not previously marked it). If you previously marked the block of text, pressing this key unmarks the text block.
F5	Press **F5** to complete the block marking (started with F4). If you did not previously press **F4** to start marking a block of text, **F5** is ignored.
F6	Press **F6** while the cursor is within the active block to move an active (marked) block of text. Move the cursor to the new location where the active block is to be moved, then press **F6** again. If there is no active block of text, **F6** is ignored.
F7	To copy an active (marked) block of text to a new location, move the cursor to the new location and then press **F7**. If there is no active block of text **F7** is ignored.
F8	To delete an active (marked) block of text, move the cursor within the active block and press **F8.** If there is no active block of text, **F8** is ignored.
F10	Press **F10**, to save all changes and exit the file.

Notes:

1. Always make a backup copy on a self-starting diskette of the AUTOEXEC.BAT and CONFIG.SYS files *before* making any changes.

2. The default text editing mode of the File Editor is the insert mode. To toggle between overtype and insert modes, press Insert.

Diagnostics Control Keys: The following is a list of the Diagnostics Control Keys, when used and a description of the Diagnostics response.

Control Keys	When Used	Diagnostics Response
Ctrl+A	Main Menu	Allows you to select test from the sub menus that are highlighted with red letters. **Attention: If selected, these test will erase the information stored on the diskette or hard disk drive.**
Up and Down Arrow Keys	Main Menu Module Test Menu Test Group Menu	Highlights an item you want to select.
Space Bar	Module Test Menu Test Group Menu	Adds a diamond to the left of the highlighted test. The test will run when **Run All Selected** is highlighted and the Enter key is pressed. Also removes the diamond to the left of the item. The test will not run when **Run All Selected** is highlighted and the Enter key is pressed.
Tab Key	Main Menu Module Test Menu	Selects the additional test for the menu you are in.
+/− Keys	Test Group Menu	Selects additional test. The LUN displayed on the top right Test Group Menu shows which test is selected and how and remain (example LUN 1 of 2).

System Board Memory: The following matrix cross-references the name of the computer (printed on the logo) and the size, speed, and type of memory modules supported in the computer.

Computer Name	Memory Module		
	Size	Speed	Type
Type 8639 SIMMs must be installed in matched pairs.	4MB 8MB 16MB 32MB	70ns	Parity
Note: Use only 70ns memory-module kits in your computer.			

Specifications

Size

- Depth: 448 mm (17.6 in.)
- Height: 160 mm (6.3 in.)
- Width: 420 mm (16.5 in.)

Weight

- Min. configuration: 12.7 kg (28.0 lb)
- Max. configuration: 14.1 kg (31.0 lb)[1]

Environment

- Air temperature:
    - System on: 10° to 32°C (50° to 90°F)
    - 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 BTUs per hour:
    - Min. configuration: 120 BTU (35 watts)
    - Max. configuration: 1060 BTU (310 watts) [2]
    - Deep sleep: 15 BTU (4 watts)

Electrical Input

- Sine-wave input (50 to 60 Hz) required.
- Low range input voltage:
    - Min.: 110 V ac
    - Max.: 125 V ac
- High range input voltage:
    - Min.: 200 V ac
    - Max.: 240 V ac
- Input kVA (approximately):
    - Min. configuration as shipped: 0.08 kVA
    - Max. configuration: 0.52 kVA

Airflow

- Approximately 0.56 cubic meters/minute (20 CFM)

Acoustical Noise Emission Values

- Average sound pressure levels:
    - At operator position:
        - 43 dB operating
        - 43 dB idle
    - At bystander position (1 meter):
        - 40 dB operating
        - 40 dB idle
- Declared (upper limit) sound power levels:
    - 5.0 bels operating
    - 4.8 bels idle

---

[1] Maximum configuration weight depends on options installed. Figures above are a system fully populated with options.

[2] Maximum power and heat specifications are based on the 200-watt maximum capacity of the system power supply.

[3] For additional information, see the *ISO Supplier's Declaration* available from IBM.

System Board Replacement

- **Notes**

  1. The BIOS and Vital Product Data (VPD) for the computer you are servicing must be installed on the new system board (FRU) after it is installed in the computer. To do this, **you must run the Flash Update program using the Flash Update diskette shipped with the new system board FRU**. See "BIOS Levels" on page 68 "Vital Product Data" on page 89, and "Flash (BIOS/VPD) Update Procedure" on page 69.
  2. Always ensure the latest level of BIOS is installed on the computer. A down level BIOS may cause false errors and unnecessary replacement of the system board.
  3. The processor is a separate FRU from the system board and is not included with the system board FRU. If you are instructed to replace the system board, do the following.
  4. Install the processor from the old system board on the new system board.
  5. If any of the following options are on the old system board, install them on the new system board.
     - External cache memory and cache tag RAM
     - Memory modules
     - Extended video memory
  6. Ensure that the new system board jumper settings match the old system board jumper settings.
  7. If the new system board does not correct the problem, reinstall the options on the old system board, reinstall the old system board, then replace the processor.

Test Programs

The Diagnostics test programs, developed by DiagSoft for IBM, are the primary method of testing the computer. You can use them to test the IBM components of the system and some external devices. The amount of time required to test all components depends on the number of components. The more optional adapters and devices you have attached to your system, the longer the testing takes.

The test programs on the Diagnostic Diskette include the following features:

Feature	Description
Advanced Diagnostic Tests	Identifies most problems associated with the following major components: • System board • Hard disk drives • Diskette drives • CD-ROM drives • RAM • Serial and parallel ports • Video adapter • Printer • Keyboard • Mouse
Flexible Test Control	Allows you to: • Run groups of tests in batch • Specify parameters to use for each test (for example, video modes, disk cylinders, and port addresses) • Specify the number of passes you want to run (one to continuous) • Log the test results to a text dBase (DBF) format file • Save all test settings for future use • View System Information • View the server's configuration information. (For example, you can view the IRQ/DMA assignments, memory usage, and device drivers) • Select System Utilities • Run a low-level format also contains system utilities. • Format a diskette

Undetermined Problem

Check the power supply voltages. See "Power Supply" on page 71. If the voltages are correct, return here and continue with the following steps.

1. Power-off the computer.
2. Remove or disconnect the following, one at a time:
   a. Non-IBM devices
   b. External devices (modem, printer, or mouse)
   c. Math coprocessor
   d. Any adapters
   e. Riser card
   f. Memory modules
      Before removing or replacing memory modules, see "System Board Memory" on page 79.
   g. Extended video memory
   h. External Cache
   i. External Cache RAM
   j. Hard disk drive
   k. Diskette drive
3. Power-on the computer to re-test the system.
4. Repeat steps 1 through 3 until you find the failing device or adapter.

If all devices and adapters have been removed, and the problem continues, replace the system board. See "System Board Replacement" on page 81.

Using the Test Programs

The test programs provide advanced functions and utilities for users and service or support professionals to troubleshoot even the most difficult problems.

Program Navigation: You can maneuver within the test programs by typing the first letter of a menu choice, using the function keys, or using command-line options.

Using the First Letter of a Menu Choice

Throughout the test programs, pressing the first letter of an option on a menu is the same as moving to that item with the cursor and pressing Enter; however, this function is not enabled on Test Group Screens.

Using the Function Keys

Use the following keys to maneuver throughout the test programs:

Keys	Action
Enter	Select an item, run the test module, or run the test
Down Arrow (↓)	Moves the cursor down
Up Arrow (↑)	Moves the cursor up
F1	Calls up the appropriate Help information. Use the up arrow key (↑) or the down arrow key (↓) to scroll through the information. Pressing F1 from within a Help screen provides a help index from which you can select different categories. One of the important help categories is function key usage. Pressing Esc exits Help and returns to where you left off.
Esc	Go back to the previous menu

Additional functions are available in the Test Module Selection screen and the Test Group screen using the following keys:

Keys	Action
Tab	Move to test group (or move to parameters)
Spacebar	Toggle modules on/off (or toggle tests on/off)
F2	View test results log

Keys	Action
F10	Local menu
+	Next logical unit number (for example, LUN 1, LUN 2, and so on)
–	Previous logical unit number

Command Line Options

The following Command Line Options are available when initially starting the diagnostic program from within its directory.

Type **QAPLPRO/XXX** (where **/XXX** represents one of the following from the list below) then press Enter.

Command	Action
/B&W	The **/B&W** command line option forces the program to load in Black and White (Monochrome) mode, which is often more readable on laptop computers.
/LOG=file	The **/LOG=file** command line option directs the test programs to start using a specified Error Log file.
/INT10	The **/INT10** command line option forces the test programs to use the BIOS for screen writes.
/OXXX	The **/OXXX** command line option, where XXX=test group (for example, MBD/MEM/VID/HDU/FDU/KBD/COM/LPT, and so on), omits the designated test group from testing.
/USRCONFIG =file	The **/USERCONFIG=file** command line option tells the test programs to look for a user diagnostic configuration file other than the default USERDIAG.CFG.
/SCRIPT =file[,R]	The **/SCRIPT=file[,R]** command line option with the ",R" runs the selected script. Please see "Scripting" on page 86 for a description of scripting. **Note:** You can use a "–" instead of a "/" as the command line switch.

Viewing the Test Groups: As you move the cursor bar up or down in the Test Module Selection window, the right hand screen changes to show the attributes, parameters, and the selected tests of the corresponding Test Group. The ◊ mark indicates a module selected for testing.

The indicated attributes are characteristics of the selected test module that are used by the test programs to determine which tests to run or how to run selected tests. Attributes are also used to limit the allowable range of parameters (for example, – ending cylinder).

Parameters are values you select to establish the scope of tests. For example, you can select Extended Memory testing parameters and limit the testing to a specific range of test blocks by specifying the starting and ending memory block. This might be appropriate if prior experience indicates that problems are likely to exist in a specific area of memory. By selecting these limiting parameters, you reduce memory testing time.

Scripting: Scripting allows you to select specific groups of tests, testing parameters, and options. Your selection is saved for later use as a test *Script*. To set up a test script, first select all the appropriate test groups and specific tests you want to run from the Module Testing section under Diagnostics. You should also select appropriate testing parameters and options. See "Program Navigation" on page 84, for instructions to save a test script.

Changing Logical Unit Numbers: In some instances, you can have more than one logical unit number (LUN) for a particular module. LUNs represent individual devices within a test group or module. For example, you might have two diskette drives or two hard disk drives; or, you might have base, extended, shadow, and cache memory installed in the computer. This configuration might result in as many as four or five different LUNs in the Memory Test Group. Or you might have base, extended, shadow, and cache memory installed in the system which might result in as many as four or five different LUNs in the Memory Test Group.

From either the Module Test Menu or the Test Group window, you can change to a different LUN (where applicable) by pressing the plus (+) key (next LUN), or the minus (–) key (previous LUN).

Test Group Specifications: In the upper-right-hand portion of the testing screen (or just the upper portion if you switched to an individual test group screen) are the specifications for the related test group.

Note: In the Hard Disk Test Group specification area, if a

software program was to compress your drive, the indicated size is the compressed size of the logical drive.

Starting the Diagnostics Diskette

1. Insert the Diagnostics diskette into drive A.
2. Power-on the computer.
3. When the Diagnostics **Main Menu** is displayed, press **Ctrl+A**. (The screen will not change.)
4. Select Diagnostics; then, press **Enter**.
5. Follow the instructions that appear on your screen. If an error is displayed, go to "Symptom-to-FRU Index Supplement" on page 95.

Module Testing Mode

If the test programs do not find a problem, or you want to perform in-depth testing, the Module Testing mode provides a method to run individual tests on a single module. For example, you can run an individual test for the diskette drive, or you can run groups of tests for several modules.

In the Module Testing mode, you can define how many times each test should run and how the test program should log the errors.

To start the Module Testing mode:

1. Start the Diagnostics diskette. See "Starting the Diagnostics Diskette."
2. Select **Diagnostic** from the Main Menu.
3. Select **Module Tests** from the next menu.
4. Use the up and down arrow keys (↑ and ↓) to move the highlight bar from one selection to the next.
5. Follow the instructions on the screen.

Note: As you scroll down the selection menu, the Test Group window to the right changes to correspond to the highlighted Module.

Running Selected Module Tests

To run all selected tests for a test group:

1. Use the up and down arrow keys (↑ and ↓) to move the cursor to your selection.
2. Press **Enter**.

Note: A ◊ appears next to your selection.

Running All Selected Modules

To run all selected test modules:

1. Use the down arrow key (↓) to move the cursor to the last choice, **Run All Selected Modules**.
2. Press **Enter**.

Note: A ◊ appears next to your selection.

Changing Selected Tests in Test Groups

To change selected tests in a Test Group:

1. In the Module Tests Menu, use the up and down arrow keys (↑ and ↓) to move the cursor to your selection.
2. Press **Tab** to move into the expanded Test Group window.
3. Scroll to the test you want to select or deselect.

> **Attention**
>
> Items indicated by a directly adjacent "*" (**red** text on color screens) are destructive tests.

4. Press the spacebar at the highlighted test to toggle between select (indicated by a ◊) and deselect.

   Note: Pressing the first letter of a test does not activate the test, unlike menu operation.

5. Press **Enter**.

Running an Individual Test

To run an individual test:

1. Use the up and down arrow keys (↑ and ↓) to move to the highlighted bar to the test you want to run.
2. Press **Enter** to run the test.

   Note: The results of the test appear in the lower-right-hand Test Log window. Also, if you enabled Test Logging, the results are recorded in the Test Log.

3. When the test completes, press Esc to return to the Test Group Menu.

Stopping the Tests: To stop running a specific test or stop testing after you have started a test, press Esc while the test is running. The test pauses at the first possible opportunity, and the Skip/Abort Test Menu appears with the following options:

Option	Action
Continue	The test program begins testing where it left off.
Skip to next test	The test program skips the current test, but remaining tests for the selected Test Module continue.
Skip to next group	The test program skips the remaining tests in the current test group.
Abort all tests	The test program stops and returns to the previous menu.

Vital Product Data

Each computer has a unique vital product data (VPD) code stored in the nonvolatile memory on the system board. After you replace the system board the VPD must be updated. To update the VDP, see "Flash (BIOS/VPD) Update Procedure" on page 69.

Locations

The following location information is for the PC Server 310 Type 8639.

- "Expansion Slots/Riser Cards."
- "Keylock Assembly Exploded View" on page 91.
- "System Board" on page 92.

Expansion Slots/Riser Cards

All Type 8639 computers have seven expansion slots, two of which are PCI expansion slots. The other five expansion slots are either Micro Channel or ISA, depending on model.

The PCI slots and their adjacent Micro Channel or ISA expansion slots are *shared expansion slots*. This means that an adapter can be installed in either the PCI expansion slot or the adjacent Micro Channel or ISA expansion slot, but not in both.

A SCSI-2 Fast/Wide PCI Adapter is installed in one of the PCI expansion slots. An Ethernet adapter is installed in one of the Micro Channel or ISA slots.

This leaves one PCI slot and three Micro Channel or ISA slots available for future expansion. For example, you can add adapters to provide communications, specialized graphics, and sound.

PCI/Micro Channel Models: The following illustration shows the location and numbering of the PCI and Micro Channel expansion slots. Note the location of the shared expansion slots.
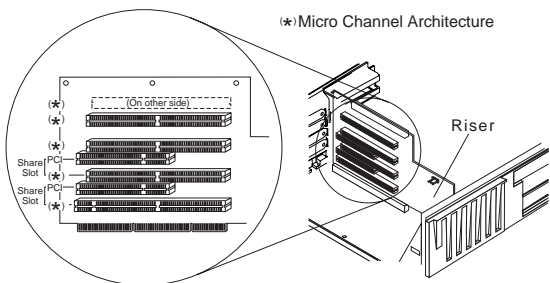
PCI/ISA Models: The following illustration shows the location and numbering of the PCI and ISA expansion slots. Note the location of the shared expansion slots.
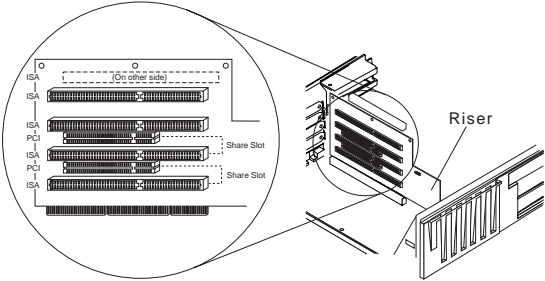
Riser Card (ISA) Administrator Password:

ISA Riser cards have an administrator password jumper located to the left of the battery.

Note: This jumper **will not** remove the password.

The setting of this jumper determines if an Administrator Password can or cannot be set on the computer.

Important

If the Administrator Password is lost or forgotten, the password cannot be changed or removed. If this occurs, the system board must be replaced.

Jumper Position	Results
1-2 (pins closest to the battery)	Administrator Password **can** be set
2-3 (pins farthest from the battery)	Administrator password **cannot** be set

Keylock Assembly Exploded View
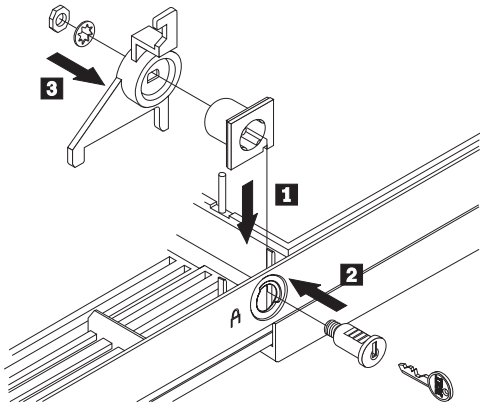
System Board
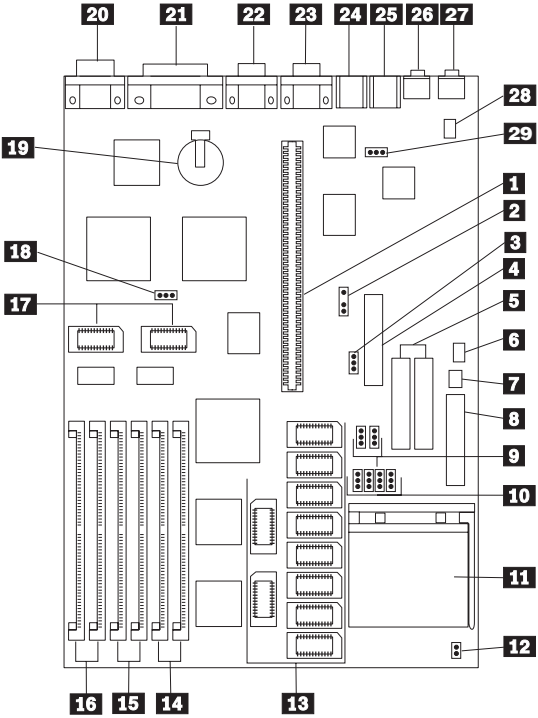
System Board (Continued)

1		Riser connector
2	MRD	Modem Ring Detect jumper
3	WP	Diskette drive write protect jumper
4		Diskette drive connector
5		Hard disk drive connectors
6	J38	On/Off Switch Power Supply Connector
7	J37	On/Off Switch Connector
8		Power supply connectors
9	J26, J27	Bus/CPU Speed (MHz)
10		256KB/1MB Cache jumpers
11		Processor connector
12	J101	Bus/Core Ratio
13		Cache connectors
14		Memory connectors (Bank 2)
15		Memory connectors (Bank 1)
16		Memory connectors (Bank 3)
17		Video memory modules
18	PWD	Power-on password jumper
19		Battery
20		Display connector
21		Parallel connector
22		Serial connector
23		Serial connector
24		Keyboard connector
25		Mouse connector
26		Audio (input jack)
27		Audio (output jack)
28		IDE CD-ROM Audio connector
29	J28	Mouse jumper

Jumper Settings

The following tables contain the jumper setting information. (D) indicates the default setting.

Jumper	Setting	Description
MRD	2-3 (D) 1-2	Modem answer on ring. Modem no answer on ring.
WP	2-3 (D) 1-2	Enable writing to a diskette Disable writing to a diskette.
Cache	1-2 (D) 2-3	256KB Cache 1MB Cache
J101	1-2 (D) 2-3	2/3 Bus/Core Ratio 1/2 Bus/Core Ratio
PWD	1-2 (D) 2-3	Password enabled. Password reset.

Bus/CPU Speed MHz Settings: The following table contains the Bus/CPU Speed Settings

Jumper	50/75	60/90 60/120	66/100 66/133
J26	2-3	2-3	1-2
J27	2-3	1-2	1-2

Symptom-to-FRU Index Supplement

The Symptom-to-FRU Index lists error symptoms and possible causes. The most likely cause is listed first. Always begin with "General Checkout (Models 0XT, 0Z0, 0ZT, 0D0, 0DT)" on page 57. This index can also be used to help you decide which FRUs to have available when servicing a computer. If you are unable to correct the problem using this index, go to "Undetermined Problem" on page 83.

Notes

- If you have both an error message and an incorrect audio response, diagnose the error message first.
- If you cannot run the diagnostic tests, but did receive a POST error message, diagnose the POST error message.
- If you did not receive any error message, look for a description of your error symptoms in the first part of this index.
- Check all power supply voltages before you replace the system board. (See "Power Supply" on page 71.)

Important

1. Some errors are indicated with a series of beep codes. (See "Beep Symptoms" on page 96.)
2. The processor is a separate FRU from the system board; the processor is not included with the system board FRU. (See "System Board Replacement" on page 81.)

Beep Symptoms

Beeps symptoms are short tones or a series of short tones separated by pauses (intervals without sound). See the following examples.

Beeps	Description
1-2-X	• One beep • A pause (or break) • Two beeps • A pause (or break) • Any number of beeps
4	Four continuous beeps

Beep Symptom	FRU/Action
1-1-3 CMOS read/write error	1. **Run Setup** 2. System Board
1-1-4 ROM BIOS check error	1. **System Board**
1-2-X DMA error	1. **System Board**
1-3-X	1. **Memory Module** 2. System Board
1-4-4	1. **Keyboard** 2. System Board
1-4-X Error detected in first 64KB of RAM.	1. **Memory Module** 2. System Board
2-1-1, 2-1-2	1. **Run Setup** 2. System Board
2-1-X First 64KB of RAM failed.	1. **Memory Module** 2. System Board
2-2-2	1. **Video Card** 2. System Board
2-2-X First 64KB of RAM failed.	1. **Memory Module** 2. System Board
2-3-X	1. **Memory Module** 2. System Board
2-4-X	1. **Run Setup** 2. Memory Module 3. System Board
3-1-X DMA register failed.	1. **System Board**
3-2-4 Keyboard controller failed.	1. **System Board** 2. Keyboard
3-3-4 Screen initialization failed.	1. **Video Adapter** 2. System Board 3. Display
3-4-1 Screen retrace test detected an error.	1. **Video Adapter** 2. System Board 3. Display

Beep Symptom	FRU/Action
3-4-2 POST is searching for video ROM.	1. **Video Adapter** 2. System Board
4	1. **Video Adapter** 2. System Board
All other beep code sequences.	1. **System Board**
One long and one short beep during POST. Base 640KB memory error or shadow RAM error.	1. **Memory Module** 2. System Board
One long beep and two or three short beeps during POST. (Video error)	1. **Display Adapter, if installed.** 2. System Board
Three short beeps during POST.	1. **See "System Board Memory" on page 79.** 2. System Board
Continuous beep.	1. **System Board**
Repeating short beeps.	1. **Keyboard stuck key?** 2. Keyboard Cable 3. System Board

No Beep Symptoms

Symptom/Error	FRU/Action
No beep during POST but computer works correctly.	1. **System Board**
No beep during POST.	1. **See "Undetermined Problem" on page 83.** 2. System Board 3. Memory Module 4. Any Adapter or Device 5. Riser Card 6. Power Cord 7. Power Supply

Numeric Error Codes

In the following index, "X" can represent any number.

Error Code	FRU/Action
000 SCSI Adapter not enabled.	1. **Be sure adapter device and Bus Master fields are enabled in PCI configuration program. See documentation shipped with computer.**
02X	1. **SCSI Adapter**
08X Check SCSI terminator installation.	1. **SCSI Cable** 2. SCSI Terminator 3. SCSI Device 4. SCSI Adapter
101 Interrupt failure.	1. **System Board**
102 Timer error.	1. **System Board**
106	1. **System Board**
110 System board parity error.	1. **Memory Module** 2. System Board
111 I/O channel parity error.	1. **Reseat adapters** 2. Any Adapter 3. System Board
114 External ROM checksum error.	1. **Memory Module** 2. System Board
129 Internal cache test error.	1. **Processor** 2. L2 Cache Memory 3. System Board
151 Real-time clock failure.	1. **System Board**
161 Bad CMOS battery.	1. **Run Setup** 2. Clock Battery (See "Battery Notice" on page 461) 3. System Board
162 And unable to run diagnostics.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable
162	1. **Run Setup** 2. Clock Battery (See "Battery Notice" on page 461) 3. System Board

Error Code	FRU/Action
163 Clock not updating or invalid time set.	1. **Time and Date Set?** 2. **Clock Battery** (See "Battery Notice" on page 461) 3. System Board
164 POST detected a base memory or extended memory size mismatch error.	1. **Run Setup. Check System Summary menu for memory size change. (See "Setup Program" on page 73.)** 2. Run the Extended Memory Diagnostic tests.
17X, 18X	1. **C2 Security**
175	1. **Riser Card** 2. System Board
176	1. **Covers were removed from the computer.**
177 Corrupted Administrator Password.	1. **Riser Card** 2. System Board
178	1. **Riser Card** 2. System Board
183	1. **Enter the administrator password**
184 Password removed due to check-sum error.	1. **Enter new password**
185 Corrupted boot sequence.	1. **Set configuration and reinstall the boot sequence.**
186	1. **Riser Card** 2. System Board
189	1. **More than three password attempts were made to access the computer.**
1XX Not listed above.	1. **System Board**
201 Memory data error.	1. **Memory Module** 2. System Board
225	1. **Unsupported Memory**
229 External cache test error.	1. **L2 Cache Memory** 2. System Board

Error Code	FRU/Action
262 POST detected a base memory or extended memory type error.	1. **Run Setup. Check System Summary menu for memory type change. (See "Setup Program" on page 73.)** 2. Run the Extended Memory Diagnostic tests.
301	1. **Keyboard** 2. Keyboard Cable 3. System Board
303 With an 8603 error.	1. **Mouse** 2. Keyboard 3. Keyboard Cable 4. System Board
303 With no 8603 error.	1. **Keyboard** 2. Keyboard Cable 3. System Board
3XX Not listed above.	1. **Keyboard** 2. Keyboard Cable 3. System Board
5XX	1. **Display Adapter** (if installed) 2. System Board
601	1. **Diskette Drive A** 2. Diskette Drive Cable 3. System Board
604 And unable to run diagnostics.	1. **Diskette Drive A** 2. Diskette Drive Cable 3. System Board
604 And able to run diagnostics.	1. **Diskette Drive B** 2. Diskette Drive Cable 3. System Board
605 POST cannot unlock the diskette drive.	1. **Diskette Drive** 2. Diskette Drive Cable 3. System Board
662	1. **Diskette drive configuration error or wrong diskette drive type, run Set Configuration.**
6XX Not listed above.	1. **Diskette Drive** 2. System Board 3. External Drive Adapter 4. Diskette Drive Cable 5. Power Supply
762 Math coprocessor configuration error.	1. **Run Setup** 2. Math Coprocessor 3. System Board
7XX Not listed above.	1. **Math Coprocessor** 2. System Board

Error Code	FRU/Action
962 Parallel port configuration error.	1. **Run Configuration** 2. Parallel Adapter (if installed) 3. System Board
9XX	1. **Printer** 2. System Board
1047	1. **16-Bit AT Fast SCSI Adapter**
107X Check SCSI terminator installation.	1. **Check SCSI terminator installation.** 2. SCSI Cable 3. SCSI Terminator 4. SCSI Device 5. SCSI Adapter
1101 Serial connector error, possible system board failure.	1. **Run Advanced Diagnostics**
1101, **1102**, **1106**, **1108**, **1109**	1. **System Board** 2. Any Serial Device
1107	1. **Communications Cable** 2. System Board
1102 Card selected feedback error.	1. **Run Advanced Diagnostics**
1103 Port fails register check.	1. **Run Advanced Diagnostics** 2. System Board
1106 Serial option cannot be turned off.	1. **Run Advanced Diagnostics** 2. System Board
1107	1. **Serial Device Cable** 2. System Board
1110 Register test failed.	1. **Run Advanced Diagnostics** 2. System Board
1116 Interrupt error.	1. **Run Advanced Diagnostics**
1117 Failed baud rate test.	1. **Run Advanced Diagnostics**
1162 Serial port configuration error.	1. **Run Configuration** 2. Serial Adapter (if installed) 3. System Board
11XX Not listed above.	1. **System Board**
1201	1. **System Board** 2. Any Serial Device

Error Code	FRU/Action
1202, **1206**, **1208**, **1209**, **12XX**	1. **Dual Async Adapter/A** 2. System Board 3. Any Serial Device
1207	1. **Communications Cable** 2. Dual Async Adapter/A
13XX	1. **Game Adapter**
1402 Printer not ready.	Information only
1403 No paper error, or interrupt failure.	Information only
1404 System board timeout failure.	1. **Run Advanced Diagnostics**
1405 Parallel adapter error.	1. **Run Advanced Diagnostics**
1406 Presence test error.	1. **Run Advanced Diagnostics**
14XX Not listed above. Check printer before replacing system board.	1. **Printer** 2. System Board
15XX	1. **SDLC Adapter**
1692 Boot sequence error.	1. **Run FDISK to ensure at least one active partition is set active.**
16XX	1. **36/38 Workstation Adapter**
1762 Hard disk drive configuration error.	1. **Run Configuration (See "Setup Program" on page 73.)**
1780 (Disk Drive 0) **1781** (Disk Drive 1) **1782** (Disk Drive 2) **1783** (Disk Drive 3)	1. **See "Power Supply" on page 71.** 2. Hard Disk Drive 3. System Board 4. Hard Disk Cable 5. Power Supply
1962 Boot sequence error.	1. **Possible hard disk drive problem, see "Hard Disk Drive Boot Error" on page 74.**
209X	1. **Diskette Drive** 2. Diskette Cable 3. 16-bit AT Fast SCSI Adapter
20XX Not listed above	1. **BSC Adapter** 2. Riser Card

Error Code	FRU/Action
21XX	1. **SCSI Device**
	2. **16-bit AT Fast SCSI Adapter**
	3. Alternate BSC Adapter
	4. Riser Card
2401, 2402 If screen colors change.	1. **Display**
2401, 2402 If screen colors are OK.	1. **System Board**
	2. Display
2409	1. **Display**
2410	1. **System Board**
	2. Display
2462 Video memory configuration error.	1. **Run Configuration**
	2. Video Memory Modules
	3. Video Adapter (if installed)
	4. System Board
3015, 3040 Check for missing wrap or terminator plug on the adapter.	1. **Network Attached?**
	2. LF Translator
	3. Cable Problem
	4. PC Network Adapter
	5. Riser Card
30XX	1. **PC Network Adapter**
	2. LF Translator
	3. Cable Problem?
	4. Riser Card
3115, 3140	1. **Network Attached?**
	2. LF Translator
	3. Alternate PC Network-Adapter
	4. Cable Problem
	5. Riser Card
31XX	1. **Alternate PC Network Adapter**
	2. LF Translator
	3. Cable Problem?
	4. Riser Card
36XX	1. **GPIB Adapter**
	2. Riser Card
38XX	1. **DAC Adapter**
	2. Riser Card
4611, **4630**	1. **Multiport/2 Interface Board**
	2. Multiport/2 Adapter
4612, **4613 4640**, **4641**	1. **Memory Module Package**
	2. Multiport/2 Adapter
4650	1. **Multiport Interface Cable**

Error Code	FRU/Action
46XX Not listed above.	1. **Multiport/2 Adapter** 2. Multiport/2 Interface Board 3. Memory Module
5600	1. **Financial System** **2. Controller Adapter**
5962 CD-ROM configuration error.	1. **Run Configuration** 2. CD-ROM Drive 3. CD-ROM Adapter 4. System Board
62XX	1. **1st Store Loop Adapter** 2. Adapter Cable
63XX	1. **2nd Store Loop Adapter** 2. Adapter Cable
64XX	1. **Network Adapter**
71XX	1. **Voice Adapter**
74XX	1. **Display Adapter** (if installed) 2. Riser Card
76XX	1. **Page Printer Adapter**
78XX	1. **High Speed Adapter**
79XX	1. **3117 Adapter**
80XX	1. **PCMCIA Adapter**
84XX	1. **Speech Adapter** 2. Speech Control Assembly 3. Riser Card
8601, **8602**	1. **Pointing Device** (Mouse) 2. System Board
8603, **8604**	1. **System Board** 2. Pointing Device (Mouse)
86XX Not listed above	1. **Mouse** 2. System Board
89XX	1. **PC Music Adapter** 2. MIDI Adapter Unit 3. Riser Card
91XX	1. **Optical Drive** 2. Adapter
96XX	1. **SCSI Adapter** 2. Any SCSI Device 3. System Board

Error Code	FRU/Action
10101, **10102**, **10104** **10105**, **10106**, **10107** **10108**, **10109**, **10111** **10112**, **10113**, **10114** **10115**, **10116**	1. **Have customer verify correct operating system device drivers are installed and operational.** 2. Modem
10103, **10110**, **101171**	1. **System Board** 2. Data/Fax Modem
10117 Not listed above.	1. **Check system speaker** 2. Check PSTN cable 3. External DAA (if installed) 4. Modem
10118	1. **Run Diagnostics and verify the correct operation of the modem slot** 2. Modem
10119	1. **Diagnostics detected a non-IBM modem** 2. Modem
10120	1. **Check PSTN Cable** 2. External DAA (if installed) 3. Modem
10132, **10133**, **10134** **10135**, **10136**, **10137** **10138**, **10139**, **10140** **10141**, **10142**, **10143** **10144**, **10145**, **10146** **10147**, **10148**, **10149** **10150**, **10151**, **10152**	1. **Modem**
10153	1. **Data/Fax Modem** 2. System Board
101XX Not listed above.	1. **Modem Adapter/A** 2. Data/Fax Modem 3. System Board
10450, **10451**, **10490** **10491**, **10492**, **10499** Read/write error.	1. **Run Advanced Diagnostics** 2. Riser Card 3. Hard Disk Drive 4. System Board
10452 Seek test error.	1. **Run Advanced Diagnostics**
10453 Wrong drive type?	Information only
10454 Sector buffer test error.	1. **Run Advanced Diagnostics**
10455, **10456** Controller error.	1. **Run Advanced Diagnostics**

Error Code	FRU/Action
10459 Drive diagnostic command error.	Information only
10461 Drive format error	1. **Run Advanced Diagnostics**
10462 Controller seek error.	1. **Run Advanced Diagnostics**
10464 Hard Drive read error.	1. **Run Advanced Diagnostics**
10467 Drive non fatal seek error.	1. **Run Advanced Diagnostics**
10468 Drive fatal seek error.	1. **Run Advanced Diagnostics**
10469 Drive soft error count exceeded.	1. **Run Advanced Diagnostics**
10470, **10471**, **10472** Controller wrap error.	1. **Run Advanced Diagnostics**
10473 Corrupt data. Low level format might be required.	Information only
10480	1. **Hard Disk Drive** (ESDI) 2. Drive Cable 3. System Board
10481 ESDI drive D seek error.	1. **Run Advanced Diagnostics**
10482 Drive select acknowledgement bad.	1. **Run Advanced Diagnostics**
106X1	1. **Check Configuration** 2. Ethernet Adapter
10635	1. **Power-off computer, wait ten seconds; then power-on the computer.** 2. Ethernet Adapter
10651, 10660	1. **Check Cables** 2. Ethernet Adapter
106XX Not listed above.	1. **Ethernet Adapter**
107XX	1. **5.25-inch External Diskette Drive** 2. 5.25-inch Diskette Drive Adapter/A
109XX Check the adapter cables.	1. **ActionMedia Adapter/A** 2. System Board
112XX This adapter does not have cache.	1. **SCSI Adapter** 2. Any SCSI Device 3. System Board

Error Code	FRU/Action
119XX	1. **3119 Adapter**
121XX	1. **Modem Adapter** 2. Any Serial Device 3. System Board
136XX	1. **ISDN Primary Rate Adapter** 2. System Board
137XX	1. **System Board**
141XX	1. **Realtime Interface Coprocessor Portmaster Adapter/A**
143XX	1. **Japanese Display Adapter** 2. System Board
14710, **14711**	1. **System Board Display Adapter** 2. Adapter Video Memory
148XX	1. **Display Adapter**
14901, **14902** **1491X**, **14922**	1. **Display Adapter** 2. System Board 3. Display (any type)
14932	1. **External Display** 2. Display Adapter
16101	1. **Riser Card Battery (See "Battery Notice" on page 461)** (See "Battery Notice" on page 461)
161XX	1. **FaxConcentrator Adapter**
164XX	1. **120MB Internal Tape Drive** 2. Diskette Cable 3. System Board
16500	1. **6157 Tape Attachment Adapter**
16520, **16540**	1. **6157 Streaming Tape Drive** 2. 6157 Tape Attachment Adapter
166XX, 167XX	1. **Token Ring Adapter** 2. System Board 3. Riser Card
18001 to **18029**	1. **Wizard Adapter** 2. Wizard Adapter Memory
18031 to **18039**	1. **Wizard Adapter Cable**
185XXXX	1. **DBCS Japanese Display Adapter/A** 2. System Board

Error Code	FRU/Action

20001 to **20003**	1. **Image Adapter/A**
	   Image-I Adapter/A
	2. Memory Module
	   DRAM, VRAM

20004	1. **Memory Module**
	   DRAM, VRAM
	2. Image Adapter/A
	   Image-I Adapter/A

20005 to **20010**	1. **Image Adapter/A**
	   Image-I Adapter/A
	2. Memory Module
	   DRAM, VRAM

200XX
Not listed above.
	1. **Image Adapter/A**
	   Image-I Adapter/A
	2. Memory Module
	   DRAM, VRAM
	3. System Board

20101 to **20103**	1. **Printer/Scanner**
	   Option
	2. Image Adapter/A
	3. Memory Module
	   DRAM, VRAM

20104	1. **Memory Module** **DRAM, VRAM** 2. Printer/Scanner Option 3. Image Adapter/A

20105 to **20110**	1. **Printer/Scanner**
	   Option
	2. Image Adapter/A
	3. Memory Module
	   DRAM, VRAM

Image Adapter/A
Memory Test failure
indicated by graphic
of adapter.
	1. **Replace memory**
	   module (shown in
	   graphic.)

206XX	1. **SCSI-2 Adapter** 2. Any SCSI Device 3. System Board
208XX Verify there are no duplicate SCSI ID settings on the same bus.	1. **Any SCSI Device**

210XXXX
Internal bus, size unknown.
210XXX**1**
External bus, size unknown.
	1. **SCSI Hard Disk Drive**
	2. SCSI Adapter or
	   System Board
	3. SCSI Cable
	4. SCSI ID Switch
	   (on some models)

Tape Drive amber LED **remains on.**	1. **Tape Drive** 2. SCSI Cable (internal) 3. SCSI Adapter or System Board

Error Code	FRU/Action
Tape Drive green "in use" LED fails to come on.	1. **Tape Drive** 2. SCSI Adapter or System Board 3. SCSI Cable (internal) SCSI Cable (external)
Tape automatically ejected from drive.	1. **Tape Cassette** 2. Drive
SCSI ID on rotary switch does not match SCSI ID set in configuration. Verify drive switches inside cover are set to zero.	1. **Rotary Switch Circuit Board** 2. Circuit Board Cable 3. Tape Drive
Tape sticks/breaks in drive. Verify that the tapes used meet ANSI standard X3B5.	1. **Tape Cassette**
212XX	1. **SCSI Printer** 2. Printer Cable
213XX	1. **SCSI Processor**
214XX	1. **WORM Drive**
215XXXC **215XX**XD **215XX**XE **215XX**XU If an external device, and power-on LED is off, check external voltages.	1. **CD-ROM Drive I CD-ROM Drive II Enhanced CD-ROM Drive II Any CD-ROM Drive** 2. SCSI Cable 3. SCSI Adapter or System Board
216XX	1. **Scanner**
217XX If an external device, and power-on LED is off, check external voltages.	1. **Rewritable Optical Drive** 2. SCSI Adapter or System Board 3. SCSI Cable
218XX Check for multi CD tray, or juke box.	1. **Changer**
219XX	1. **SCSI Communications Device**
24201Y0, **24210**Y0 Be sure wrap plug is attached.	1. **ISDN/2 Adapter** 2. ISDN/2 Wrap Plug 3. ISDN/2 Communications Cable
273XX	1. **1Mbps Micro Channel Infrared LAN Adapter**
27501, **27503** **27506**, **27507**	1. **ServerGuard Adapter** 2. System Board

Error Code	FRU/Action
27502, **27504**, **27510** **27511**, **27533**, **27534** **27536**, **27537**	1. **ServerGuard Adapter**
27509	1. **Remove redundant adapters, run Auto Configuration program, then retest.**
27512	1. **WMSELF.DGS diagnostics file missing.** 2. WMSELF.DGS diagnostics file incorrect.
27535	1. **3V Lithium Backup Battery** 2. ServerGuard Adapter
27554	1. **Internal Temperature out of range** 2. ServerGuard Adapter
27555, **27556**	1. **ServerGuard Adapter** 2. Power Supply
27557	1. **7.2V NiCad Main Battery Pack** 2. ServerGuard Adapter
27558, **27559** **27560**, **27561**	1. **PCMCIA Type II Modem** 2. ServerGuard Adapter
27562	1. **External Power Control not connected** 2. External Power Control 3. ServerGuard Adapter
27563, **27564**	1. **External Power Control** 2. ServerGuard Adapter
275XX	1. **Update Diagnostic Software**
27801 to **27879**	1. **Personal Dictation System Adapter** 2. System Board
27880 to **27889**	1. **External FRU (Speaker, Microphone)**
I**999030**X Hard disk reset failure.	**Possible hard disk drive problem, see "Hard Disk Drive Boot Error" on page 74.**

Error Messages

Error Message/Symptom	FRU/Action
Address Exceeds the Size of Your Memory An invalid memory address was entered. Diagnostics Tests display this message during the Locate Bad Chips option.	1. **Enter the correct address.** 2. Memory Module 3. System Board
Arithmetic Functions Failed An error was detected during the CPU Test.	1. **Microprocessor** 2. System Board
Base Memory Test Failed An error was detected in base memory.	1. **Memory Module** 2. System Board
Boot Sector Unreadable A boot sector read error was detected on the hard disk drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
Bus Noise Test Failed RAM Test detected an error in the memory bus.	1. **Memory Module** 2. System Board
Butterfly Cylinder Access Test Failed Hard Disk Drive Test detected mismatch between the data read and the data stored on the drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
Clock Stopped Real-time clock has stopped working.	1. **Real-Time Clock Assembly** 2. System Board
CMOS Clock Test Failed Time and Date Settings for CMOS and DOS **do not** Match.	1. **Real-Time Clock Assembly** 2. System Board
Controller Diagnostic Test Failed An error was detected while testing the Hard Disk Controller (Adapter).	1. **Hard Disk Drive Adapter** (if installed) 2. Hard Disk Drive 3. System Board
Cylinder 0 errors Test detected an error reading the first cylinder of the hard disk drive.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
Device is Not Ready **Ready the Device...** **or** **Press Any Key**	1. **Ensure the device is powered-on.** 2. Replace failing device 3. Device Adapter (if installed) 4. System Board

Error Message/Symptom	FRU/Action
Disk Error Encountered Opening Output File Press Any Key To Continue.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
DMA #X Failed Main Components Test detected an error while testing the DMA controller.	1. **System Board**
DMA Page Register Failed DMA page register error	1. **System Board**
Drive (x) Media (y) Mismatch FAT ID mismatch with installed drive.	1. **Check diskette and diskette drive capacity.** 2. Diskette Drive 3. System Board
Error in video buffer. Bad bits. Video memory test error.	1. **Video Adapter** 2. System Board 3. Display
Exception Interrupt In Protected Mode Diags Cannot Continue Server error, remove one adapter at a time until the symptom goes away.	1. **Any Adapter** 2. System Board 3. Processor
Extended Memory Test Failed Extended memory error.	1. **Memory Module** 2. System Board
Floppy Drive Failed Diskette drive(s) failed.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable
General Function Failed Remove one adapter at a time until the symptom goes away.	1. **Any Adapter** 2. System Board 3. Processor
Hard Drives Failed Hard Disk Drive test error.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
Incorrect DOS version	1. **Ensure you are using DOS version 3.0 or higher.**
INT Mask Register Failed INT Mask Register error.	1. **Microprocessor** 2. System Board
Invalid Date Clock/DOS date mismatch.	1. **Real-Time Clock Assembly** 2. System Board
Invalid Time Clock/DOS time mismatch. Back-up clock and DOS time of day settings do not match.	1. **Real-Time Clock Assembly** 2. System Board

Error Message/Symptom	FRU/Action
Linear Cylinder Access Test Failed Hard disk drive error.	1. **Hard Disk Drive** 2. Hard Disk Drive Cable 3. Hard Disk Drive Adapter (if installed) 4. System Board
Logic Function Failed CPU Logic test error.	1. **Microprocessor** 2. System Board
Loopback Error COM Port Test or Parallel Port error. A wrap plug must be installed to successfully complete these tests.	1. **System Board** 2. Wrap Plug
Main Components Failed System board error.	1. **System Board** 2. Processor
Memory test cannot run at this location in memory Not enough free memory available to start the memory test.	1. **Memory Module** 2. System Board
Missing QAPlus/PRO Files(s) One or more diagnostic support files are missing.	1. **Diagnostic Diskette**
NO LOOP-BACK PLUG. Skipping External loopback test No wrap plug installed.	1. **Install wrap plug on the serial port, rerun test.** 2. System Board
Not ready Printer not on-line or not ready.	1. **Ready Printer** 2. Printer 3. Printer Cable 4. System Board
No 'type-amatic' repeat At least one repeat key must be tested during this test or an error will occur. Type-amatic test error.	1. **Keyboard** 2. System Board
Not used by any standard device IRQ is not currently being used by a non-standard device.	1. **System Board**
Numeric Proc Failed NPU test error.	1. **Microprocessor** 2. System Board
Parallel Ports Failed Test Report Summary message.	1. **System Board**
Pass (N): ** Errors ** Drive (X) Failed Diskette drive read/write test error.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable

Error Message/Symptom	FRU/Action
Pass (N) Drive Not Ready Diskette drive door is open or defective.	1. **Ensure diskette drive is ready.** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Pass (N): Drive (X) Write Protected or Unformatted	1. **Insert a non-write protected, formatted diskette into the diskette drive; then rerun the test.** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Pass (N): Unknown Media Drive (X) Diskette Drive Test error.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Place Hi-density Media in Drive Media/drive mismatch.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Printer Failed Printer powered-on and ready?	1. **Printer** 2. Printer Cable 3. System Board
Printer Fault Printer powered-on and ready?	1. **Printer** 2. Printer Cable 3. System Board
Printer Not Selected Ensure the printer is powered-on and ready.	1. **Printer** 2. Printer Cable 3. System Board
Program or File Not Found Press Any Key Diagnostics cannot find the USER(N).COM file.	1. **Diagnostic Diskette** 2. Diskette Drive 3. System Board
Program Too Big To Fit In Memory Too many Terminate and Stay Resident programs in memory.	1. **Reboot the system from the Diagnostic Diskette.**
QAPlus/PRO Cannot Be Re-run Because Of Error In Relocating Program Diagnostics failed to relocate the Diagnostics Test programs so the memory space it resides in was not tested.	1. **Diagnostic Diskette** 2. Memory Module 3. System Board
RAM Memory Error in Block n. Bad bits n Memory error.	1. **Memory Module** 2. System Board
RAM Test Failed Memory error.	1. **Memory Module** 2. System Board

Error Message/Symptom	FRU/Action
Read error on cylinder n Hard disk drive format error.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed) 3. System Board
Read Errors Diskette drive read error.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Receive Error Serial Port loopback test error.	1. **Serial Port Cable** 2. System Board
Refresh Failure Diagnostics Test detected an error while testing the DMA controller's RAM refresh cycle.	1. **Memory Module** 2. System Board
RTC Interrupt Failure Diagnostics Test cannot detect the Real-Time clock interrupt.	1. **Real-Time Clock Assembly** 2. System Board
Serial Chip Error COM Port error, general.	1. **Serial Port Cable** 2. System Board
Serial Compare Error COM Port error, information transmitted is not the same as information received.	1. **Serial Port Cable** 2. System Board
Serial Time-out Error COM Port error, time interval is too long between transmitted and received data.	1. **Serial Port Cable** 2. System Board
Serious Memory Error — **Diags Cannot Continue** Memory Test error.	1. **Memory Module** 2. System Board
Sorry You Need A Mouse Mouse or mouse driver was not detected.	1. **Mouse** 2. System Board
System Hangs Go to "Undetermined Problem" on page 83.	1. **Any device** 2. Any adapter 3. System Board
The Address Exceeds The Size Of Your Memory An invalid memory address was entered. The Diagnostics Tests display this message during the Locate Bad Chips option under the interact menu if an invalid memory address was entered at the "Enter Memory Address Of Bad Chip" prompt.	1. **Enter correct address** 2. Memory Module 3. System Board

Error Message/Symptom	FRU/Action
That Number is Out Of Range An invalid bit number was entered. Diagnostics Tests display this message during the Locate Bad Chips option.	1. **Enter the correct number.** 2. Memory Module 3. System Board
Too Many Errors — Test Aborted Too many errors, the Diagnostics Test cannot continue.	1. **Microprocessor** 2. System Board
Transmit Error Internal or external serial port loopback test failure.	1. **Serial Port Cable** 2. System Board
Video Adapter Failed Test Result Summary, displayed if "Fail" was at the Quit/Fail/Pass menu of any video test.	1. **Video Adapter** 2. System Board 3. Display
Write error on cylinder n Hard disk drive write error.	1. **Hard Disk Drive** 2. Hard Disk Drive Adapter (if installed)
Write Errors Diskette drive write error.	1. **Diskette** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
Write Protected or Unformatted Diskette is Write Protected or not formatted.	1. **Insert a non-write protected, formatted diskette into the diskette drive; then rerun the test.** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
You Cannot Delete the Motherboard "Remove Board" option was selected. The Diagnostics Tests display this message during the Locate Bad Chips option.	1. **Make the correct selection.** 2. Memory Module 3. System Board 4. Processor

Miscellaneous Error Messages

Message/Symptom	FRU/Action
Changing colors.	1. **Display**
Computer will **not** power-off. See "Power Supply" on page 71.	1. **Power Switch** 2. System Board
Dead computer. See "Power Supply" on page 71.	1. **Power Switch** 2. Power Supply 3. System Board
Diskette drive in-use light remains on or does not light when drive is active.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable
Flashing cursor with an otherwise blank display.	1. **System Board** 2. Primary Hard Disk Drive 3. Hard Disk Drive Cable
Incorrect memory size during POST.	1. **Run the Memory tests.** 2. Memory Module 3. System Board
"Insert a Diskette" icon appears with a known-good diagnostics diskette in the first 3.5-inch diskette drive.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable 4. Network Adapter
Intensity or color varies from left to right of characters and color bars.	1. **Display** 2. System Board
No power, or fan not running.	1. **See "Power Supply" on page 71.**
Nonsystem disk or disk error-type message with a known-good diagnostic diskette.	1. **Diskette Drive** 2. System Board 3. Diskette Drive Cable
Other display symptoms not listed above (including blank or illegible display).	1. **See "Display" on page 490.** 2. System Board 3. Display
Power-on indicator or hard disk drive in-use light not on, but computer works correctly.	1. **Power Supply** 2. System Board 3. LED Cables
Printer problems.	1. **See "Printer" on page 524.**
Program loads from the hard disk with a known-good diagnostics diskette in the first 3.5-inch diskette drive.	1. **Run Setup** 2. Diskette Drive 3. Diskette Drive Cable 4. System Board 5. Power Supply
Serial or parallel port device failure (system board port).	1. **External Device Self-Test OK?** 2. External Device 3. Cable 4. System Board

Message/Symptom	FRU/Action
Serial or parallel port device failure (adapter port).	1. **External Device Self-Test OK?** 2. External Device 3. Cable 4. Alternate Adapter 5. System Board 6. Riser Card
Some or all keys on the keyboard do not work.	1. **Keyboard** 2. Keyboard Cable 3. System Board
Clock Battery inaccurate.	1. **Clock Battery (See "Battery Notice" on page 461)** 2. System Board

Parts Listings

Service Position.

System

Index	Description	Part Number
1	Cover (Top)	06H1771
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
2	Diskette Drive,	
	see DASD (PC Server 310 - Type 8639)	
3	Hard Disk Drive,	
	see DASD (PC Server 310 - Type 8639)	
4	Power Supply Assembly (210W, 3.3V),	06H2968
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
5	System Board see System Board	
	(PC Server 310 - Type 8639)	
6	Base Frame	06H9405
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
7	Card Guide	06H1779
	(Models 0D0, 0DT, 0XT, 0Z0, 0ZT)	
7	Card Guide	06H1778
	(Models MDT, MXT, MZT)	
9	DASD Tray (Removal)	06H1780
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
10	DASD Tray (Non-Removal)	06H1781
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
11	Floor Stand Assembly	07H0516
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	5.25-Inch Blank Bezel	96G2484
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Blank Bezels	06H1784
	(Models MDT, MXT, MZT)	
	Bottom Cover	06H1791
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	C2 Switch Assembly	06H1788
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Cover Latch	06H1783
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Door Assembly	96G2446
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Door Hinge	96G2447
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	EMC Clip	06H5734
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	EMC Shield	06H1782
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Fan Assembly	06H1796
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Front Bezel	96G2445
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Keyboard with Cable, see	
	"Keyboards (101/102 Key - RD)" on page 123,	
	"Enhanced Keyboards (101/102 Key - BS)" on page 124	
	Keylock with Keys	33F8433
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	LED and Cable Power	93F2389
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Mouse	06H4595
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	
	Power Button	06H1777
	(Models 0D0, 0DT, 0Z0, 0ZT, 0XT, MDT, MXT, MZT)	

Keyboards (101/102 Key - RD)

Arabic	71G4617
Belgium-French	71G4618
Belgium-Dutch	71G4639
Bulgarian	71G4619
Czech	71G4620
Danish	71G4621
Dutch	71G4622
French	71G4624
French/Canadian	06H2963
German	71G4625
Greek	71G4626
Hebrew	71G4627
Hungarian	71G4628
Iceland	71G4629
Italy	71G4630
Latin/Spanish	82G3291
Norwegian	71G4631
Polish	71G4632
Portuguese	71G4633
Romanian	71G4634
Russian/Cyrillic	71G4635
Serbian/Cyrillic	71G4636
Slovak	71G4637
Spanish	71G4638
Swedish/Finnish	71G4623
Swiss-French/German	71G4640
Turkish	71G4642
Turkish	82G3255
UK English	71G4643
US English	71G4646
US English (E/ME/A use only)	71G4644
Yugoslavian/Latin American	71G4647

Enhanced Keyboards (101/102 Key - BS)

Enhanced Keyboards (101/102 Key - BS)

Arabic	8125417
Belgium-French	8125418
Belgium-Dutch	8125439
Bulgarian	8125419
Czech	8125420
Danish	81G5421
Dutch	8125422
Finnish	8125423
French	8125424
French/Canadian	82G3280
German	8125425
Greek	8125426
Hebrew	8125427
Hungarian	8125428
Iceland	8125429
Italy	8125430
Latin/Spanish	82G3294
Norwegian	8125431
Polish	8125432
Portuguese	8125433
Romanian	8125434
Russian/Cyrillic	8125435
Serbian/Cyrillic	8125436
Slovak	8125437
South African	8125441
Spanish	8125438
Swedish	8125423
Swiss - French/German	8125440
Turkish	8125442
UK English	8125443
US English	82G3278
US English (E/ME/A use only)	1396790
Yugoslavian/Latin American	8125447

Power Cords

Power Cords

Arabic	14F0033
Belgium	1339520
Bulgaria	1339520
Czech Republic	1339520
Denmark	13F9997
Finland	1339520
France	1339520
Germany	1339520
Hungary	1339520
Israel	14F0087
Italy	14F0069
Latvia	1339520
Netherlands	1339520
Norway	1339520
Poland	1339520
Portugal	1339520
Serbia	1339520
Slovakia	1339520
South Africa	14F0015
Spain	1339520
Switzerland	1339520
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	1339520

PC Server 320 - Type 8640

Features

> **Note**
>
> All PC Server computers have Selectable Startup.

Microprocessor

- Pentium with 16KB of internal cache
- Expandable to two microprocessors

Cache Memory

- 256KB of level-2 cache, upgradable to 512KB

Memory

- Standard: 16MB (min.), expandable to 256MB
- 70 ns, parity
- 8 single inline memory-module sockets

Diskette Drives

- Standard: one 3.5-inch, 1.44MB
- Optional (internal):

Hard Disk Drive

- Number of drives and drive capacities are model dependent
- Supports up to 7 internal hard disk drives

CD-ROM Drive

- Standard: SCSI-2

Keyboard and Mouse

- 101-key keyboard
- Mouse

Expansion

- 6 EISA/ISA slots, 3 PCI slots
  (1 shared slot)
- Up to 10 drive bays

Video

- SVGA Adapter
- Compatibility:
    - Video graphics adapter (VGA)
    - Enhanced graphics adapter (EGA)
    - Color graphics adapter (CGA)
    - Multicolor graphics array (MCGA)

Security Features

- Bolt-down capability
- Door lock
- Supervisor and user passwords
- Selectable drive-startup
- Security cover (optional)

Upgradable POST and BIOS

- Upgradable EEPROM on the system board
- BIOS upgrades (when available)

Integrated Functions

- Video port on an adapter
- 2 serial ports
- 1 parallel port
- Mouse port
- Keyboard port
- Battery-backed clock and calendar
- SCSI-2 connectors on an adapter

- 2 internal connectors
- 1 external connector

Power Supply

- 300 watt with voltage switch (115–230 V ac)
- Built-in overload and surge protection

SCSI-2 Controller (varies by model)

- IBM SCSI-2 Fast/Wide PCI Adapter
  - 2 internal connectors (one 8-bit and one 16-bit)
  - One 16-bit external connector
- IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter
  - Two 16-bit internal connectors
  - One 16-bit external connector

Diagnostics and Test Information

The following list contains problems and references for
diagnosing a PC Server 320.

Notes

- The QAPlus/PRO diagnostic program recognizes
  the primary processor as LUN 1 and the
  secondary processor as LUN 2. During testing
  the program automatically tests LUN 1. You
  must select LUN 2 if you want the program to
  test the secondary processor.
- The type of DASD diagnostics required to test
  the hard disk controller (adapter) and drives is
  determined by the type of hard disk adapter
  installed in the computer.
- Always start with "General Checkout
  (QAPlus/PRO)" on page 4.

Problem	Reference
Error Codes/Error Messages	"General Checkout (QAPlus/PRO)" on page 4 and the Symptom-to-FRU Index (QAPlus/PRO) on page 61 in the PS/2 Hardware Maintenance Manual.
DASD Adapter Problems	For non-disk-array models, see "SCSISelect Utility Program" on page 547. SCSI-2 Fast/Wide PCI-Bus RAID Adapter, see "Disk Array Configuration" on page 461.
Memory	"General Checkout (QAPlus/PRO)" on page 4.
Power Supply Voltages	"Power Supply" on page 152.
Miscellaneous	"General Checkout (QAPlus/PRO)" on page 4.

Additional Service Information

The following additional service information is for the PC Server 320 Type 8640.

- "Checkpoint Codes."
- "Configuration" on page 135.
- "Configuration Conflicts" on page 142.
- "Diagnostic Programs" on page 145.
- "Internal SCSI Drives" on page 147.
- "Power Supply" on page 152.
- "Setup Program" on page 153.
- "Specifications" on page 154..
- "System Board Replacement" on page 155.
- "Symmetric Multiprocessors/Multiprocessing" on page 155.

Checkpoint Codes

During POST, the computer displays the status of the components being tested in the form of Checkpoint (CP) codes in the lower left-hand corner of the screen. The following is a list of the CP codes followed by the routine in process and the boot mode.

CP Code	Routine	Boot Mode
01	Its_A_Reset	Cold+Warm+Restore+Mfg+SAD
0D	Init Chip_NS	Cold+Warm+Restore+Mfg+SAD
12	Periph Init	Cold+Warm+Restore+Mfg+SAD
03	Disable Video	Cold+Warm+Restore+Mfg+SAD
05	Phase 1 Enter Big Real	Cold+Warm+Restore+Mfg+SAD
B0	Enable Local APIC	Cold+Warm+Restore+Mfg+SAD
06	Cache Init	Cold+Warm+Restore+Mfg+SAD
07	Init Refresh	Cold+Restore+Mfg
08	Wait For RTC	Cold+Restore+Mfg
0A	Std CMOS Checksum NS	Cold+Warm+Restore+Mfg
0B	Mid CMOS Checksum NS	Cold+Warm+Restore+Mfg
0C	Ext CMOS Checksum NS	Cold+Warm+Restore+Mfg
0E	C SET_INIT	Cold+Warm+Restore+Mfg+SAD
10	Check Parity NonParity	Cold+Warm+Restore+Mfg
11	Disable Parity	Cold+Warm+Restore+Mfg+SAD
B1	Init Seattle	Cold+Restore+Mfg+SAD
13	Test CPU Regs	Cold+Restore+Mfg
14	Init RTC	Cold+Warm+Restore+Mfg+SAD
16	Init Timer 0	Cold+Warm+Restore+Mfg+SAD
17	Init Timer 2	Cold+Warm+Restore+Mfg+SAD
18	Test DMA	Cold+Warm+Restore+Mfg+SAD
19	Test Page Regs	Cold+Warm+Restore+Mfg+SAD

CP Code	Routine	Boot Mode
1A	Verify Refresh	Cold+Restore+Mfg
1B	Enable Parity	Cold+Warm+Restore+Mfg+SAD
1C	Save ID Warm	SAD
1D	Test First 64k	Cold+Restore+Mfg
1E	Clear First 64k	Cold+Warm+Restore+Mfg
1F	POST with Stack	Cold+Warm+Restore+Mfg+SAD
20	Enable BIOSE000	SAD
21	BIOS Shadow	Cold+Warm+Restore+Mfg
B2	Shadow SCSI	Cold+Warm+Restore+Mfg
23	Phase 2 POST	Cold+Warm+Restore+Mfg+SAD
24	Enable BIOS F000	SAD
24	Shadow VPD	Cold+Warm+Restore+Mfg
25	Init Key Board Data	Cold+Warm+Restore+Mfg+SAD
26	Save ID	Cold+Warm+Restore+Mfg+SAD
B3	Check P54C	Cold+Mfg
27	Init Q Boot	Cold+Warm+Restore+Mfg
28	Periph Config	Cold+Warm+Restore+Mfg+SAD
2A	Init Timeout Tables	Cold+Warm+Restore+Mfg+SAD
2B	Pos_Setup	Cold+Warm+Restore+Mfg
2F	Test DMA Locations	Cold+Warm+Restore+Mfg+SAD
B4	Init DMA Regs	Cold+Warm+Restore+Mfg+SAD
30	Test PICs	Cold+Warm+Restore+Mfg+SAD
31	Init Vector Table	Cold+Warm+Restore+Mfg+SAD
32	Enable Timer Int	Cold+Warm+Restore+Mfg+SAD
33	Init Keyboard	Cold+Warm+Restore+Mfg+SAD
34	Clear Memory Size Error	Cold+Restore+Mfg
35	Check Configuration	Cold+Warm+Restore+Mfg
36	Mfg Boot Fork	Cold+Restore+Mfg
37	PCI Reset	Cold+Warm+Restore+Mfg
B5	NVRAM check	Cold+Warm+Restore+Mfg
38	PCI Video	Cold+Warm+Restore+Mfg
3B	Sign On	Cold+Warm+Restore+Mfg
3C	Test Timer Tick	Cold+Restore+Mfg
3F	Enable Video	SAD
40	CSET BFR SIZMEM	Cold+Warm+Restore+Mfg+SAD
41	Size Memory Above 64k	Cold+Warm+Restore+Mfg
42	CSET AFT SIZ MEM	Cold+Warm+Restore+Mfg
43	Test Timer 2	Cold+Warm+Restore+Mfg
44	Password Not Entered	Cold+Restore

CP Code	Routine	Boot Mode
45	Test PS/2 Mouse	Cold+Warm+Restore+Mfg
46	Check For Mouse Buttons	Cold+Restore
47	Init Key Board Flags	Cold+Warm+Restore+Mfg+SAD
48	Test Key Board	Cold+Warm+Restore
4B	Memory Test Prompt	Cold+Warm+Mfg
4C	Test Memory	Cold+Restore+Mfg
4D	Clear EBDA	Warm
4E	CSET AFT M TEST	Cold+Warm+Restore+Mfg
4F	Allocate EBDA	Cold+Warm+Restore+Mfg
B6	Set Planar Info	Cold+Restore+
50	xfer ebda vars	Cold+Warm+Restore+Mfg
B7	Init P54M	Cold+Warm+Restore+Mfg
B8	Init MP Structures	Cold+Warm+Restore+Mfg
B9	CPU Speed	Cold+Warm+Restore+Mfg+SAD
51	Set Warm Boot Flag	Warm
52	Clear Speed Bits	Cold+Warm+Mfg+SAD
53	E FLOB	Cold+Warm+Restore+Mfg+SAD
54	Enable System Interrupts	Cold+Warm+Restore+Mfg+SAD
55	C2 Security Check	Restore
56	Init Key Board	Cold+Warm+Restore+SAD
57	Test RTC	Cold+Warm+Restore+SAD
58	Check For NPX	Cold+Warm+Restore+Mfg+SAD
59	reset hdctl	Cold+Warm+Restore+Mfg+SAD
5A	FD INIT	Cold+Warm+Restore+Mfg+SAD
5B	Set Floppy Config	Cold+Warm+Restore+Mfg+SAD
BA	Unlock Early	Cold+Restore
5C	Init A20	Cold+Warm+Restore+Mfg+SAD
5D	Cache Config	Cold+Warm+Restore+Mfg+SAD
5E	HD SETUP	Cold+Warm+Restore+Mfg+SAD
62	Verify CMOS Config	Cold+Warm+Restore+Mfg
70	Check For Setup Hot Key	Cold+Warm
63	Clear Screen	Cold+Warm+Restore+SAD
BB	Init IRQ Levels	Cold+Restore
65	IBM Cirrus DDC	Cold
BC	PACP Arbitration	Cold+Warm+Restore+Mfg+SAD
BD	Enable Planar SCSI	Cold+Warm+Restore+Mfg+SAD
66	CSET BFR OPROM	Cold+Warm+Restore+Mfg

CP Code	Routine	Boot Mode
BE	Do ROM Scan	Cold+Warm+Restore
2C	TCPC	Cold+Warm+Restore+Mfg
49	TCPC Errors	Cold+Warm+Restore
2D	Find Serial Ports	Cold+Warm+Restore+Mfg
2E	Find Parallel Ports	Cold+Warm+Restore+Mfg
68	CSET AFT OPROM	Cold+Warm+Restore+Mfg
BF	Get MC Data	Cold+Warm+Restore
69	PCI Configure	Cold+Warm+Restore+Mfg
6A	MFG Hook 65	MFG
6B	Init Time Of Day	Cold+Warm+Restore+Mfg+SAD
6C	Check For Locked Key Board	Cold+Warm+Restore+SAD
6D	Init Enable NMI	Cold+Warm+Restore+Mfg+SAD
6E	Set Boot Speed	Cold+Warm+Restore+Mfg
6F	Set Key Board LEDs	Cold+Warm+SAD
71	Init Flush Key Board	Cold+Warm+Restore+SAD
72	Move Error Log To EBDA	Cold+Warm+Restore+Mfg
73	Init Disable Mouse	Cold+Warm+Restore+Mfg+SAD
74	Sys Reset	MFG
75	Phase 2 Exit Big Real	Cold+Warm+Restore+Mfg+SAD
76	BOOT STRAP 1	Cold+Warm+MFG+SAD
78	SAD BOOT PROC	SAD
79	Start Boot Sequence	N/A
7A	Read Boot Sector	N/A
7B	Boot Sector Read Complete	N/A
7C	Check for CE Boot Override	N/A
7F	Xfer to boot code	N/A

The following codes also produce a series of beeps. The series of beeps are listed for each code followed by an explanation of the code.

CP Code	Beeps	Definition
82	1-1-3	CMOS write/read failure
83	1-1-4	BIOS ROM checksum failure
84	1-2-1	Programmable Interval Timer test failure
85	1-2-2	DMA initialization failure

CP Code	Beeps	Definition
86	1-2-3	DMA page register write/read test failure
87	1-2-4	RAM refresh verification failure
88	1-3-1	1st 64K RAM test failure
89	1-3-2	1st 64K RAM parity test failure
90	2-1-1	Slave DMA register test in-progress or failure
91	2-1-2	Master DMA register test in-progress or failure
92	2-1-3	Master interrupt mask register test failure
93	2-1-4	Slave interrupt mask register test failure
95	2-2-2	Key-board controller test failure
99	2-3-2	Screen memory test in-progress or failure
9A	2-3-3	Screen retrace tests in-progress or failure
9B	N/A	Search for video ROM in-progress
9C	N/A	Screen believed operable - mode in low two bits
9D	N/A	Screen believed operable - mode in low two bits
9E	N/A	Screen believed operable - mode in low two bits
9F	N/A	Screen believed operable - mode in low two bits
A0	3-1-1	Timer tick interrupt test failure
A1	3-1-2	Interval timer channel 2 test failure
A3	3-1-4	Time-Of-Day clock test failure
A7	3-2-4	Comparing CMOS memory size against actual
A8	3-3-1	Memory size mismatch occurred
D0	N/A	Cache State
D1	N/A	Cache Init
D2	N/A	Cache Restore
D3	N/A	Cache Config
D4	N/A	Cache Flush
D5	N/A	Cache Enable
D6	N/A	Cache Disable
D7	N/A	Cache Custom
e1h	N/A	CSET BFR VIDROM
e5h	N/A	CSET AFT CMCFG

Configuration

> **Note**
>
> DASD and other adapters may require additional configuration information.

Configuration is the allocation of the server resources to organize and interconnect hardware devices and software programs. The steps required to configure the above named severs depend on the number and variety of devices and programs installed.

For information about configuring the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter, see "Starting the RAID Configuration Program" on page 465.

These servers support the following types of adapters.

- Peripheral Component Interconnect (PCI)
- Extended Industry Standard Architecture (EISA)
- Industry Standard Architecture (ISA)

The following hardware configuration utility programs are supplied with the server.

- Built-in Setup program
  Configures system board functions, such as the integrated drive electronics (IDE) controller and serial and parallel port assignments that you install. It also allows you to set passwords for starting up and accessing the Setup program.
- PC Server 520 EISA Configuration Diskette
  Configures EISA and ISA adapters (boards).
- Built-in SCSI-2 adapter utility program (SCSISelect Utility program)
  Configures SCSI devices installed in non-disk-array models
- Configuration Option Diskette
  Configures SCSI devices in disk-array models

Assigning Interrupt Levels: A rotational interrupt technique to is used to configure PCI adapters. This technique enables you to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

Always use the IBM PC Server EISA Configuration Diskette for the system you are servicing when assigning interrupts for EISA and ISA adapters. You cannot assign an EISA or ISA adapter the same interrupt that you have assigned to a PCI adapter. This is because the server does not support interrupt sharing among PCI, EISA, and ISA adapters.

If a situation occurs where you need an additional interrupt, you can use an interrupt from another function that you might not need, such as the IDE controller (Interrupt 14) or COM2 (Interrupt 3).

EISA Configuration Diskette: You must use the EISA Configuration Diskette anytime you want to change resource allocations, such as:

- Adding or removing devices
- Moving devices
- Changing device function
- Resolving conflicts
- Adding or removing PCI adapters

Each time you use the EISA Configuration Diskette to configure the server, the configuration information is saved in a *System Configuration Information (SCI)* file and in the NVRAM configuration. Only devices that you install and configure correctly appear on the EISA Configuration screens.

Backing Up the EISA Configuration Diskette:
Use an operating system command, such as the DOS DISKCOPY command, to make a *complete* backup copy of the EISA Configuration Diskette. Using the backup copy can prevent damage to the original diskette. The operating system documentation provides information on backing up diskettes.

Making Menu Selections: When you start the EISA Configuration Diskette, an introductory screen appears. Type **CF** at the prompt. After you press Enter, the main menu, **Steps in configuring the computer**, appears. The EISA Configuration program main menu contains five steps:

Step 1

Important EISA configuration information: This step provides information about the differences between the ISA configuration process and the EISA configuration process.

Step 2

Add or remove boards: If the server is configured correctly, this step provides a list of the devices installed in the EISA expansion slots. The **Add** choice allows you to add ISA devices to the configuration. If EISA adapters are installed in the server, and you have not copied the *.CFG* file to the EISA Configuration Diskette, you are prompted to insert the adapter's configuration diskette into the diskette drive. The *.CFG* file is copied to your diskette. If the adapter's *.CFG* file is copied to the EISA Configuration Diskette before starting the diskette, and the adapter is installed in the server, EISA devices are added automatically.

Step 3

View or edit details: After adding EISA or ISA adapters in Step 2, use the **Edit** selection of this step to configure them. Use the **Edit Resources** selection of this step for

complex configurations. If you change a setting in this step, you might have to change a switch or jumper setting on the system board or on a device.

Step 4

Examine switches or print report: After Steps 1 and 2 have been completed correctly, this step displays the correct switch and jumper settings for the installed devices that have switches and jumpers. Also, you can choose to print a system configuration report.

Step 5

Save and exit: This step allows you to save the configuration or to discard the changes before exiting the program.

Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your selection; then press **Enter** to make your selection. To help you track your progress, a checkmark (√) appears on the main menu next to the completed steps.

You can access help information through:

- Help windows, which remain active.
- Information windows, which appear automatically as a result of some configuration activities.
- The Help=F1 prompt, which allows you to access the Help Menu for screens displaying the prompt. To remove the Help Menu, press **Esc**.

Recording EISA Configuration Settings: Record the configuration settings you made in **Step 3, View or edit details** and **Step 4, Examine switches or print report** on a separate sheet and store it in a safe place for future reference. If a printer is attached to the server, you can use the **Print Screen** key to print these settings. The settings are helpful when you install additional options. Also, record the new settings each time you make changes. Be sure to record the current configuration settings for the user.

Starting the EISA Configuration Diskette: Using a backup copy of the EISA Configuration Diskette can prevent damage to the original diskette (see "Backing Up the EISA Configuration Diskette" on page 136).

To start the EISA Configuration Diskette, do the following:

1. Insert the EISA Configuration Diskette into the diskette drive.
2. Power-on the computer, or if it is already on, shut down the operating system and restart the computer.
3. When the first screen appears, type **CF** and press **Enter**. Follow the instructions on the screen until the main menu, **Steps in configuring the computer**, appears.

4. Use the Up Arrow (↑) or Down Arrow (↓) key to
   advance through the items on the screen. Use the
   Tab key to select choices on the bottom of the
   screen. Press the Esc key to return to a previous
   menu.
5. Press **Enter** to make a selection.
6. Follow the instructions on the screen to view or
   change (edit) the configuration information.

> **Note**
>
> Adapters installed in the server appear
> automatically on the EISA Configuration screens
> *after* you copy the adapter's configuration file (file
> with an extension of *.CFG*) to the EISA
> Configuration Diskette. If you want to manually
> add an adapter that you have not yet installed in
> the server, add it using Step 2 from the menu.
> To configure ISA adapters, follow the instructions
> on the screen.

**Using EISA Configuration Diskette Advanced
Function:** Locking an ISA adapter reserves the selected
resources and prevents the system from using them to
resolve resource conflicts. Use the **Advanced** function to
lock ISA boards. An exclamation mark (!) appears next to
locked adapters.

To use the Advanced functions, do the following:

1. Start the EISA Configuration Diskette (see "Starting
   the EISA Configuration Diskette" on page 137).
2. At the main menu, select **Step 3,** The View or edit
   details screen appears.
3. Press **F7**. The Advanced functions screen appears.
4. Follow the instructions on the screen to:
   a. Lock or unlock boards
   b. View additional system information
   c. Set verification mode
   d. Maintain SCI files

EISA, ISA, and PCI Adapters: Before installing a
new device or program, read the documentation supplied
with it. Reading the instructions helps you determine the
steps required for installation and configuration. The
following list provides a preview of the actions that might
be required to configure the server.

When installing different types of adapters at the same
time, install and configure them in the following sequence:

1. ISA
2. EISA
3. PCI

1. Run the Setup program and record the current configuration settings.
2. Backup the EISA Configuration Diskette.

   See "Backing Up the EISA Configuration Diskette" on page 136.
3. Start the EISA Configuration Diskette and:
   a. Record the current settings.
   b. Install configuration files (.CFG).

   Note

   If the .CFG files were not supplied with the adapter, see "Files."

   See "Recording EISA Configuration Settings" on page 137 and "Starting the EISA Configuration Diskette" on page 137.
4. Set jumpers or switches on the server system board.

   See "Jumpers" on page 162.
5. Set jumpers or switches on the device.

   See the instructions supplied with the adapter.
6. Install the adapter in the server.
7. Install software programs.

   See the installation instructions supplied with the software.
8. Resolve configuration conflicts.

   See "Configuration Conflicts" on page 142.

EISA or ISA Features and Options: Some ISA and most EISA devices are supplied with option diskettes. These diskettes can contain any or all of the following types of information:

- Configuration files (.CFG)
- Diagnostic files (.DGS)
- Device drivers
- Sample applications (mini-applications)

Files: A configuration file is required to configure the server for ISA or EISA adapters. You must copy this configuration file, which has a file-name extension of .CFG, from the device diskette to the EISA Configuration Diskette before installing the device in the server. The configuration file reserves the system resources that the adapter needs to function properly.

Some ISA adapters are supplied with a diskette that contains the CFG file for the adapter. If ISA adapters are installed that were not supplied with their own CFG files, you must use the PC Server EISA Configuration Diskette

for the system you are servicing to create a unique CFG file for each adapter.

> **— Note —**
>
> The unique .CFG files are slot sensitive. That is, they should not be used to configure identical adapters in multiple systems unless you install the adapters in the same expansion slots within each system.

To create a unique CFG file for an ISA adapter, do the following:

1. Insert the IBM PC Server EISA Configuration Diskette for the system you are servicing into diskette drive A.
2. Start the configuration utility program.
3. At the main menu, select Step 2, **Add or remove boards.**
4. At the next menu, select the slot in which you installed the adapter.
5. At the next screen, select **OK.**
6. At the next screen, press **F5**; then select **Create .CFG file**.
7. Press **Enter**.
8. At the Create a board CFG file screen, type in the adapter manufacturer and description (for example IBM Token Ring); then press **Enter**.
9. Refer to the adapter documentation for information about specific configuration parameters (such as IRQ or DMA channel) required for the adapter. Then, follow the instructions on the screen to enter the appropriate parameters on the menu.

   Notes:

   a. Normally, ISA adapters do not use every parameter. Most adapters require only a PORT address.

   b. The SVGA video adapter in the server requires specific memory and I/O address assignments to function properly. To avoid configuration conflicts, do not assign the following SVGA memory and I/O addresses to other adapters or options in the server:

      - Memory address space:

        A000H – C7FFH

      - I/O address spaces:

        02E0h – 02EFh
        03B0h – 03DFh
        46E8h

10. After you type in all of the appropriate parameters, press **F10**.
11. At the next screen, carefully verify that the information is correct; then press **Enter**.
12. At the Add Confirmation window, press **Enter** again.

13. In the next window (add), press **Enter**.

   The adapter description appears in the selected slot.
14. Verify the installation; then press **F10**.
15. At the next menu, select **Save and exit the configuration utility**.

  Note

  PCI devices do *not* require .CFG files.

Device Drivers: Device drivers are programs designed to support a specific type of hardware device. They provide instructions that enable the computer to interact with the device, or to take advantage of a device's special feature. The device driver might ship with the operating system, the application program, or on the option diskette. Not all devices require device drivers. Refer to the documentation supplied with the option for additional information.

Sample Applications: Some optional devices provide small applications or sampler files. These applications demonstrate the capabilities of the device and serve as software examples for programming the device. Refer to the documentation supplied with the option for additional information.

To configure the server for an ISA or EISA adapter:

1. Read the documentation supplied with the adapter.
2. Copy any files with the extension of *.CFG* from the option diskette to the EISA Configuration Diskette. See "Files" on page 139 for important information about configuring ISA adapters.
3. Start the EISA Configuration Diskette (see "Starting the EISA Configuration Diskette" on page 137).
4. Record the new configuration information (see "Recording EISA Configuration Settings" on page 137).
5. Save the new configuration settings to the EISA Configuration Diskette and to the nonvolatile random access memory (NVRAM) (see "Starting the EISA Configuration Diskette" on page 137).
6. Set any jumpers or switches on the adapter.
7. Install the adapter in the server.

Memory: After you add (or remove) extended memory, you must update the EISA Configuration Diskette.

  Note

  Not performing the following procedure could result in memory errors, and in the operating system not recognizing the added (or removed) memory.

---

1. Start the EISA Configuration Diskette (see "Starting the EISA Configuration Diskette" on page 137).
2. Select **Step 3: View or edit details**. The system information appears.
3. Under **Advanced System Feature Setup**, select **Total System Memory**.
4. Select the correct amount of memory, then press **F10**.

> **Note**
>
> It is possible to install single-inline-memory-modules (SIMMs) in combinations where the total amount of memory installed does not appear on the memory configuration screen. In the unlikely event that this occurs, select the next lower setting on the memory configuration menu, and all of the installed memory will be supported on the server.

5. Return to the Main Menu, save the configuration, and exit from the utility program.

PCI Features and Options: PCI devices automatically communicate with the server's configuration information. This usually results in automatic configuration of a PCI device. If a conflict does occur, refer to "Configuration Conflicts."

Configuration Conflicts

The resources used by a server consist of interrupt request levels (IRQs), direct memory access channels (DMAs), I/O ports (for example, serial and parallel), and memory. This information is useful when a resource configuration conflict occurs.

Conflicts in the configuration occur if:

- A device is installed that requires the same resource as another device. (For example, if you install an ISA network adapter and an EISA network adapter, both requesting *IRQ 5*, only one of the adapters can be configured.)
- A device resource is changed (for example, changing jumper settings).
- A device function is changed (for example, assigning *COM 1* to two different serial ports).
- An installed software program requires the same resource as a hardware device (for example, an expanded memory specification (EMS) device driver that uses the address required by the SVGA video adapter).

The steps required to resolve a configuration error are determined by the number and variety of hardware devices and software programs install in the system.

If a hardware configuration error is detected, a *configuration error* message appears after the server completes POST, but before the operating system starts. You can bypass the error or start one of the configuration utility programs. Press **F1** to bypass the error and load the operating system. Press **F2** to start the Setup program. To start the EISA Configuration Diskette, insert the diskette in the diskette drive and press **F1**.

The Setup program and the EISA Configuration program configure only the system hardware. These programs do not consider the requirements of the operating system or the application programs.

Changing the Software Configuration: The best way to resolve memory-address conflicts is to change the addresses used by the application program or the device driver. To do this, use the EISA Configuration program.

If a device driver is causing a memory-address conflict, refer to the operating-system documentation or the documentation supplied with the device drivers.

Resolving Hardware Configuration Conflicts: Use the following information to help resolve hardware configuration conflicts:

1. Run the Setup program to view and change resources used by the system board functions. Record the current settings before making any changes. (See "Setup Program" on page 153 for instructions.)
2. Determine which adapter or device is causing the error. The EISA Configuration program specifies how the server checks for resource conflicts. Initially, this verification mode is set to automatic. When the mode is set to automatic, the EISA Configuration program tries to resolve configuration conflicts for you. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to change the setting (see "Using EISA Configuration Diskette Advanced Function" on page 138).

   If the automatic verification mode is set, the configuration program attempts to resolve conflicts for you. However, this might disable adapters or system board features. For example, if you choose IRQ 4 for an adapter, the program disables Serial Port 1, which uses IRQ 4. If this happens, and you do not want this feature disabled, choose another IRQ for the adapter.

   If you set the verification mode to *manual*, the configuration utility program does *not* try to resolve a conflict. Instead, you have to determine if a resource conflict has occurred and then resolve the conflict.

When the verification mode is set to manual, an asterisk (*) appears on the View or edit details screen next to adapters in conflict.

If the EISA Configuration program cannot resolve a configuration error, it *deactivates* the adapter and displays the deactivated status (<>) on the View or edit details screen. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to update or copy the server's system configuration information file (see "Using EISA Configuration Diskette Advanced Function" on page 138).

3. Change configuration resource allocations. Use the built-in Setup program to view or change system board resource allocations. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to view the available or the used system resources (see "Using EISA Configuration Diskette Advanced Function" on page 138). Use the **Edit Changes** selection to change resource allocations for complex configurations.

4. Change adapter jumpers or switches. Jumpers and switches define the system resources that a device can use. If the settings are incorrect or set to use a resource that cannot be shared, a conflict occurs and the device remains deactivated by the configuration program. Use the EISA Configuration Diskette's Step 4, **Examine switches or print report** screen to verify switches (see "Making Menu Selections" on page 261). Read the documentation supplied with the device.

5. Change system board jumpers or switches. Remove the cover; then, refer to the system-board diagram inside the server.

6. Remove the device or adapter. Some configurations are not supported (for example, you cannot operate the server with two ISA SVGA adapters installed).

Resolving Software Configuration Conflicts:
The memory-address space and interrupt levels (IRQs) used by some hardware options might conflict with addresses defined for use through application programs or the EMS. (EMS is used only with DOS.)

If there is a conflict, one or more of the following conditions might exist:

- The system cannot load the operating system.
- The system does not work.
- An application program does not operate, or it returns an error.
- Screen messages indicate a conflict exists.

You can resolve conflicts by changing either the software or the hardware configuration.

Diagnostic Programs

The Diagnostic program supplied with the server is the
primary method of testing the server. Option-specific
diagnostic files are supplied with some optional devices
and adapters. These files provide a more specialized test
of the option. "Installing Additional Test Programs"
provides additional information about installing and using
diagnostic files. Also, refer to the documentation supplied
with the option for information on installing and running
option-specific diagnostics.

Installing Additional Test Programs: You can
add other test programs to the Diagnostic Diskette. These
other programs are usually provided on the diskette
supplied with a device. After you add the programs to the
Diagnostic Diskette, you can include information from the
programs in the Test Log.

Before the test programs can find these programs to run
as the User Diags test group, information about them must
be included in a file called USERDIAG.CFG. This is an
ASCII text file. It must include the following three items for
each test to run:

- Program Name (.COM and .EXE files only)
- Test Description of the test to be run
- Command-line parameters to be passed to the
  program identified in the first item of this list

Notes

1. All of the information for a given test must be on a single line, and a semicolon (;) must separate the items on the line.

2. Make sure you press **Enter** at the end of each line of text in the USERDIAG.CFG file. This creates a carriage return line feed (CR LF) which is necessary for the User Diagnostics to be found and executed.

3. If the program executable file is in a directory other than the QA directory (or other directory you have designated to contain the QA files), that directory must be listed in the PATH= section of the AUTOEXEC.BAT.

4. You can use a .CFG file other than USERDIAG.CFG if you use the command line "USRCONFIG=*filename*," when running the diagnostic programs. For example, you might use: QAPLPRO /USRCONFIG=MYTESTS.CFG.

USERDIAG.CFG Example: An example
USERDIAG.CFG file might look like the following:

Program Name	Test Description	Command-Line Parameter
BBSMODEM.EXE;	9600 Baud 5 Line Modem;	5
TEST1.EXE;	Generic 1;	
TEST2.EXE;	Generic 2;	
TESTALL.EXE;	CMD 1;	1
TESTALL.EXE;	CMD 2;	2
TESTALL.EXE;	CMD 3;	3

> **Note**
>
> You can have more than one command-line parameter for any given test.

When you view these tests on the Test Group window for
the User Diag test group, they appear as follows:

- (♦) 9600 Baud 5 Line Modem
- (♦) Generic 1
- (♦) Generic 2
- (♦) CMD 1
- (♦) CMD 2
- (♦) CMD 3

The diagnostic program automatically assigns a test
number to each test. The test numbers start at 201 and
continue upward as needed. The numbers for the tests
listed above are as follows:

202 9600 Baud 5 Line Modem
203 Generic 1
204 Generic 2
205 CMD 1
206 CMD 2
207 CMD 3

Internal SCSI Drives

The server supports *small computer system interface*
(SCSI) drives. You can attach multiple SCSI drives to the
preinstalled SCSI-2 adapter.

If you install additional SCSI devices in a non-disk-array
model, you must set a unique identification (ID) for each
SCSI device that you connect to the SCSI-2 Fast/Wide
PCI-Bus adapter, so that the SCSI-2 adapter can identify
the devices and ensure that different devices do not
attempt to transfer data at the same time.

The SCSI IDs in disk-array models with the SCSI-2
Fast/Wide PCI-Bus Adapter are hard-coded in the
backplane of the hot-swap bay and preset for the CD-ROM
drive. Do not attempt to change the SCSI IDs for internal
SCSI devices on disk-array models.

Refer to Table 1 on page 148 before setting SCSI IDs. Do not set the SCSI IDs for other devices to these values.

Note

Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.

Setting SCSI IDs for Internal Devices: For non-disk-array models, Fast/Wide (16-bit) devices support SCSI IDs 0 to 15; narrow (8-bit) devices support SCSI IDs 0 to 7. For disk-array models, the external channel connector supports SCSI IDs 0 to 7; the internal channel connector (only one of the two internal channel connectors can be used at one time) also supports SCSI IDs 0 to 7.

Note

For disk-array models, devices attached to the external connector and internal connector are accessed independently. A SCSI ID of 0 assigned to an internal device and a SCSI ID of 0 assigned to an external device does not create a conflict.

Table 1. SCSI IDs for Preinstalled SCSI Devices		
SCSI ID	**Bay**	**Device**
Non-Disk-Array Models		
6	1	Hard Disk Drive[1]
3	4	CD-ROM Drive
7	N/A	SCSI-2 Fast/Wide PCI Adapter
Disk-Array Models[2]		
0–5[3]	1–6	Hot-Swappable Hard Disk Drives[4]
6	7	CD-ROM Drive
7	N/A	SCSI-2 Fast/Wide PCI-Bus RAID Adapter
Note:		
1. This only applies to models with a hard disk drive preinstalled in bay 1.		
2. Or non-disk-array models with the hot-swap bay option installed.		
3. SCSI IDs are hard-coded into the hot-swap bay backplane.		
4. Two hard disk drives are preinstalled in some disk-array models in bays 1 and 2. The SCSI IDs for the two hard disk drives are 0 and 1.		

The drive from which you will start the non-disk-array server (also known as the boot or startup drive) should have a SCSI ID of 6. Therefore, if the server was not supplied with a preinstalled hard disk drive and you install hard disk drives, set the SCSI ID of the first drive (the boot drive) to 6.

> **Note**
>
> If the BIOS is version M54PE_08 or earlier and you have two PCI SCSI adapters installed in the PCI slots, the system will start from the hard disk drive attached to the SCSI adapter with the least amount of Read-only memory (ROM) and the lowest ROM address space. (In the case of equal ROM size, the system scans from slot 1 to 3 and assigns slot 1 as the lowest ROM address.) Therefore, in order for the system to load the operating system correctly, connect the startup drive to the SCSI adapter with the lowest ROM address space. If the version of BIOS is later than M54PE_08, and you have two PCI SCSI adapters installed in the PCI slots, the system will start from the hard disk drive attached to the SCSI adapter in descending order from slot 3 to slot 1.

If the disk-array model was supplied with a preinstalled hard disk drive in bay 1, this drive is the startup drive, and it already has a SCSI ID of 0. The SCSI ID of the preinstalled hard disk drive in bay 1 of non-disk-array models is set to 6.

Refer to the instructions supplied with the SCSI devices for information about setting a SCSI ID.

The SCSI-2 adapter in the server has two internal connectors and one external connector:

- On non-disk-array models, the SCSI-2 adapter has one internal connector for an 8-bit cable, and one internal connector for a 16-bit cable.

  Non-disk-array models that are supplied with a preinstalled wide hard disk drive use a 16-bit internal connector. Non-disk-array models that are not supplied with a preinstalled hard disk drive or supplied with a narrow hard disk drive use an 8-bit internal connector.
- On the disk-array models, the SCSI-2 adapter has two internal connectors for 16-bit cables.

  > **Note**
  >
  > To keep the external channel available for use on the preinstalled RAID adapter, use Channel 2 for connecting internal SCSI devices.

Internal Channel 1   Internal Channel 2

External Channel 1
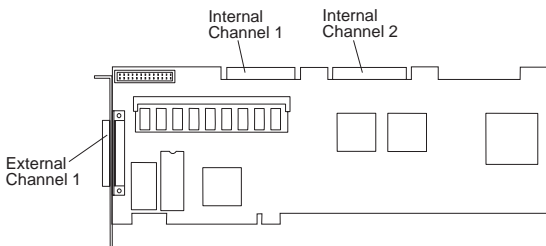
- On all models, the external connector is for 16-bit cable.

The SCSI-2 Fast/Wide PCI Adapter supports a total of seven 8-bit or fifteen 16-bit SCSI devices. The SCSI-2 Fast/Wide PCI-Bus Adapter supports a total of fourteen 16-bit SCSI devices.

- **Note**

If you plan to install both internal and external SCSI devices, you must follow the instructions given in "External SCSI Devices" on page 508 in addition to the instructions in this section.

Termination (Internal SCSI Devices): The devices at both ends of the SCSI bus must be terminated. If you attach SCSI devices (internal or external), you must terminate the last device in the chain. You must remove the termination from the other devices within the chain. If you attach external devices to a non-disk-array model with internal devices attached, you must also change the termination setting of the SCSI-2 adapter from the default in the SCSISelect utility program, as described in "SCSISelect Utility Program" on page 547.

- **Note**

Read the README file on the SCSI-2 Fast/Wide PCI-Bus Adapter Configuration Option Diskette for updated information. Select **Option Diskette** from the first menu.

Termination on disk-array models is automatically set.

The requirements for terminating internal SCSI devices on non-disk-array models are:

- If you attach internal SCSI devices to only one of the SCSI-2 adapter internal connectors, you must terminate the last internal device on the bus (cable) and disable the termination on the other devices connected to the internal SCSI connector. The SCSI-2 adapter is already terminated.
- If you attach internal SCSI devices to both of the SCSI-2 adapter internal connectors, you must

terminate the last internal device on each internal
cable and disable the termination on the other
devices connected to the internal SCSI connectors.
You must also change the termination setting of the
SCSI-2 adapter from the default in the SCSISelect
utility program, as described in "SCSISelect Utility
Program" on page 547.

> **Note**
>
> You can use only one of the two internal SCSI
> connectors on the SCSI-2 adapter if you connect
> both internal and external devices.

A CD-ROM drive is installed in bay 4 of non-disk-array
models and bay 7 of disk-array models. In non-disk-array
models that are supplied with a narrow hard disk drive a
narrow (8-bit) cable is provided. In non-disk-array models
that are not supplied with a hard disk drive:

- The CD-ROM drive is terminated.
- A narrow (8-bit) cable is provided in these models.

  If you install 8-bit drives above the CD-ROM drive in
  bays 5–9, remove the termination from those drives.
- If you install a drive in bay 1, you must terminate that
  drive and remove the termination from the CD-ROM
  drive
- If you install a 16-bit device, you must purchase a
  16-bit cable and a 16-bit to 8-bit SCSI Internal
  Converter to connect the CD-ROM drive to the 16-bit
  cable.

Refer to the instructions supplied with the SCSI device for
more information about termination.

Power Supply

Note: Verify that the voltage-select switch (if applicable) is set for the correct voltage.

If the power-on indicator is not on, and if the power-supply fan is not running, check the power cord for proper installation and continuity.

If the power cord is OK, either the power supply is defective or a defective device is causing the power supply to shut off. Check the power supply voltages.

If the voltages are incorrect, replace the power supply. If the voltages are correct, and the Symptom-to-FRU index does not solve the problem, go to "Undetermined Problems" on page 552.

P1

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
5, 6	1	Power Good	
5, 6	2	+4.8V	+5.25V
5, 6	3	+11.52V	+12.60V
5, 6	4	−10.8V	−13.2V

P2

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
1, 2	3	−4.5V	−5.5V
1, 2	4	+4.8V	+5.25V
1, 2	5	+4.8V	+5.25V
1, 2	6	+4.8V	+5.25V

P3

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
4, 5, 6	1, 2, 3	+4.8V	+5.25V

P4 and P6

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2, 3	1	+4.8V	+5.25V
2, 3	4	+11.52V	+12.6V

P5, P7, and P8

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2, 3	1	+11.52V	+12.6V
2, 3	4	+4.8V	+5.25V

Setup Program

To access the Setup program:

1. Remove all diskettes from the server.

   > ── **Note** ──
   >
   > Never start the Setup program while using the
   > EISA Configuration program.

2. Power-on the server and watch the screen. Be ready
   to act quickly.
3. After the IBM logo screen appears and then quickly
   disappears, you are prompted to Press <F1> or <F2>
   to enter SETUP. As soon as you see that prompt,
   press the correct **F-key (F1 or F2)**. If the Setup
   program screen doesn't appear, restart the system
   and try again.

   > ── **Note** ──
   >
   > If a configuration error occurs, a prompt appears
   > before the operating system starts (see
   > "Configuration Conflicts" on page 274).

4. Follow the instructions on the screen to view or
   change the configuration.

   You must *correctly* exit from the Setup program to
   save the configuration information.
5. Press **Esc** or move the cursor to the **Exit menu**
   option on the menu bar.
6. Select **Exit menu** from the menu bar.
7. Select **Save changes and exit.**

Specifications

Size

- With pedestal:
  - Depth: 473 mm (18.6 in.)

    585 mm (23.0 in.) with cable cover
  - Height: 651 mm (25.6 in.)
  - Width: 315 mm (12.4 in.)
- Without pedestal:
  - Depth: 473 mm (18.6 in.)

    585 mm (23.0 in.) with cable cover
  - Height: 622 mm (24.5 in.)
  - Width: 195 mm (7.7 in.)

Weight

- Minimum configuration as shipped: 19.0 kg (42 lb)
- Maximum configuration as shipped: 19.5 kg (43 lb)

Environment

- Air temperature:
  - System on: 10° to 35° C
    (50° to 95° F)
    Altitude: 0 to 914 m (3000 ft.)

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

Electrical Input

- Sine-wave input (50 to 60 Hz) is required
- Input voltage:
  - Low range:
    - Minimum: 90 V ac
    - Maximum: 137 V ac
  - High range:
    - Minimum: 180 V ac
    - Maximum: 265 V ac

  - Input kilovolt-amperes (kVA) approximately:
    - Minimum configuration as shipped: 0.07 kVA
    - Maximum configuration: 0.64 kVA

Total Power Available for Drives

- Nominal Operating Current allowed:
  - +5 V dc line: 9.3 A
  - +12 V dc line: 6.0 A

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour:
  - Minimum configuration:
    150 BTU (44 watts)
  - Maximum configuration:
    1434 BTU (420 watts)

System Board Replacement

Type 8640 computers have one or two processors, and other components installed on the system board. When replacing the system board, remove all of the installed components from the old system board and install them on the new system board. If the problem remains, check the following:

- The primary processor is installed and seated correctly in socket U2 on the system board.
- If installed, the secondary processor is seated correctly in socket U3 on the system board.
- All other components removed from the old system board are installed and seated correctly on the new system board.

- **Note**

  If the processor(s) are not seated correctly, intermittent problems can occur.

Symmetric Multiprocessors/Multiprocessing

Some PC Server computers incorporate a 90MHz Pentium processor and a second upgradeability processor socket on the system board to support Symmetric Multiprocessors/Multiprocessing (SMP). The SMP capability extends processing performance by allowing tasks to be dispatched to the next available processor rather then being queued until the busy processor has completed its task. The SMP capability also provides a level of high availability in that with some operating systems, such as OS/2 SMP, run in a uni-processor mode if one of the processors should experience a failure. This function will allow the LAN to continue operation so that service can be scheduled at a non-critical time.

Locations

Input/Output Connectors

- Power Connector
- Keyboard Connector
- Mouse Connector
- Serial Connectors
- Parallel Connector
- SCSI Connector
- Expansion Slots
- Display Connector

Keyboard Connector: The cable from the keyboard connects here.

Mouse Connector: This is where the mouse cable connects to the server. This connector sometimes is called an auxiliary-device or pointing-device port.

Serial Connectors: Two 9-pin serial connectors, A (COM1) and B (COM2), are provided. The serial signal cable for a modem or other serial device usually connects here. If you are using a 25-pin signal cable, you need a 9-pin to 25-pin adapter cable.

Parallel Connector: One 25-pin parallel port is provided. This is where the signal cable for a parallel printer, or other parallel device, connects to the server.

SCSI Connector: Attach external SCSI devices here.

Display Connector: The display signal cable attaches to the connector on this adapter.

Internal Drive Bays (Disk-Array Models)

Internal drives are installed in *bays*. The bays are numbered 1 through 10.
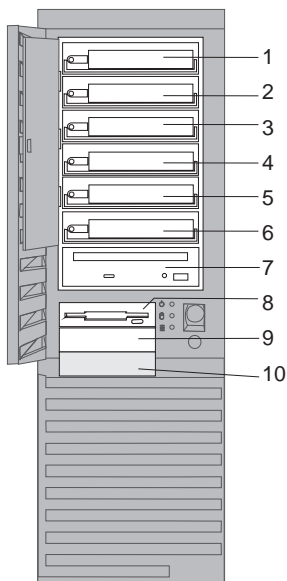
Cover plates (sometimes called *bezels*) cover the front of some installed drives. If you install a drive that uses removable media (diskette, optical disc, or tape), you might need to remove or change the cover plate.

- Bays 1–6 are for 3.5-inch hot-swappable hard disk drives.
- Bay 7 has a preinstalled SCSI CD-ROM drive.
- Bays 8 and 9 are for 3.5-inch diskette interface devices, such as a diskette drive or a tape backup unit that uses the diskette cable.

  The system board in the server supports a maximum of two diskette interface devices. You can install a second 3.5-inch diskette interface device in bay 9.
- Bay 10 is for a 3.5-inch hard disk drive only. Be sure the screw holes in the device line up with the screw holes in bay.
- Disk-array models are supplied with a 2-drop SCSI cable.

The following table shows the widths, types, and maximum heights for the drives that you can install in each bay.

Bay	Drive Width	Drive Type	Maximum Drive Height
1–6	3.5-inch	Hard disk	41.3 mm (1.6 inches)
7	5.25-inch	CD-ROM	41.3 mm (1.6 inches)
8, 9	3.5-inch	Diskette[1]	25.4 mm (1 inch)
10	3.5-inch	Hard disk	25.4 mm (1 inch), with a drive in bay 9 41.3 mm (1.6 inches), with no drive in bay 9
Note:			
[1] Or a drive that connects to the diskette cable. Be sure the holes in the drive align with the drive housing.			

Table 2. Maximum Allowable Drive Sizes (Disk-Array Models)

Internal Drive Bays (Non-Disk-Array Models)

Internal drives are installed in *bays*. The bays are numbered 1 through 9.
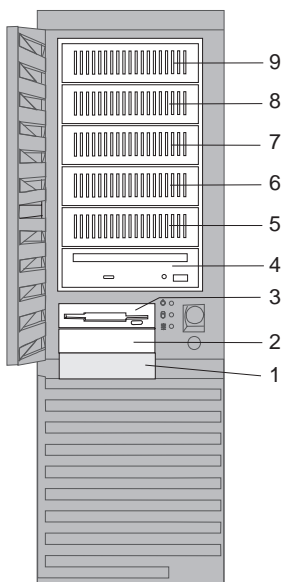
> **Note**
>
> If you install a drive that uses removable media (diskette, optical disc, or tape), you might need to remove or change the cover plate.

- Bay 1 is for 3.5-inch hard disk drives only. Some models are supplied with a hard disk drive preinstalled in bay 1.
- Bays 2 and 3 are for 3.5-inch diskette interface devices, such as a diskette drive or tape backup unit that uses the diskette cable. All models are supplied with a diskette drive preinstalled in bay 3.
- Bay 4 has a preinstalled SCSI CD-ROM drive.
- Bays 5–9 are for 3.5-inch or 5.25-inch drives.
- The system board supports a maximum of two diskette interface devices. You can install a second 3.5-inch diskette interface device in bay 2. Be sure the screw holes in the device line up with the screw holes in bay.
- Bays 5–9 contain trays for housing 3.5-inch drives. If you want to install a 5.25-inch drive in one of these bays, you must remove screws and the tray before attempting to install the drive.

- You can install a full-high drive between bays 6 and 7 by removing the trays from these bays. You cannot install full-high drives between bays 4 and 5, or between bays 8 and 9.
- If you are installing one or two integrated drive electronics (IDE) drives, you must purchase an IDE cable, such as in the PC Server Cable Kit.
- If you are connecting two hard disk drives to the IDE controller, you must reset the jumpers on one of the drives, as specified in the documentation supplied with the drive.
- If a preinstalled hard disk drive was not supplied with the server and you plan to have more than four 8-bit internal SCSI drives (including the CD-ROM drive), you must use an optional 7-drop SCSI cable in place of the 4-drop SCSI cable supplied with the server.

  To install 16-bit devices, you need a 16-bit cable (and a 16-bit to 8-bit SCSI Internal Converter if you want to connect the CD-ROM drive to the 16-bit cable). See "Internal SCSI Drives" on page 147 for additional information.
- The IBM 3.5-inch rewritable optical disc drive requires a special mounting bracket.

The following table shows the widths, types, and maximum heights for the drives that you can install in each bay.

Bay	Drive Width	Drive Type	Maximum Drive Height
1	3.5-inch	Hard disk	25.4 mm (1 inch), with a drive in bay 2
			41.3 mm (1.6 inches), with no drive in bay 2
2, 3	3.5-inch	Diskette[1]	25.4 mm (1 inch)
4	5.25-inch	CD-ROM	41.3 mm (1.6 inches)
5–9	3.5-inch or 5.25-inch	Hard disk, removable media[2]	41.3 mm (1.6 inches)

Notes:

1. Or a drive that connects to the diskette cable. Be sure the holes in the drive align with the drive housing.
2. Removable media include CDs, optical discs, and tapes.

Table 3. Maximum Allowable Drive Sizes (Non-Disk-Array Models)

System Board

Connections

Header	Configuration	Connect To
W12/W31	Speaker	Speaker
W18/W37	Power LED	Pins 1-3
W24/W38	IDE Hard Drive LED	IDE Hard Drive
W35	CPU Fan Connector	Fan
W36	CPU Fan Connector	Fan
J1/J2/J26	Power Supply Connector	P1 to J1 P2 to J2 P3 to J26
J6	Mouse Connector	Mouse
J8	Keyboard Connector	Keyboard
J9	Parallel Port Connector	Parallel Device
J10	Floppy Drive Connector	Diskette Drive
J11	Serial Port COMM A Connector	Serial Device
J12	Serial Port COMM B Connector	Serial Device
J13	ISA IDE Connector	IDE Hard Drive
N/A	SCSI LED	SCSI Option Card
N/A	SCSI Device Connector	SCSI Option Card

Jumpers

Jumper	Description	Setting
W1	L1 Cache Mode	Open - L1 Write-Back (Default) Closed - L1 Write-Through
W2	Reserved	Open
W5	L2 Cache Size	Pins 1-2 - L2 Cache Size = 256K (Default) Pins 2-3 - L2 Cache Size = 512K
W6	CPU Clock	Pins 1-2 Pentium 60/90MHz Pins 2-3 Pentium 66/100MHz

Jumper	Description	Setting
W10	L2 Cache Size	Pins 1-2 - L2 Cache Size = 256K (Default) Pins 2-3 - L2 Cache Size = 512K
W16	Reserved	Pins 1-2 (Default)
W17	Reserved	Closed (Default)
W20	Monitor Selection	Open - Monochrome Monitor Setting Closed - Color Monitor Setting (Default)
W21	Reserved	Open - AT Style Keyboard Closed - PS/2 Style Keyboard and Mouse (Default)
W22	Reserved	Open (Default)
W23	Reserved	Open (Default)
W25	ISQ IDE IRQ Select	Pins 1-2 - ISA IDE using IRQ 14 Primary IDE Controller (Default) Pins 2-3 - ISA IDE using IRQ 15 Secondary Controller
W30	Reserved	Open (Default)

Symptom-to-FRU Index

This index supports Type 8640 computers.

Always start "General Checkout (QAPlus/PRO)" on page 4.

The Symptom-to-FRU lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this Symptom-to-FRU Index and the Symptom-to-FRU Index (QAPlus/PRO) on page 61 in the PS/2 Hardware Maintenance Manual to help you decide which FRUs to have available when servicing the computer.

In the following error codes and model numbers, *X* can be any number or letter.

Where the model number is used to identify an error, *XX* used in place of the last 2 digits can be any number or letter.

- **Note**

  For IBM devices not supported by the QAPlus/PRO diagnostics code, refer to the manual for that device.

For information on:	Go to:
Additional service help. (For example, 0S/2 Trap)errors, or	"Related Service Information" on page 453.
Possible software and hardware mismatch problems. (Not repairable by replacing FRUs)	"Software/Hardware Mismatch Problems" on page 550.
Memory Configuration Problems	"Memory" on page 141.
Replacing the system board does not correct the problem.	See "System Board Replacement" on page 155.

Error Code/Symptom	FRU/Action
101, 102 (System and microprocessor error)	1. **System Board**
0103 (System Timer error)	1. **System Board**
106 (System and microprocessor error)	1. **System Board**
0110 (Parity Check 1 XXXX, run Setup)	1. **Memory SIMM** 2. System Board
111 (I/O channel check error)	1. **Memory SIMM** 2. System Board

Error Code/Symptom	FRU/Action
114 (Adapter read-only memory error)	1. **Run Diagnostics** 2. Failing Adapter
0115 (Parity Check 1 XXXX, run Setup)	1. **Memory SIMM** 2. System Board
0120 (Previous boot incomplete, default configuration used)	1. **Run Setup** 2. Battery/CMOS Chip 3. System Board
0130 (Invalid NVRAM media type)	1. **Battery/CMOS Chip** 2. System Board
151 (Real time clock error)	1. **Run Diagnostics** 2. System Board
161 (Real time clock battery error)	1. **Battery**
0162 (Models EXX) (Configuration error for slot XX, run Setup; then, run the EISA Configuration Utility)	1. **Battery/CMOS Chip** 2. System Board
162 (Configuration error)	1. **Run Configuration/Setup**
0163 (Real-Time Clock error)	1. **Battery/CMOS Chip** 2. System Board
164 (Memory configuration changed)	1. **Run Configuration**
165 (Micro Channel adapter configuration changed)	1. **Run Configuration, insert Reference diskette**
0171 (System battery is dead)	1. **Battery/CMOS Chip** 2. System Board
0173 (System CMOS checksum bad)	1. **Run Setup** 2. Battery/CMOS Chip 3. System Board
0174 (Invalid ISA Configuration)	1. **Run Setup** 2. Look for configuration conflicts. 3. Battery/CMOS Chip
0175 (EISA Configuration Error, run the configuration utility)	1. **Run Setup** 2. Run EISA Configuration Utility 3. Battery/CMOS Chip 4. System Board
176 (Computer cover or cable cover was removed without a key being used)	1. **Run Configuration/Setup**
177, 178 (Hardware error)	1. **Run Diagnostics** 2. System Board

Error Code/Symptom	FRU/Action
184 (Power-on password corrupted)	1. **Run Configuration/Setup**
185 (Drive startup sequence information corrupted)	1. **Run Configuration/Setup**
186 (System board or security hardware error)	1. **Run Configuration/Setup** 2. System Board
189 (An attempt was made to access the computer with an invalid password)	1. **Run Configuration, enter the administrator password**
201 (Memory test error)	1. **Memory SIMM** 2. System Board
0214 (System RAM failed at offset XXXX)	1. **Memory SIMM** 2. System Board
0215 (Failing Bits XXXX)	1. **Memory SIMM** 2. System Board
0216 (Extended RAM failed at offset XXXX)	1. **Memory SIMM** 2. System Board
0221 (Shadow RAM failed at offset)	1. **Memory SIMM** 2. System Board
0254 (System board Cache error, Cache disabled)	1. **System Board Cache** 2. System Board
229 (Cache memory test error. Be sure the cache memory is enabled.)	1. **Cache memory** 2. System Board
0301 (Keyboard or keyboard controller error)	1. **Keyboard** 2. System Board
0302 (Keyboard locked)	1. **Unlock the keyboard** 2. Keyboard 3. System Board
0303 (Keyboard Error, stuck key)	1. **Keyboard** 2. System Board
604 (Diskette drive error)	1. **Diskette Drive** 2. Drive Cable 3. System Board
0610 (Incorrect drive A type)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable

Error Code/Symptom	FRU/Action
0612 (Incorrect drive B type)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
0632 (Diskette drive A error)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
0642 (Diskette drive B error)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
662 (Diskette drive configuration error)	1. **Run Configuration/Setup**
762 (Processor configuration error)	1. **Run Configuration/Setup** 2. Run Diagnostics
962 (Parallel port error)	1. **Disconnect external cable on parallel port.** 2. Internal Cable 3. System Board
1162 (System-board serial port 1 or 2 error)	1. **Disconnect external cable on serial port.** 2. Run Configuration
1300 (Operating system not found)	1. **Run Setup with known good diskette** 2. Fixed Disk Drive 3. Fixed Disk Adapter 4. Diskette Drive 5. System Board
1701 (Fixed Disk X failed)	1. **Run Setup** 2. Fixed Disk Drive 3. Fixed Disk Adapter 4. System Board
1702 (Fixed Disk Drive Controller failed)	1. **Run Setup** 2. Fixed Disk Adapter 3. Fixed Disk Drive 4. System Board
1801 (No room for PCI option ROM)	1. **Run Reference Diskette** 2. Failing Adapter 3. System Board
1802 (No more I/O space available for PCI adapter)	1. **Run Reference Diskette** 2. Failing Card 3. System Board
1803 (No more memory (above 1MB for PCI adapter)	1. **Run Reference Diskette** 2. Failing Card 3. System Board

Error Code/Symptom	FRU/Action
1804 (No more memory (below 1MB for PCI adapter)	1. **Run Reference Diskette** 2. Failing Card 3. System Board
1805 (PCI option ROM checksum error)	1. **Remove Failing PCI Card** 2. System Board
1962 (No valid boot device found, be sure the drive you want to start from is the boot sequence)	1. **Run Configuration/Setup** 2. Run Diagnostics 3. Drive Cable 4. Hard Disk Drive 5. System Board
2401 (Monitor type does not match CMOS)	1. **Run Setup and enter correct monitor type** 2. Video Display 3. Video Adapter 4. System Board
2462 (Video controller error)	1. **Display** 2. System Board
000**247**100 **(Type 8641)**	1. **L2 processor cache was disabled, do the following** • **Boot the system diagnostics.** • **Run the processor tests.** • **When asked if you want to turn on the processor cache, reply, "yes," and the error will be cleared.**
I9990301 (Fixed boot sector error, no operating system installed)	1. **Install operating system to hard disk drive.**
8601, 8603 (Pointing Device Error)	1. **Pointing Device** 2. System Board

Parts Listings

System

> **Note**
>
> The model(s) listed for the following FRUs indicates FRUs that the models may contain at the time of shipping. However, other FRUs are supported in each model as options.

Index	System Unit (PC Server 320 - Type 8640)	
1	Access Cover	06H8930
2	DASD Hot Swap Backplane (Models 1Y0, 1YT, MZ1, MY0, MYT, MYR, MD0, MDV, MDS, MZ0, MZV, 1D0, 1DS)	06H7669
3	Hot Swap Shell (Models 1D0, 1DS, 1Y0, 1YT, MYT, MYR, MD0, MDV, MDS, MZ1, MZ0, MZV,)	06H5068
4	Hot Swap Door Assembly (Models 1Y0, 1YT, MY0, MYT, MYR, MD0, MDV, MDS, MZ1, MZ0, MZV, 1D0, 1DS)	06H5070
5	1/2-Inch Hard Disk Drive Adapter Tray (Models 0D0, 0DV, 0T0, 0XT, 0Y0, 0YT) MD0, MDS, MDV, MX0, MXT, MY0, MYR, MYT, MZ0, MZ1, MZV)	06H2652
6	Hard Disk Drtive, see DASD (PC Server 300/320 - Type 8640)	
7	DASD Tray - Hot Swap (Wide) (Models 1D0, 1DS, 1Y0, 1YT, MD0, MDS, MDV, MY0, MYR, MYT, MZ0, MZ1, MZV)	06H3956
7	DASD Tray - Hot Swap Option (Models 1D0, 1DS, 1Y0, 1YT, 1Z0)	71G6292
8	Base Frame (Models 0D0, 0DV, 0T0, 0XT, 0Y0, 0YT, 1D0, 1DS, 1Y0, 1YT, 1Z0)	06H8933
8	Base Frame (Models MD0, MDS, MDV, MX0, MXT, MY0, MYR, MYT, MZ0, MZ1, MZV)	06H8934
9	Front Bezel/Door Assembly	06H8935
10	Keylock with Keys	33F8433
11	Keylock with Keys	33F8433
12	1/2-Inch Blank Bezel	71G0770
13	1/4-Inch Blank Bezel	71G0771
14	CD-ROM Drive, see DASD (PC Server 300/320 - Type 8640)	
15	16/8 BIT SCSI Converter (Models 0T0, 0XT, 0YT, MX0, MXT, MY0, MYT, MYR, MD0, MDV, MDS, MZ0, MZ1, MZV, 0D0, 0DV)	92F0324
16	Speaker	06H2649
18	Card Guide (Models 0D0, 0DV, 0T0, 0XT, 0Y0, 0YT, 1D0, 1DS, 1Y0, 1YT)	71G0757
18	Card Guide (Models MD0, MDS, MDV, MX0, MXT, MY0, MYR, MYT, MZ0, MZ1, MZV)	96G2111
17	Fan Assembly with Connector (Models 0D0, 0DV, 0T0, 0XT, 0Y0, 0YT, 1D0, 1DS, 1Y0, 1YT)	06H2647
17	Fan Assembly with Connector (Models MD0, MDS, MDV, MX0, MXT, MY0, MYR, MYT, MZ0, MZ1, MZV)	96G2112
19	Pedestal	07H0516

Index	System Unit (PC Server 300/320 - Type 8640) continued	
20	DASD 2-Drive Cage (Models MD0, MDS, MDV, MX0, MXT, MY0, MYR, MYT, MZ0, MZ1, MZV)	06H8937
20	DASD 3-Drive Cage (Models 0D0, 0DV, 0T0, 0XT, 0Y0, 0YT, 1D0, 1DS, 1Y0, 1YT)	06H8938
21	Diskette Drive, see DASD (PC Server 300/320 - Type 8640)	
22	Hard Disk Drive, see DASD (PC Server 300/320 - Type 8640)	
23	Casting I/O Back Panel (Models MX0, MXT, MY0, MYT, MYR, MD0, MDV, MDS, MZ0, MZ1, MZV)	96G2107
24	300 Watt Power Supply Assembly with Switch	71G0044
	Keyboard with Cable, see "Keyboards (101/102 Key)" on page 175	
	Memory Riser Card (Models MX0, MXT, MY0, MYT, MYR, MD0, MDV, MDS, MZ0, MZ1, MZV)	96G3692
	Miscellaneous Parts Kit	06H8940

  - 32X5/16-Inch Screws (6 each)
  - Captive Screws (2 each)
  - Diskette Drive M3 Screws (2 each)
  - EMC Ground Contacts (4 each)
  - EMC I/O Spring
  - EMC Keyboard/Mouse Clip
  - FEM-Nut 4-40 Screws (2 each)
  - FEM-Nut 2-56 Screws (2 each)
  - Hard Drive 6-32 Screws (2 each)
  - I/O EISA Blank
  - I/O Micro Channel Blank
  - Memory Card Standoff
  - System Board Edge Support
  - System Board M3X8 Hex Screws (3 each)
  - System Board Standoff
  - Thumb Screw
  - Video Gasket

	Mouse	06H4595
	PC Server 300 Label	06H6003
	PC Server 320 Label	06H6004
	Pressing I/O Back Panel - Old Models only (Models MX0, MXT, MY0, MYT, MYR)	96G2411
	SCSI-2 Fast/Wide Card (Models 0T0, 0XT, 0Y0, 0YT, 0D0, 0DV MDS, MZ1)	06H8574
	SCSI Fast/Wide ARRAY Card (Models MDS, MZ1, 1D0, 1DS)	06H5078
	Shadow Box	96G2411
	SVGA Card (Models 0T0, 0XT, 0Y0, 0YT, 1Y0, 1YT)	71G0031
	SVGA Card (Models 0D0, 0DV, 0Z0, 0ZV, 1D0, 1DS, 1Z0)	06H9114

Index	DASD (PC Server 320 - Type 8640)	
6	1GB Hard Disk Drive - Fast (Models 0T0, 0XT, MX0, MXT)	06H6416
6	1GB Hard Disk Drive - Fast/Wide (Models 0YT, MY0, MYT, MYR)	06H3371
6	2GB Hard Disk Drive - Fast/Wide (Models MDV, MDS, MZ1, MZV, 0DV, 0ZV, 1DS)	06H8561
15	2X SCSI CD-ROM Drive (Models 1Y0, 1YT, 0Y0, 0YT, MX0, MXT, MY0, MYT, MYR)	06H3847
15	4X SCSI CD-ROM Drive (Models 0D0, 0DV, 0T0, 0XT, 1D0, 1DS, MD0, MDV, MDS, MZ0, MZ1, MZV)	88G4921
23	1.44MB Diskette Drive	93F2361

Cables

Keyboards (101/102 Key)

Arabic	1391490
Belgium-Dutch	1391414
Belgium-French	1391526
Bulgarian	1399583
Czech	1399570
Danish	1391407
Dutch	1391511
Finnish	1391411
French	1391402
German	1391403
Greek	1399046
Hebrew	1391408
Hungarian	1399581
Iceland	1391495
Italy	1393395
Latvia	1391406
Norwegian	1391409
Polish	1399580
Portuguese	1391410
Romanian	1399582
Russian-Cyrillic	1399579
Serbian-Cyrillic	1399578
Slovak	1399571
Slovenia/Croatia/Bosnia	1393669
South Africa	1396790
Spanish	1391405
Swedish	1391411
Swiss-French	1391412
Swiss-German	1391412
Turkish 179	8125409
Turkish 440	1393286
U.K. English	1391406
U.S. English (Models 0X0, 0XT, 0Y0, 0YT, 1Y0, 1YT, MX0, MXT, MY0, MYT)	71G4646
U.S. English (Models MD0, MDV, MZ0, MZV, MDS, MZ1, 0D0, 0DV, 0Z0, 0ZV, 1D0, 1DS, 1Z0)	06H9743
U.S. English (E/ME/A use only)	1396790

Power Cords

Power Cords	
Arabic	14F0033
Belgium	1339520
Bulgaria	1339520
Czech Republic	1339520
Denmark	13F9997
Finland	1339520
France	1339520
Germany	1339520
Hungary	1339520
Israel	14F0087
Italy	14F0069
Latvia	1339520
Netherlands	1339520
Norway	1339520
Poland	1339520
Portugal	1339520
Serbia	1339520
Slovakia	1339520
South Africa	14F0015
Spain	1339520
Switzerland	1339520
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	1339520

PC Server 500 - Type 8641

Features

In addition to the following features, the PC Server 500 is shipped with a ServerGuide package that contains a set of ServerGuide Compact Discs (CDs). The easiest and most efficient way to set up the server, install an operating system, and take advantage of the latest software for the network environment is to use the ServerGuide compact discs. Refer to the "User's Guide" that is shipped with the ServerGuide Compact Discs.

Microprocessor

- P54C 90/60MHz Processor Complex

Memory

- Standard: 16 or 32 MB (Varies by model) 70 ns, ECC

Diskette Drives

- Standard: one 3.5-inch

Hard Disk Drives

- Number of drives and drive capacities varies by model

Keyboard and Mouse

- 101-key Keyboard
- Mouse

Expansion

- 6 Micro Channel slots, 6 Standard slots
- Up to 20 bays

Video

- SVGA Adapter
- Compatibility
    - Video graphics adapter (VGA)
    - Enhanced graphics adapter (EGA)
    - Color graphics adapter (CGA)
    - Multicolor graphics ARRAY (MCGA)

Integrated Functions

- Video port on an adapter
- 2 serial ports
- 1 parallel port
- Mouse port
- Keyboard port
- Battery-backed clock and calendar

Power Supply

- Power Supply:
    - Standard Primary: 434 watt
    - Optional Secondary: 220 watt

SCSI Controller (varies by model)

- IBM SCSI-2 Fast/Wide Adapter
- IBM Enhanced SCSI-2 RAID Adapter

Diagnostics and Test Information

The following list contains problems and references for diagnosing a PC Server 500 Type 8641.

Notes

Always start with "General Checkout (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual*

Problem	Reference
Error Codes/Error Messages	"Symptom-to-FRU Index" on page 209.
DASD Adapter Problems	For non-disk-array models, see "SCSISelect Utility Program" on page 547. SCSI-2 Fast/Wide PCI-Bus RAID Adapter, see "Disk Array Configuration" on page 461.
Memory	"General Checkout (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual*
Power Supply Voltages	"Power Supplies" on page 199.
Miscellaneous	"General Checkout (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual*

Additional Service Information

The following information is for the PC Server 500 Type 8641.

- "Administration Monitoring Utilities."
- "Advanced Functions" on page 180.
- "Configuring the Disk Array" on page 185.
- "Drive Maintenance" on page 187.
- "Drivers" on page 191.
- "Installing Internal Drives" on page 191.
- "Performing Common Tasks" on page 193.
- "Power Supplies" on page 199.
- "RAID Recovery Procedure Not Effective" on page 200.
- "Redefining Space in an Array" on page 202.
- "Removing a Drive from Bank C, D, or E" on page 204.
- "Starting the RAID Configuration Program" on page 205.
- "Viewing the RAID Configuration" on page 206.

Administration Monitoring Utilities

Several of the operating systems that your server supports also support (for disk-array models) RAID monitoring programs. The monitoring programs are:

- OS/2 RAID Controller Administration and Monitor
- OS/2 RAID NetFinity/Alert Manager

- OS/2 RAID Controller Administration for NetWare
- IBM RAID Controller Administration for Banyan Vines

These programs include many of the functions contained in the IBM RAID configuration program, but unlike that program, they reside on top of your operating system and do not require you to start the program from a startable diskette or from a startable compact disc. You can start these programs from your active operating system desktop.

Each of these monitoring programs allow you view the RAID configuration, reconfigure the array when replacing a defective drive, and perform tuning tasks such as changing the write policy.

To monitor the drive status with OS/2, Novell NetWare, Microsoft Windows, and Banyan Vines, you must run the administration programs. The RAID controller diskette contains files that must be installed when you use OS/2, NetWare, or Banyan Vines.

See the README file on the RAID controller diskette for installation and usage instructions for OS/2 RAID Controller Administration and Monitor, OS/2 RAID Controller Administration for Netware, and IBM RAID Controller Administration for Banyan Vines. For OS/2 RAID NetFinity Alert Manager, see the ServerGuide CD documentation.

Advanced Functions

You can select several utilities from the Advanced Functions menu. They include:

- Backup configuration to diskette
- Restore configuration to diskette
- Change the write policy
- Change the RAID parameters
- Format a drive

Backing Up Your Disk-Array Configuration:

The RAID adapter maintains a record of the disk-array configuration information in its EEPROM (electronically erasable programmable read-only memory) module. The disk-array configuration is *vital information.* To protect this information, back up the information to diskette as soon as you have completed your tasks. You need a blank, formatted, 3.5-inch diskette.

To back up the disk-array configuration information to diskette:

1. Label the blank diskette "Disk Array Configuration Backup," and date it.
2. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
3. Select **Advanced functions** from the Main Menu.

4. Select **Backup config. to diskette**.
5. Remove the RAID controller diskette from the drive and insert the blank diskette.
6. Follow the instructions on the screen.

Restoring the Disk-Array Configuration: To restore the disk-array configuration information in the RAID adapter EEPROM module, use the RAID controller diskette and an up-to-date Disk Array Configuration Backup diskette.

--- **Note** ---

Because dynamic changes in the configuration of your disk array occur due to hot-spare drive replacement or other drive maintenance activity, the configuration backup information on the diskette might be different from that in the adapter. It is important that you back up the disk-array configuration information frequently, to keep the backup information on the diskette current.

To restore the RAID configuration information:

1. Insert the IBM RAID controller diskette into the primary drive and power-on the system. If the system already is on, press **Ctrl**+**Alt**+**Del**.
2. Select **Advanced functions** from the Main Menu.
3. Select **Restore config. from diskette**.
4. Follow the instructions on the screen.

Using the Advanced Functions: This section gives the procedures for using the advanced functions, such as changing the write policy, changing the RAID parameters, and formatting a drive.

Warnings appear throughout this section to alert you to potential loss of data and should be heeded before answering yes to the confirmations requested by the RAID configuration program.

Changing the Write Policy: When you configure a logical drive, the RAID adapter automatically sets the write policy to *write-through* (WT) mode, where the completion status is sent *after* the data is written to the hard disk drive. To improve performance, you can change this write policy to *write-back* (WB) mode, where the completion status is sent *after* the data is copied to cache memory, but *before* the data is actually written to the storage device.

Although you gain performance with write-back mode, it creates a greater risk of losing data due to a power failure. This is because the system gets a completion status message when the data reaches cache memory, but *before* data is actually written to the storage device.

To change the write policy:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
2. Select **Advanced functions** from the Main Menu.
3. Select **Change write policy** from the Advanced Functions menu. The cursor will be active in the Logical Drive list.
4. Select the logical drive whose write policy you want to change. The Advanced Functions screen appears.

> **Note**
>
> Your information might be different from that shown in this screen.

   The Logical Drive list shows you the logical drive ID, the size in megabytes of each logical drive, the RAID level you assigned to that logical drive, and the date you created it.

   The status of the logical drive is also shown. **Good** means that all is well with the drive; **Critical** means that you must replace the hard disk drive and rebuild the logical drive. (You will have received a message telling you what has happened to the drive.) **Offline** means that the logical drive is unrecoverable; the data in that drive is lost.
5. Locate the **Wrt pol** (Write Policy) field in the Logical Drive list.

   The write policy is shown as either **WT** (write-through, which is the default setting) or **WB** (write-back).
6. Use the Up Arrow (↑) key or the Down Arrow (↓) key to select the logical drive whose write policy you want to change.

> **Warning**
>
> If you change the write policy to write-back, wait at least 10 seconds after your last operation before you power-off the server. It takes that long for the system to move the data from the cache memory to the storage device. Failure to follow this practice can result in lost data.

7. Press **Enter** to change the write policy.

   Notice that **WT** changes to **WB**. You can press **Enter** to alternate between **WT** and **WB**.
8. When you have made your choice, press **Esc** to return to the Advanced Functions menu.
9. Select **Exit**. The Confirm pop-up window appears asking you to confirm your action.
10. To return the setting to its original state, select **No**. To save your changes, select **Yes**.
11. Back up the disk-array configuration information to diskette. Refer to "Backing Up Your Disk-Array Configuration" on page 180 for more information.

Formatting Drives: You can perform a low-level format on drives with **RDY** (ready), **OFL** (offline), or **UNF** (unformatted) status.

Note

The **Format drive** choice on the Advanced Functions menu provides a low-level format. If you install a new hard disk drive that requires a standard format, use the Format command provided by your operating system.

The Format program works like the low-level format program in the advanced diagnostics portion of the system programs. It is provided in the IBM RAID configuration program so that you can perform a low-level format on a drive controlled by the RAID adapter.

To perform a low-level format:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
2. Select **Advanced functions** from the Main Menu.

   Warning

   A low-level format erases all data and programs from the drive.

   ---

3. Select **Format drive**. The low-level format program starts.
4. Follow the instructions on the screen.

   You can perform a low-level format on more than one drive at a time.

Changing the RAID Parameters: You can change the RAID parameters using the advanced functions by selecting **Change RAID parameters**.

The default settings are:

- Stripe unit size — 8K

  The stripe unit size is the amount of data written on a given disk before writing on the next disk. To maximize the overall performance, this stripe unit should be chosen such that the stripe-unit size is close to the size of the system I/O request. The default is set to 8K data bytes.

  Warning

  Once the stripe unit is chosen and data is stored in the logical drives, the stripe unit cannot be changed without destroying data in the logical drives.

- Rebuild priority — Equal.

Rebuild priority can be set to equal, high, or low. When set to equal, the rebuild I/O request and system I/O request get equal priority in the execution order.

When set to high, the rebuild I/O request will get a higher priority than a system I/O request. In a heavily loaded system (with a high rate of system I/O requests), the high-priority rebuild can significantly reduce the disk rebuild time at the expense of degraded handling of I/O requests.

When the rebuild priority is set to low, the rebuild I/O requests can execute only if there is no pending system I/O requests. In a moderate to heavily loaded system, low rebuild priority will increase the disk rebuild time significantly and provide better system performance.

> **Note**
>
> Rebuild priority can be changed without affecting data in the logical drives.

- Parity placement — RA.

  > **Warning**
  >
  > Once a parity placement scheme is chosen and data stored, it cannot be changed without destroying data.

  Parity placement defines how parity is placed in the disk array with respect to data. The following illustration shows both the Left Symmetric (LS) and Right Asymmetric (RA) parity placement in a four-drive disk array. Here AAA, BBB, and CCC are the data stripe units, and PP0 is the corresponding parity. Similarly DDD, EEE, and FFF are the data stripe units, and PP1 is the corresponding parity.

```
  Right Asymmetric (RA)        Left Symmetric (LS)

 Disk  Disk  Disk  Disk      Disk  Disk  Disk  Disk
   1     2     3     4         1     2     3     4
 PP0   AAA   BBB   CCC       AAA   BBB   CCC   PP0
 DDD   PP1   EEE   FFF       EEE   FFF   PP1   DDD
 GGG   HHH   PP2   III       III   PP2   GGG   HHH
 JJJ   KKK   LLL   PP3       PP3   JJJ   KKK   LLL
```

  In some situations you may want to try LS parity placement to improve performance. The default parity placement is RA.

- Read ahead — On.

  Normally the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter transfers data from disk to its local cache in steps of stripe-unit size. This provides excellent overall performance when workloads tend to be sequential. However, if the workload is random and

system I/O requests are smaller than stripe-unit size, reading ahead to the end of the stripe unit will result in a wasted SCSI bus bandwidth and wasted disk utilization. When read-ahead is set to Off, the size of data transfer from the disk to local cache is equal to the system I/O request size, and no read-ahead to the end of the stripe unit is performed.

Notes

1. The Read-ahead setting can be changed without destroying data in a logical drive.
2. When the configuration is saved on a diskette, the RAID parameters are saved also.

Configuring the Disk Array

The following information applies only to disk array models. Use this information to perform the tasks necessary to configure, add, change, or delete one or more disk arrays.

- If you need to create an IBM RAID controller diskette, refer to the ServerGuide User's Guide that was shipped with the system.
- Familiarize yourself with the information contained in this manual and the RAID (redundant array of inexpensive disks) information in the User's Reference shipped with the server.
- Verify the disk-array configuration. The disk-array model comes configured as one logical drive.
  - To view the disk-array configuration, go to "Viewing the RAID Configuration" on page 206 and select **View Configuration** from the Main Menu.
  - To create a disk array, go to"Creating a Disk Array" on page 195.
- Backup the disk-array configuration. See "Backing Up Your Disk-Array Configuration" on page 180.

After you configure the disk array, you can complete setup by installing an operating system (from the ServerGuide compact disc that was shipped with the server or from the diskettes that came with the operating system). To install an operating system from the ServerGuide CD, refer to the ServerGuide User's Guide.

RAID Technology: RAID is the technology of grouping several hard disk drives in a server into an array that can be defined as a single logical drive. This logical drive then appears to the operating system as a single physical drive. This grouping technique greatly enhances logical-drive capacity and performance. In addition, if one of the hard-disk drives fails (becomes defective the server continues to run, with no operator intervention required, at reduced performance. The defective drive can be replaced without powering off the server (hot-swap). For more

information about hot-swappable hard disk drives, see
"Installing Internal Drives" on page 191.

Hard Disk Drive Capacities: With a server, it is
important to understand the implications of hard disk drive
capacities and how they influence the way you create disk
arrays.

Drives in the disk array can be of different capacities. For
example, if the model came with two 1GB hard disk drives
and you install a 2GB hard disk drive to create a RAID 5
disk array, the total capacity of the array is 3GB instead of
4GB. Therefore, when creating arrays it is wise to add
drives of equal capacity.

Additional Storage Capacity: When you add
hard disk drives to the server, you must configure a new
disk array before the drives can be used. You can either
reconfigure the existing disk array to include the capacity
offered with the added drives, or group the added drives
into their own array (see "Adding Drives to Create an
Additional Array" on page 196). You also can create an
array with only one drive.

The RAID Configuration Program Screens:

When you configure the disk array, or even just view its
configuration, you will be using the IBM RAID configuration
program on the IBM SCSI-2 Fast/Wide Streaming-RAID
Adapter/A Option Diskette (also called the IBM RAID
controller diskette). The following figure is a compilation of
many of the IBM RAID Controller Disk Array Configuration
(also called the IBM RAID configuration program) screens.
The list below the figure gives explanations of the
numbered areas of the figure.

1. This pop-up allows you to select the RAID level you
   want to assign to the logical drive you are defining,
   and it allows you to select the logical drive size. You
   can enter the size, in megabytes, or you can accept
   the default value shown.

   When you need to confirm an action, the Confirm
   pop-up appears in this area.
2. You can select any of the choices that appear on the
   menus.
3. The Bay/Array selection list shows each bay in the
   server (for each channel) numbered 1 through 7. The
   abbreviation in the bay indicates the status of the
   drive installed in the bay. Selections are made from
   this list to determine which bays (hard disk drives) are
   in the arrays. The letter to the right of the bay,
   identifies the array in which the hard disk drive in that
   bay is grouped.

> **Note**
>
> The Channel/Bay/Array area on the screen does not reflect the physical configuration of the server. The hard disk drives are installed in horizontal banks of bays (in banks C, D, and E there are 6 bays, numbered 1 through 6 from left to right). See "Installing Internal Drives" on page 191 to see the physical location of the hard disk drives.

4. The Array list shows you the array ID and the size (in megabytes) of the array.

> **Note**
>
> The capacity (size) is shown in binary equivalent.

When a drive is being rebuilt, this area, along with the Logical Drive list area, shows the progression of the rebuilding process.

5. The Logical Drive list identifies the logical drive (for example, A1), the size of the logical drive, the RAID level assigned to the logical drive, the date it was created, and the write policy.

The status of the logical drive also is shown. **Good** means that all is well with the drive; **Critical** means that you must replace the drive or do a rebuild operation. (You will have received a message telling you the drive is in a **Critical** state.) **Offline** means that the logical drive is unrecoverable; the data in that drive is lost.

When a drive is being rebuilt, this area, along with the Array list area, shows the progression of the rebuilding process.

> **Note**
>
> The capacity (size) is shown in binary equivalent.

During an initialization process, the Write Policy area displays the percent initialized; during a synchronization process, it displays the percent synchronized.

6. The information area tells you the action you can perform on this screen or pop-up.

Drive Maintenance

The following section provides information about status indicators for logical and hard disk drives, and the results of a hard disk drive failure. It also contains procedures for replacing defective drives and for redefining the space in an array by replacing logical drives.

Obtaining Drive Status: To see the ID, capacity, and other information about each of the hard disk drives attached to the RAID adapter:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
2. Select **Drive information**.
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight each of the drives shown in the Bay/Array selection list. As a drive is highlighted, the information for that drive is shown at the bottom of the screen.
4. Press **Esc** to return to the Main Menu.

Note

The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.

Bay/Array Selection List: The status of the drives in the Bay/Array selection list is defined as follows:

Status	Meaning
CDR	CD-ROM drive installed.
DDD	Defective. The drive is an online or hot-spare drive that does not respond to commands. (If a **RDY** drive is defective or powered down, it shows an empty bay (a blank status), not a **DDD** status).
FMT	Format. The drive is being reformatted.
HSP	Hot spare. The drive will replace a similar drive that becomes defective in real time. At that time, its status changes to **ONL**, and its array association is displayed.
OFL	Offline. The drive is a good drive that has replaced a defective drive in a RAID level 1 or level 5 array. It is associated with an array, but does not contain any valid data. The drive state remains OFL during the rebuild phase.
ONL	Online. The drive is part of an array. If this drive fails, logical drives defined in the array in which this drive is grouped will have a status of offline (if the logical drive is assigned RAID level 0 with a good status) or Critical (if the logical drive is assigned RAID level 1 or level 5 with a good status).
RDY	Ready. The drive is recognized by the adapter and is available for definition.
TAP	Tape drive installed.

Status	Meaning
UFM	Unformatted. The drive requires a low-level format before it can be used in an array.
Blank Status	Any of the following circumstances can cause the status area to be blank: • No hard disk drive is installed in that bay. • The bay contains a hard disk drive, but the drive is not inserted correctly. • An array was deleted and a defective drive is still in the bay. • A new drive was installed and the configuration program has not been restarted. (The status will change to **RDY** when the RAID configuration program is restarted.)

Results of a Hard Disk Drive Failure:

Depending on the circumstances, there can be several possible results from a drive failure.

Example 1:

- Only one hard disk drive fails.
- A hot-spare drive is defined that is the same or greater size than the failed drive.
- The logical drives in the array are assigned RAID level 1, level 5, or a combination of these two levels.

Then the hot spare will take over immediately.

— **Note** —

Data for logical drives assigned RAID levels 1 and 5 is maintained; however, system performance will be reduced. Hot-spare drive capability does not apply to logical drives assigned RAID level 0.

Example 2:

- Only one hard disk drive fails.
- A hot-spare drive is not defined.
- The logical drives in the array are assigned RAID levels 1, 5, or a combination of these two levels.

Then no data will be lost, but the system will operate at reduced performance until the defective drive is replaced and rebuilt.

Example 3:

If more than one drive fails, all data is lost. Therefore, it is important that you replace and rebuild a defective drive as soon as possible.

Logical and Hard Disk Drive Status

Indications: The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.

- A single hard disk drive failure (indicated by a **DDD** status in the Bay/Array selection list) causes logical drives in that array that are assigned levels 1 and 5 to have a **Critical** status. Data remains in logical drives with a **Critical** status, but you must replace the one defective hard disk drive promptly, because if two hard disk drives were to fail, all of the data in the array would be lost.

  After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **OFL** if there is a **Critical** logical drive. After the Rebuild process, the hard disk drive status changes from **OFL** to **ONL**.

- A single or multiple hard disk drive failure causes logical drives in that array that are assigned level 0 to have an offline status. Data in logical drives with an offline status is lost. However, with a *multiple* disk drive failure, when the defective drives are part of the same array, logical drives in that array will have an offline status. This means that data is lost in all the logical drives in that array, regardless of which RAID level is assigned.

Replacing a Faulty Drive

- **Note**

  The hard disk drive indicator light will blink when the drive has failed and needs to be replaced (DDD state only).

To replace a faulty drive:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.

   If the drive failed while the system was powered down, a screen appears the next time the system is powered on showing you which drive is defective.

2. If the drive is not damaged (for example, it is not inserted correctly):
   a. Power-off the system.
   b. Correct the problem.
   c. Remove the diskette.
   d. Restart the system.

3. If the drive is defective:
   a. Press **Y** (Yes) to reconfigure the system.
   b. Press **Ctrl**+**Alt**+**Del** when instructed to restart the system. The Main Menu appears.
   c. Select **Rebuild device**.

At this point, the drive status shows **DDD**.

> **Warning**
>
> Removing the wrong hard disk drive can cause loss of all data in the array.

   d. Replace the defective drive. Refer to "Removing a Drive from Bank C, D, or E" on page 204.

   e. After you have replaced the drive, press **Enter**. The system will reconfigure to include the drive, and the drive's status will change to **OFL**.

   f. Allow the system to complete the configuration (the screen displays a completion message); then select **Rebuild drive**.

   g. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **OFL** (offline) drive you want to rebuild; then press **Enter**.

      The progress of the rebuilding process appears on the screen.

   h. When the rebuilding process completes, press **Esc** to return to the Main Menu. The new configuration will be saved automatically.

   i. Backup the new configuration (see "Backing Up Your Disk-Array Configuration" on page 180).

   j. Select **Exit** to end the RAID configuration program.

   k. Remove the diskette and press **Ctrl**+**Alt**+**Del** to restart the system.

Drivers

The RAID adapter requires the installation of device drivers. See the README file on the RAID controller diskette for detailed instructions.

If you install OS/2 from the ServerGuide CD, the device drivers will be installed automatically. If, however, you install OS/2 from diskette, you will need to install the device drivers. See the README file on the RAID controller diskette.

Installing Internal Drives

The Type 8641 server supports the following drive types:

- Diskette
- Hard disk
- Rewritable optical disc
- Tape

The server has hardware that lets you replace a failed hard disk drive without powering-off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are also known as *hot-swappable* drives.

Hot-swappable drives have a green LED that shines through the knob on the tray containing the drive. If the drive has a good electrical connection upon installation, the LED illuminates. The LED blinks briefly during power-up, and also blinks if the drive malfunctions.

Internal drives are installed in *bays*. A diskette drive and a CD-ROM. drive are preinstalled in bay A in all models. A removable CD storage compartment is shipped in bay B1. You can install two drives in bay B. You can install hot-swappable hard disk drives in banks C, D, and E only. Banks C, D, and E each contain six bays. Bank C supports up to six drives. However, the total number of SCSI drives that you can install in bay B and bank C is six. The number of preinstalled hard disk drives in bank C varies according to the model you purchased. You can install up to six drives in bank D and up to six drives in bank E.

Note

The bank letter-designations are located on both vertical rails on the front of the server. The bay-slot numbers are located on the top of bank C and the bottom of bank E.

A *cover plate* (sometimes called a *bezel* or *face plate*) covers the front of bay B2 only. If you install a drive that uses removable media (diskette, optical disc, tape), you might install and adjust the cover plate after you install the drive in bay B2.

Considerations

- Bay A comes with one SCSI CD-ROM drive and one 3.5-inch, 2.88MB diskette drive.
- Bay B supports:
    - One 5.25-inch, full-high, removable-media or non-removable-media device, or
    - One 5.25-inch, half-high, removable-media device and one 3.5-inch, half-high, removable-media device, or
    - Two 3.5-inch or two 5.25-inch, slim-high or half-high, removable-media devices.

    Note

    Only one of the devices installed in bay B can be a SCSI device.

- You cannot install hot-swappable drives in bay B.
- PC Server 500 supports eighteen 3.5-inch, slim-high, hot-swappable hard disk drives, or nine 3.5-inch, half-high hard disk drives in the bottom three banks (C, D, and E).

Banks C, D, and E can accommodate six slim-high drives or three half-high drives, or a combination of both drive sizes. If you use a combination, remember that one half-high drive uses the equivalent space of two slim-high drives.

- If you install drives in bank D or E, you will remove the fan assembly on the rear of the server, install a direct access storage device (DASD) *backplane* in banks D and E, and install an optional 220-watt power supply.
- Each backplane has six connectors, to support up to six hard disk drives.

Performing Common Tasks

The Create/Delete Array menu of the RAID configuration program contains the more common tasks for configuring disk arrays. Procedures to complete these tasks are contained in this section as follows:

- "Defining a Hot-Spare Drive"
- "Deleting a Disk Array" on page 194
- "Creating a Disk Array" on page 195
- "Defining Logical Drives" on page 196

Defining a Hot-Spare Drive: To define a drive as a hot-spare drive:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
2. Select **Create/delete array** from the Main Menu. The Create/Delete Array screen appears.
3. Select **Define hot-spare drive**. The cursor will become active in the Bay/Array selection list.

    - **Note**

    Only SCSI hard disk drives are shown as RDY, ONL, DDD, OFL, or HSP state. SCSI tape and CD-ROM drives are not shown. They appear when you select drive information. Refer to "Bay/Array Selection List" on page 188 for the drive status meanings.

    The numbers shown on the left are the bay IDs. See "Installing Internal Drives" on page 191 for an explanation of the bay IDs.

4. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **RDY** (ready) drive you want to define as the hot spare; then press **Enter.** The **RDY** changes to **HSP** (hot spare). You can press **Enter** again to toggle between **HSP** and **RDY**.
5. Press **Esc** when you have finished. The cursor will become active in the Create/Delete Array menu.
6. If you want to create a disk array, go to "Creating a Disk Array" on page 195.
7. If you are finished:

a. Select **Exit** or press **Esc**. A pop-up window will appear asking you to confirm your change.

> **Note**
>
> The changes you make are not saved until you confirm them by selecting **Yes** in the Confirm pop-up window.

b. Select **No** if you do not want the drive you selected to be a hot spare; select **Yes** to define it as a hot-spare drive.

c. Back up the disk-array configuration information to diskette. Refer to "Backing Up Your Disk-Array Configuration" on page 180 for instructions.

Deleting a Disk Array: The last array created must be the first deleted.

> **Warning**
>
> All the data and programs in the array are lost during this procedure. Before proceeding, back up any data and programs that you want to save.

To delete a disk array:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
2. Select **Create/delete array** from the Main Menu.
3. Select **Delete disk array** from the Create/Delete Array menu. The cursor will be active in the Array list.
4. Review the Date Created column in the Logical Drive list; then press the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the most recently defined array.
5. Press **Del**. The Confirm pop-up window appears.
6. If you do not want to delete the array, select **No**. To delete the array, select **Yes**.

> **Note**
>
> To use hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array.

If a defective drive is still in a bay, the status shows a blank bay, as though there is no drive in that bay. When you replace the drive, the status will show **RDY** after you reconfigure and select **Yes** in the Confirm pop-up window.

Creating a Disk Array: To create a disk array:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.

    Note

    To create an array using hard disks in an existing array, refer to "Redefining Space in an Array" on page 202.

2. Select **Create/delete array** from the Main Menu.
3. Select **Create disk array** from the Create/Delete Array menu.

    The cursor will be active in the Bay/Array selection list.

    Important

    In the following step, when you press Enter to select a drive for an array, you cannot deselect it by pressing Enter again, as you can with the hot-spare selection process. Carefully determine which drives you want to include in the array before beginning the selection process.

    If you change your mind after selecting the drives for an array, you can delete the array (by selecting **Delete disk array** from the Create/Delete Array menu) and begin again.

4. Select each drive you want in the array by using the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the drive and then pressing **Enter**. As you select each drive, the status will change from **RDY** (Ready) to **ONL** (Online).
5. When you have selected all the drives you want to include in the array, press **Esc**. The cursor will become active in the menu.
6. If you have drives you did not use in this array and you want to create another array, you can do one of the following:
    - Define the logical drive or drives for this array; then create another array and its logical drives. See "Defining Logical Drives" on page 196.
    - Create another array now by repeating steps 2 through 5 in this procedure; then define logical drives for both arrays.

- Continue with "Defining Logical Drives."

Adding Drives to Create an Additional

Array: To add storage capacity to your server without disturbing existing data:

1. Install the additional hard disk drive or drives. (See "Installing Internal Drives" on page 191.)
2. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
3. Create a new disk array and define logical drives (see "Creating a Disk Array" on page 195 for additional information.

Defining Logical Drives: After you have created an array, you must define a logical drive. (You cannot leave the RAID configuration program until you define the logical drives for any created arrays.)

To define a logical drive:

1. Select **Define Logical drive** from the Create/Delete Array menu. The Create/Delete Array menu screen appears; the cursor is active in the Array list.
2. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the array you want to define; then press **Enter**. The Select RAID Level pop-up window appears, and the cursor is active in the window.

   If you have only two hard disk drives in the array, the Select RAID Level pop-up window appears, but RAID level 5 is not selectable because you need at least three hard disk drives in an array to assign RAID level 5 to one of the logical drives. You can define more than one logical drive for your array. The only restriction is that the maximum number of logical drives you can define is eight.
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the RAID level you want to assign to these logical drives, then press **Enter**.

> **Note**
>
> Because the level you assign can influence the space needed for the drive, you must assign a RAID level before you enter the size of the logical drive.

The Logical Drive list shows you the logical drive ID, the size of each logical drive, the RAID level you assigned to that logical drive, and the date that the logical drive was created.

The status of the logical drive also is shown. **Good** means that all is well with the drive. **Critical** means that you must replace the hard disk drive or do a rebuild operation. (You will have received a message telling you what has happened to the drive.) **Offline** means that the logical drive is unrecoverable; the data on that drive is lost.

The Logical Drive Size pop-up window shows the space in this array that is available for logical drives.

4. Type the size, in megabytes, that you want for the logical drive; then press **Enter**. A pop-up window appears asking you to confirm your action.

   Information about the new logical drive appears in the Logical Drive list.

> **Note**
>
> The size appearing in the Logical Drive list might be different from the size you typed because it appears in binary equivalent.

The size of a logical drive is determined by a number of factors, but basically the size must be divisible by the number of drives in the array.

Consider the following examples:

Example 1:
There are three 1GB drives in the array. You assign RAID level 0 (which uses all the drives in the array with no parity storage), and type "1000MB." The "Size (MB)" will be 999, which is the number closest to and lower than 1000 that is divisible by 3.

Example 2:
There are three 1GB drives in the array, and you assign RAID level 5. Data is striped across all three drives in the array, but the space equivalent to that of one drive is used for redundant storage. Therefore, if you type "1000MB," the "Size (MB)" remains 1000 because it is divisible by 2 (drives), which is the space available for data.

If you do not use the entire array for this logical drive, you can create another by assigning either the same

or a different RAID level for an additional logical drive. You can have as many as eight logical drives among four disk arrays.

5. To return to the Create/Delete Array menu, press **Esc**. To define more logical drives, repeat steps 1 through 5 of this procedure.

6. To leave this screen, select **Exit** or press **Esc**. A pop-up window appears asking you to confirm your action.

7. To save your changes, select **Yes**. To maintain the disk-array configuration that was in place before you made changes, select **No**.

8. If you are using RAID level 1 or RAID level 5, *you must select* **Initialize logical drive** *for proper operation*. This sets the drive to a predetermined state. Any data existing on the drive is overwritten with zeros, and corresponding parity is initialized to the correct value.

   a. Select **Initialize/synchronize array** from the Main Menu; then select **Initialize logical drive**.

   b. Select the logical drives you want to initialize from the Logical Drive list by pressing the Spacebar (the selected drives will appear highlighted). To start the initialization, press **Enter**. A pop-up window appears asking you to confirm your action.

   > ⎯ **Warning** ⎯
   >
   > If you select **Yes** in the Confirm pop-up window, information in the logical drive will be overwritten with zeros.

   c. Select **Yes** to confirm that you want to initialize this logical drive.

   The initialization process begins, and you can see its progress in the **Pct. Int.** (Percent Initialized) column of the Logical Drive list.

   d. To stop the initialization at any time, press **Esc**. Then press **Esc** again to return to the menu, or press **Enter** to continue initializing the drive.

9. To back up the disk-array configuration to diskette, you will need a 3.5-inch formatted diskette. To back up the disk-array configuration:

   a. Select **Advanced functions** from the Main Menu.

   b. Select **Backup config. to diskette**.

   Follow the instructions on the screen. A pop-up window shows the default file name of CONFIG. You can change the file name by typing over the default. The Backup program will assign a file-name extension of *.dmc*.

Power Supplies

The Type 8641 computers is shipped with a primary power supply. An additional or optional power supply can be added to the computer. Connectors are used to transfer the primary power supply voltages and signals from the primary power supply to the optional power supply. The following illustrations show how the two power supplies are connected.

Attention

When replacing the primary power supply cover plate, rotate the plate 180°. (This will leave an opening for the primary power supply connector cable that connects to the optional power supply.) Failure to do so will cause the power supply connector cable to be crimped when the plate is replaced.

Note

Tabs are located on the side of each power supply to secure them together.

Primary Power Supply Voltages: If the voltages are correct, and the power supply fan runs, the power supply is OK.

Power-Supply Connector
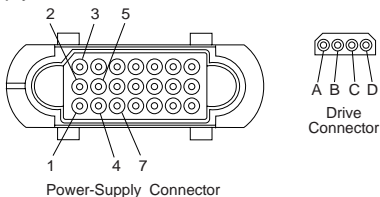
Drive Connector

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
5	3	+4.8	+ 5.25
5	4	+11.52	+12.6
5	7	−10.8	−15.0
B	D	+4.8	+ 5.25
B	A	+11.52	+12.6

Connectors P11, P12, and P13

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2	1	+11.5	+12.6

Optional Power Supply Drive Connector

Voltages: If the voltages are correct, and the power supply fan runs, the power supply is OK.

A B C D
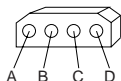
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
B	D	+ 4.8	+ 5.25
B	A	+ 11.52	+12.60

If the power supply shuts down, or *appears* to fail at power-on, you might have one of the following problems:

- Too many devices are set to start instantly, see "Setting the Motor-Start Jumper" on page 549.
- There are too many large-capacity devices installed. The nominal operating current of the devices installed collectively exceeds the available current of the power supply. See the "Personal System/2 Installation Planning" guide (form number G41G-2927) for more information.

Attention

Unplug the power cord and wait two minutes before checking voltages to give the power supply capacitors time to discharge.

On some models, there is an access-cover fan (to cool the processor). If that fan does not work, you have one of the following problems:

- No power to the fan: 12 V dc (±1.4 V dc) required at the two fan cable pins on the base.
- Defective J28 cable (check cable continuity)
- Defective fan. (To test the fan, use a two-wire jumper to connect the fan terminals to the cable pins on the base.)
- Defective system board.

Note

Verify that the voltage-select switch (if applicable) is set for the correct voltage.

If the voltages are correct, and the Symptom-to-FRU index does not solve the problem, go to "Undetermined Problems" on page 552.

RAID Recovery Procedure Not Effective
Symptom:

A single drive failed, but 2 RAID fixed disk drives appear as DDD (Defunct, the drive is not responding to

commands). Routine recovery procedures are ineffective in bringing the DDD drive(s) back on-line.

Note

The system may have run without problems for some time.

Problem Isolation Aids:

- The system is a Server 500 RAID Array (8641).
- The system diagnostics do not fail.
- The RAID Administration program appears normal.
- More than one DASD backplane is installed.

Fix:/Background:

The RAID controller requires two cables to be attached to the DASD backplane in order to maintain control of the RAID subsystem, the SCSI signal cable (wide), and a much smaller Status cable. The backplane in Bank C must be attached to SCSI Connector Channel 1. If installed, DASD backplane in Bank D would be attached to SCSI Connector Channel 2. The same is true of the Status cables. Status connector 1 must be attached to DASD backplane C and Status connector 2 must be attached to DASD backplane D, if installed.

The signal cable and status cables for each channel may not be connected to the same backplane. (For example: The Status cable for the backplane in Bank C is mistakenly connected to Bank D, and vice-versa). In this case, the RAID adapter is not communicating with the correct backplane (but has no way of knowing this), so erroneous status information is being presented to the RAID adapter.

Attempting to rebuild a fixed disk with the cables connected in this manner will probably result in customer data loss.

In systems which have more than one DASD backplane installed, make certain that the RAID Channel 1 (SCSI) signal cable and the RAID Channel 1 Status cable are both attached to the same backplane (are not crossed).

SCSI-2 Fast/Wide Streaming RAID Controller, FRU P/N06H3059

Redefining Space in an Array

You can redefine space in a disk array in a number of ways. For example, you can combine a number of small logical drives to create a larger one or you can redefine the existing logical drive into several smaller drives. Also, you can install additional hard disk drives to create a larger logical drive than was possible with the existing storage capacity.

One method to redefine space in an array is to change the RAID level assigned to a logical drive. For example, if you assigned RAID level 1 to a logical drive and then decided you needed the capacity offered with RAID level 5, you can use this procedure to replace the existing logical drive with a logical drive assigned the new RAID level.

To redefine the space in a disk array, first you must delete the array. The last disk array defined must be the first deleted.

- **Warning**

  In all cases, when you delete an array, all the data and programs in the array are lost.

If you have data and programs that you want to save, they must be backed up and then restored. It is suggested you use a high-speed backup device, such as a tape drive.

To redefine the space in an array:

1. Back up all data and programs in the array.
2. If needed, install additional hard disk drives.

   Refer to the *User's Reference* for information about selecting drive sizes.
3. Insert the IBM RAID controller diskette; then press **Ctrl**+**Alt**+**Del** to start the RAID configuration program.
4. Delete the existing array:
   a. Select **Create/delete array** from the Main Menu. The Create/Delete Array menu will disappear.

b. Select **Delete disk array**. The cursor will be active in the Bay/Array list.

c. Review the Logical Drive List Date Created column; then press the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the most recently defined array.

> **Note**
>
> You must delete disk arrays in descending order; the last one created must be the first one deleted.

d. Press **Del**. The Confirm pop-up window appears.

> **Warning**
>
> All the data in the array will be lost during this procedure. Be sure to back up all data and programs that you want to save.

e. If you do not want to delete the array, select **No**. To delete the array select, **Yes**.

> **Note**
>
> To use the hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array. After you make your selection, the Confirm pop-up window will disappear, and the cursor will be active in the menu.

5. If you want a drive defined as a hot spare, refer to "Defining a Hot-Spare Drive" on page 193 for step-by-step instructions.

6. Create a new disk array and define logical drives.

   See "Creating a Disk Array" on page 195 for instructions on creating a disk array and defining logical drives.

7. After you have established the new array and logical drive or drives, select **Initialize/synchronize array** from the Main Menu; then select **Initialize logical drive** to prepare the drives in the array to receive data. This sets the drive to a predetermined state. Any data existing in the drive is overwritten with zeros, and corresponding parity is initialized to the proper value.

8. Insert a 3.5-inch formatted diskette in the primary drive, select **Advanced functions** from the Main Menu; then select **Backup config. to diskette**. Follow the instructions on the screen.

9. Exit the RAID configuration program by pressing **Esc** or selecting Exit while on the Main Menu. A pop-up window will appear asking you to confirm your action.

10. Reinstall your operating system and device drivers, then restore your data and programs.

Removing a Drive from Bank C, D, or E

Locate the drive you are removing. You do not have to power-off the server to remove a drive from banks C, D, and E.

Warning

If you are removing a failed hard disk drive that is part of a *disk array* in bank C, D, or E, you must not accidentally remove a good drive. Before you attempt to remove a defective drive, thoroughly review the information displayed on your server's screen to determine the location of the failed drive. "Logical and Hard Disk Drive Status Indications" on page 190 explains the codes that your server uses to indicate a defective drive. When a hard disk drive fails, a blinking green indicator light illuminates on the knob of the drive tray. When a hard disk drive is good, a solid green indicator light illuminates on the knob of the drive tray.

If you partially or completely remove a good drive instead of the defective one, your server might lose valuable data. This situation is especially relevant if you assigned RAID level 1 or 5 to the logical drives in your disk array. However, the RAID controller can rebuild the data you need, provided that certain conditions are met. See "Starting the RAID Configuration Program" on page 205 for more details.

If you have a non-disk-array model, an illuminated drive tray knob means the drive is a good one. An unilluminated drive tray knob means the drive is defective, or no power is being supplied to the drive.

To remove a drive from bank C, D, or E, do the following steps:

1. Find the drive you plan to remove.
2. If you have a disk-array model and a drive has failed, ensure that you have selected the correct drive for removal by verifying that the light on the tray's knob is blinking.
3. Unlock the drive by turning the knob directly above it 90 degrees.
4. Disconnect the drive from the connector on the backplane, by grasping the handle on the drive tray and pulling the drive out of the server. Store the drive in a safe place.

Starting the RAID Configuration Program

To start the RAID configuration program.

1. Insert the IBM RAID controller diskette into the primary drive and power-on the server.
   If the server is already on, press **Ctrl**+**Alt**+**Del**.
   If you have more than one RAID adapter, you will get an adapter selection screen. Otherwise, the Main Menu appears.

RAID Program Keys

Key	Program Response
F1	Selects **Help** from any menu
Esc	Return to the previous screen or to the previous work area of a screen
Up **(↑)** and Down **(↓)** Arrows	Highlights the item to be selected
Enter	Selects the highlighted item

Main Menu Selections

Note

Whenever you make changes to the disk-array configuration and select **Exit**, the Confirm pop-up window will appear. You must select **Yes** to save and activate the changes.

Selection	Program Response
Help	Provides additional information
View configuration:	Displays the existing disk array configuration
Create/delete array:	Selects the drives, defines a hot-spare drive for an array you want to create, or to deletes an existing array. This selection also has choices for defining a logical drive and formatting a drive.

Selection	Program Response
Initialize/synchronize array:	Select this choice after creating an array to: • Set the drive to a predetermined value. • For proper operation of RAID levels 1 and 5. **Note:** Any data existing on the drive is overwritten with zeros, and the corresponding parity information is initialized to the correct value. • Initialize more than one logical drive at a time. • Interrupt the initialization process at any time by pressing **Esc**. • Restart the initialization process by pressing **Enter** • End the process by pressing **Esc** again.
Synchronize logical drive	Recomputes and rewrites the parity data on the drive. You can select this choice to recompute parity data for RAID levels 1 and 5. This selection does not alter data on the drive. The synchronization process can be done on multiple logical drives.
Rebuild device:	Rebuilds logical drives. The rebuild operation is supported only for RAID levels 1 and 5.
Advanced functions:	Changes the write policy (the way data is written to the drive), to saves your configuration information to a diskette, restores it from a diskette, or changes RAID parameters. This choice also allows you to do a low-level format.
Drive information:	Displays information about the SCSI devices (hard disk, CD-ROM, tape, and so on) connected to the RAID adapter.
Exit:	Leaves the Main Menu.

Viewing the RAID Configuration

Before creating or changing a disk array, you can look at the current configuration by selecting **View Configuration** from the Main Menu of the RAID configuration program.

To view the disk-array configuration:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 205.
2. Select **View configuration**. The current disk-array configuration information appears on the screen.
3. Press **Enter** to see the stripe order in the Bays Occupied (Ch:Bay) field.
4. Press any key to continue.
5. Press **Esc** to return to the Main Menu.

Locations (System Board)

1 32-bit expansion slots
   (video extensions J25, J27)
2 Processor slot
3 Parallel ports
4 Serial ports
5 Keyboard/Pointing-device connectors
6 Power-on Features jumper
7 Privilege-access password jumper
8 Memory-module connectors
9 Tamper-evident cable connector
10 Power Supply connector
11 Override jumper connector (JMP1)
12 Battery
13 Diskette-drive cable connector
14 Reserved (Pins 1 and 2 must be connected.)
15 Operator-panel cable connector
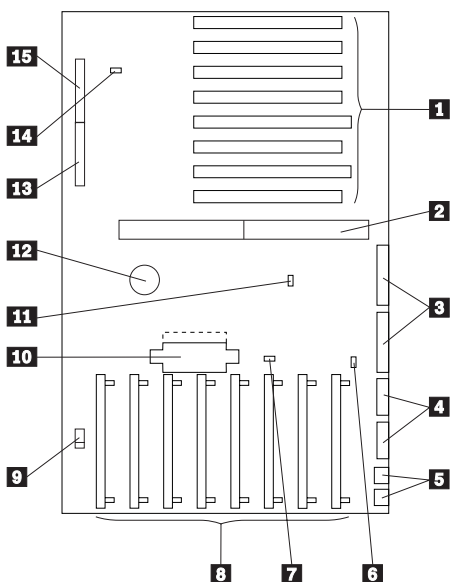
Symptom-to-FRU Index

Always start with "General Checkout (Micro Channel)" on page 18 in the *PS/2 Hardware Maintenance Manual*

The Symptom-to-FRU Index lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this index along with the "Symptom-to-FRU Index (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual* to help you decide which FRUs to have available when servicing the computer.

In the following error codes, *X* can be any number or letter.

> **Note**
>
> For IBM devices not supported by the Micro Channel diagnostics code, refer to the manual for that device.

Beep Symptoms

Beep/Symptom	FRU/Action
Continuous beep and a blank display (Run he Display Self Test)	1. **Display Adapter** 2. Video Memory (if used) 3. System Board
One long and three short beeps. (Run the Display Self Test)	1. **Display Adapter** 2. Video Memory (if used) 3. System Board
RAID drives DDD, recovery procedure not effective. See"RAID Recovery Procedure Not Effective" on page 200 .	**N/A**

No Beep Symptoms

No Beep/Symptom	FRU/Action
Memory count hangs during POST.	1. **System Board Memory** 2. Memory Option (if installed) 3. System Board 4. Processor

Error Codes

Error Code	FRU/Action
0**210XX**XX (Internal bus, size unknown) 0**210XX**X**1** (External bus, size unknown)	1. **SCSI Hard Disk Drive** 2. SCSI Adapter or the SCSI controller built into the system board. 3. SCSI Cable 4. SCSI ID Switch (on some models)

Error Code	FRU/Action
0**2790X**XX, 0**2791X**XX 0 **2792X**XX, 0**2793X**XX 0 **27906**XX, 0**27907**XX (Eithernet adapter POST error)	1. **Check power and reseat adapter.** 2. Ethernet PeerMaster Server Adapter
0**2799X**XX (Communications to the Ethernet PeerMaster Server Adapter failed or the adapter failed.)	1. **Run Setup and verify the Ethernet PeerMaster Server Adapter configuration.** 2. Ethernet PeerMaster Server Adapter
0**279XX**XX	1. **Fast/Wide Streaming RAID Adapter/A (FRU No. 06H3059)** 2. System Board 3. Signal Pass Through Card (if installed)

Error Messages

Error Message	FRU/Action
Drive in channel X bay X does not respond. Installation stopped.	1. **Replace the drive in the bay indicated.**
Controller does not respond to commands; no logical drive installed.	1. **RAID Adapter** 2. System Board

SCSI Error Code Format

This section provides an explanation of the encoded SCSI and non-SCSI Post error codes and detailed information about each code.

Error messages are displayed on the screen as three, four, five, eight, twelve or, thirteen digits. An "X" in an error message can be any number. The shorter POST errors are highlighted in the Symptom-to-FRU Index. Some digits will represent different information for SCSI errors versus non-SCSI errors.

The following figure shows which digits display the shorter POST errors. The figure also defines additional SCSI information.

Notes:

1. Non-IBM device error codes and documentation supersede this list.

2. Duplicate SCSI ID settings will cause misleading error symptoms or messages.

```
RDDDPLSCB QEET
                  │└ └ Test state
                  └── Error code Extension
                  └──── Qualifier

            ──── Bus (0=internal  1=external)
            ──── Capacity of the device
            ──── Slot number of the device
            ──── LUN (usually 0)
            ──── PUN (SCSI ID #)

            ──── Device Number
            ──── Reserved Digit (usually 0)
```
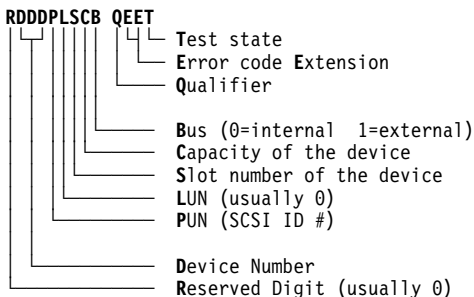
As an example, if you have SCSI error code **021050A0**, each digit decodes as follows:

Digit	Information
0	Reserved digit (usually 0)
210	Device number 210 indicates hard disk
5	SCSI ID assigned is 5
0	Logical Unit Number (not used, usually 0)
A	The device capacity is 60MB (A = 60MB)
0	The device is connected to the internal bus

RDDD Codes for Adapters

RDDD	Device Type or Information
0**037**	SCSI on the system board
0**096**	SCSI adapter with cache
0**112**	SCSI adapter without cache
0**206**	SCSI-2 adapter

RDDD Codes for Devices

RDDD	Device Type or Information
0**208**	Unknown device type
0**209**	Direct access - removable media, and/or other than 512 byte blocks
0**210**	Direct access - hard disk, 512 byte blocks
0**211**	Sequential access (tape)
0**212**	Printer
0**213**	Processor
0**214**	Write Once, Read Multiple (W.O.R.M.)
0**215**	Read only (CD-ROM)
0**216**	Scanner
0**217**	Optical memory (read/write optical disk)
0**218**	Changer (multiple tray CD-ROM)
0**219**	Communications

B Codes

B	Device Type or Information
0	Dual SCSI adapter (internal bus)
1	Dual SCSI adapter (external bus)

QEET 0000 Codes

Refer to this list if the "DDD" indicates an adapter, followed by a **QEET** of 0000. For example, 0**1120100 0000**.

PLSC	QEET	Information
0100	0000	On systems with NVRAM, SCSI setup data not located, or the checksum did not verify. On systems without NVRAM (Model 50 for example), setup data must be on the 1st hard disk.
0200	0000	Configuration error. No hard disk found at PUN 6, LUN 0 for 161,162,165 system error path. Might be an unsupported configuration.
0300	0000	No space available in extended BIOS data area for SCSI data table (possibly too many adapters installed).
0400	0000	ROM modules not found on adapter (IML based systems only). Running setup might correct it.
0500	0000	ROM checksum error on 2nd 16K portion of 32K ROM
0600	0000	ROM access control port error

QEET Errors (other than 0000)

These are specific "QEET" error codes (preceded by a "DDD" indicating an adapter).

Note: A number in slot "S" indicates an error on the adapter, (or device attached to the adapter) in slot "S." If "S" is 0, suspect the system board.

QEET	Information
001x	8032/80188/80C186 ROM test failure
002x	Local RAM test failure
003x	Bad fuse, or bad termination, or local RAM address failure on SCSI adapter if "RDDD" is 0112.
004x	Internal peripheral test failure
005x	Buffer control chip test failure, or LTB failed, (or system-board SCSI failed if "RDDD" is 0037)
006x	Undefined error condition, or buffer RAM test failure on SCSI adapter if "RDDD" is 0096
007x	System interface control chip test failure
008x	SCSI internal interface test failed

QEET	Information
00Ax	SCSI external interface test failed
107x	Adapter hardware failure
10Cx	Command failed
10Ex	Command error (invalid command or parameter)
10Fx	Sequencing error
110x	Adapter internal error log contains entries. (Reported if no other errors on adapter exist.)
180x	Time out
181x	Adapter busy error
182x	Unexpected interrupt presented by adapter
183x	Adapter register test failure
184x	Adapter reset failure
185x	Adapter buffer test failure (on cached adapters)
186x	Adapter reset count expired
187x	Adapter registers not cleared on reset
188x	Card ID in adapter microcode did not match ID in POS registers
190x	Expected device did not respond
19Yx	DMA arbitration level conflict (Y = assigned arbitration level)
220x	Adapter hardware error
221x	Global timeout on adapter (device did not respond)
222x	Adapter DMA error
223x	Adapter buffer defective
224x	Command aborted by adapter
301x	Invalid parameter in SCB
303x	Command not supported
304x	Command aborted by system
305x	Command rejected (buffer not disabled)
306x	Command rejected (Adapter diagnostic failure)
307x	Format rejected
308x	Assign rejected (command in progress)
309x	Assign rejected (device already assigned)
30Ax	Command rejected (device not assigned)
30Bx	Command rejected (maximum LBA exceeded)
30Cx	Command rejected (16 bit card slot address range exceeded)
313x	Invalid device for command
3FFx	Status not returned by adapter
401x	Recovered error (not an error condition)
402x	Device not ready

QEET	Information
403x	Device medium error
404x	Device hardware error
405x	Illegal request for device
406x	Device unit attention would not clear
407x	Device data protect error
409x	Device vendor unique error
40Ax	Copy operation aborted by device
40Bx	Device command aborted
40Cx	Device search data command satisfied
40Dx	Device volume overview (residual data remains in buffer)
40Ex	Device mismatch (source data did not match medium data)
500x	Check condition on device, no sense data returned
501x	No index or sector
502x	Seek incomplete
503x	Write fault
504x	Drive not ready
505x	Drive not selected
506x	No track zero found
507x	Multiple drives selected
508x	Logical unit communication failure
509x	Head positioning error (track following error)
510x	CRC or ECC error on ID field
511x	Unrecoverable read error
512x	No address mark (ID field)
513x	No address mark (data field)
514x	Record not found
515x	Seek error
516x	Data synchronization error
517x	Recoverable read (without ECC) error
518x	ECC recovered read error
519x	Defect list error
51Ax	Parameter overrun
51Bx	Synchronous transfer error
51Cx	Primary defect list not found
51Dx	Compare error
520x	Invalid command
521x	Illegal logical block address (LBA)
522x	Illegal function for device type
524x	Illegal command block field

QEET	Information
525x	Invalid LUN
526x	Illegal field in parameter list
528x	Media changed
529x	Power-on or bus device reset occurred (not an error)
52Ax	Mode select parameters changed (not an error)
531x	Medium format corrupted
532x	Defect spare location unavailable
540x	Device RAM failure
541x	Data path diagnostic failure
542x	Power-on diagnostic failure
543x	Message rejected
544x	Internal controller error
545x	Device was unable to reconnect
547x	Interface parity error
548x	Initiator detected error
549x	Illegal command or command out of sequence error
5F0x	Format in progress (not an error)
5F1x	Spinup in progress
601x	SCSI bus reset occurred
602x	SCSI interface fault
610x	Selection timeout error (device not available)
611x	Unexpected bus free
612x	Mandatory SCSI message rejected
613x	Invalid SCSI phase sequence
620x	Short length record error
702x	Device not ready (removable media devices)
704x	Device not ready (non-removable media devices)
728x	Media changed error would not clear
731x	Medium format corrupted (format unit interrupted - format must be issued again)
7F0x	Format in progress (prior format unit issued being completed)
7F1x	Spinup in progress

Q Codes

All error codes with "Q" = 1 are developed using information returned by either an adapter or device. The "Q" value defines the origin of the "EE" code that is reported. Error codes (EE) with "Q" = 4 or 5 may be reported that are not listed here or can actually have a definition other than that given, depending on the device.

"Q"	Information
2	Command error field of command complete status block returned by the adapter
3	SCSI Status field of the command complete status block or command error field values indicating software problems (< 20H)
4	Sense key value returned by a device
5	Additional sense byte (byte 12) of sense information from device
6	Device error code field of command complete status block
7	Device errors not normally considered an error, but considered an error based on when the code was returned (medium corrupted error on device with non-removable media)

Test Status Codes

"T"	Information
O	Not applicable for error code
A	Adapter initialization error)
B	Adapter reset
C	Adapter register test
D	Adapter buffer test phase 1 (on cached adapters)
E	Adapter buffer test phase 2 (on cached adapters)
F	Adapter buffer test phase 3 (on cached adapters)
G	Adapter buffer test phase 4 (on cached adapters)
H	Adapter (buffer enable, buffer size, retry, enable)
I	Device assignment sequence
J	Device not ready (initial unit attention clearing)
K	Device reset
L	Device starting phase
M	Device in process of starting
N	Device block size determination
O	Device self-test
P	Device single block read (LBA)
Q	Device double block read (LBA)
S	Error occurred after device testing completed

Parts Listing
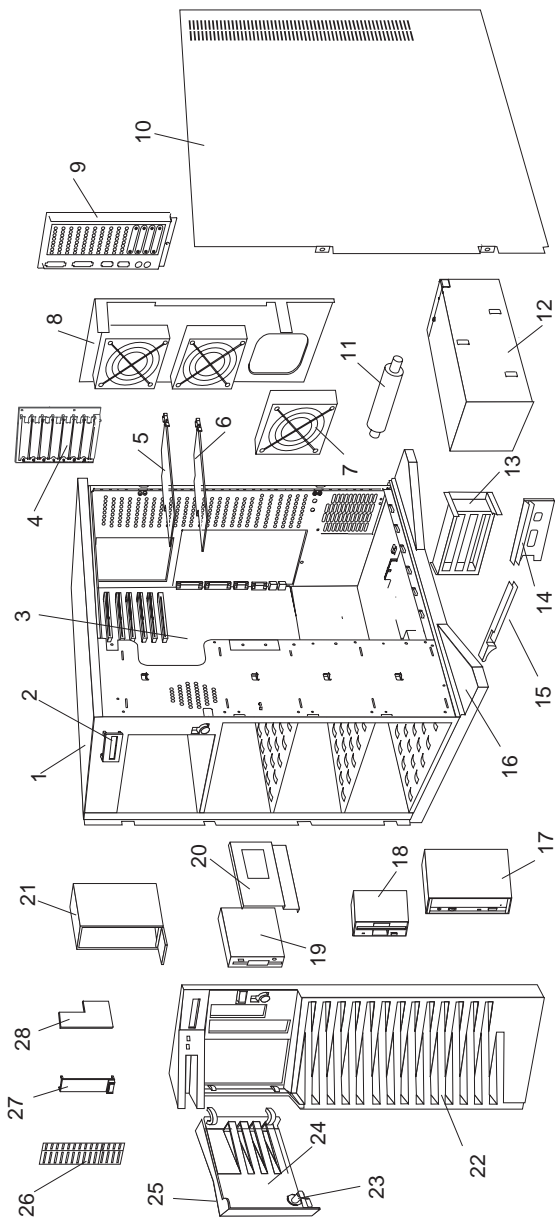
Index	System Unit (Type 8641)	
1	Base Frame	82G3593
2	LED Information Display Assembly	06H3766
3	System Board	92F2623
	(without Memory and Processor)	
	I/O Spring (bracket on system board)	06H3796
	Pentium 90MHz Processor Card	06H3739
	16MB ECC Memory SIMM	96F9100
4	I/O Panel Die Cast	06H3593
5	SCSI RAID Hard Disk Drive Adapter	06H3059
5	SCSI Fast Wide Hard Disk Drive Adapter	92F0160
6	Video Adapter	71G0650
7	Fan Assembly	06H3407
8	Fan Mounting Support (without Fans)	82G3618
9	I/O Flex Plate	06H3594
10	Right Side Door	82G3594
	Right Side Door Hinges	82G3600
11	Pedestal Wheel (with Axle)	82G3609
12	434 Watt Power Supply	06H3596
13	Card Guide	82G3604
14	Processor Card Support	82G3959
15	Card Guide Support	82G3603
16	Pedestal	82G3608
17	Slim-Line CD ROM Drive	06H2150
18	2.88MB Diskette Drive	82G1888
19	1GB SCSI Hard Disk Drive	06H3371
19	2GB SCSI Hard Disk Drive	06H3372
20	DASD Hot Swap Tray Assembly (Wide)	06H3956
	DASD Hot Swap Backplane Assembly	71G6291
	DASD Hot Swap Cam Spring (Shaft and Knob)	06H5059
	DASD Mounting Plate	82G3602
21	CD Storage Tray	06H5060
22	Front Bezel (with Shield)	82G3595
23	Keylock (with Keys)	82G3606
24	DASD Door	82G3596
25	IBM Logo (R)	82G3601
26	5.25-Inch Drive Bezel (with Spacer)	82G3599
27	Control Panel Bezel	06H3595
28	Control Panel Card Assembly	06H3755
	Ethernet Quad-BT PeerMaster Server Adapter	06H4220
	Ethernet Quad-B2 PeerMaster Server Adapter	06H6042
	Battery	33F8354
	See "Battery Notice" on page 461.	
	Keyboard (with Cable)	71G4646
	Miscellaneous Parts Kit	82G3611
	• C2 Spring (1 each)	
	• EMI Ground Clips (4 each)	
	• Hinge Screws 2 each)	
	• Lock Pawl (1 each)	
	• Planar Mounting Boss (2 each)	
	• Screws (4 each)	
	Mouse	96F9258
	Power Cord	62X1045
	Speaker (with Bracket)	33F8444

Cables (Type 8641)

IBM PC Server 500 System/390 - Type 8641

Features

The following is a list of models of the IBM PC Server 500 System/390 - Type 8641.

Note

All PC Server computers have Selectable Startup.

Microprocessor

- Pentium-90 MHz (PC Server Complex)
  390PC (390 Processor Complex)

Memory

- Standard: 32 MB
- 70 ns, ECC

Diskette Drives

- Standard: one 3.5-inch

Hard Disk Drive

- Number of drives and drive capacities are model dependent

Keyboard and Mouse

- 101-key keyboard
- Mouse

Expansion

- 6 Micro Channel slots, 6 Standard slots
  (1 shared slot)
- Up to 10 drive bays

Video

- SVGA Adapter
- Compatibility:
  – Video graphics adapter (VGA)
  – Enhanced graphics adapter (EGA)
  – Color graphics adapter (CGA)
  – Multicolor graphics array (MCGA)

Integrated Functions

- Video port on an adapter
- 2 serial ports
- 1 parallel port
- Mouse port
- Keyboard port
- Battery-backed clock and calendar

Power Supply

- Standard Primary: 434 watt
- Optional Secondary: 220 watt

SCSI Controller (varies by model)

- SCSI RAID Hard Disk Drive Adapter
- SCSI Fast/Wide hard Disk Drive Adapter

Diagnostics and Test Information

In addition to the error reporting capability of the S/390 Microprocessor Complex, the PC Server System/390 has two sets of diagnostics to help locate hardware problems. See, "Error Reporting (P/390)" on page 234.

- PC Server 500 Reference and Diagnostics Diskettes. (See the diagnostic information for the Server 500 in your manual.)
- S/390 Microprocessor Complex Diagnostics and Option Diskette. (See "Microprocessor Complex Diagnostics (S/390)" on page 239.)

A diskette containing diagnostics and hard disk recovery programs is also provided for the RAID controller that comes with the Array model of the PC Server System/390.

Additional Service Information

The following information is for the PC Server 500 System/390 - Type 8641.

- "CMS Commands and Utility Programs."
- "Configuration" on page 226.
- "Device Managers" on page 228.
- "Device Map" on page 230.
- "Diagnostic Flow Chart (S/390)" on page 231.
- "Documentation and Related IBM Manuals (390)" on page 232.
- "Error Reporting (P/390)" on page 234.
- "Icons (System/390)" on page 235.
- "Initialization (S/390)" on page 235.
- "Machine Check Error Messages" on page 235
- "Power-On Self Test (POST)" on page 237.
- "Product Overview" on page 237.
- "Software Facilities (Server System/390)" on page 238.

CMS Commands and Utility Programs

Several conversational monitor system (CMS) commands and utility programs are supplied with the PC Server System/390 software in addition to those provided by the OS/2, VM/ESA, and VSE/ESA operating systems. These are essential to the operation of the 370 functions on the PC Server System/500.

CMS Commands: CMS commands are included with the VM Starter System supplied with the PC Server System/390 software. These commands can be invoked from VM sessions running on the PC Server System/390 to access host VM data and OS/2 files and to interact with the OS/2 environment. These are included with the VM Starter System supplied with the PC Server. The following is a list of commands and their functions.

Command	Function
CACHE	Install and control CMS minidisk cache in the PC Server System/390 virtual machines
HDETACH	Detach a host VM minidisk
HLINK	Establish a link from a PC Server/390 VM session to the host VM minidisk
HQUERY	Display information about host minidisks
LTRENAME	Rename the title bar for a 3270 session
MOUNT	Associate an OS/2 file specification with a PC Server System/390 emulated tape drive
OS2	Execute an OS/2 command from a PC Server System/390 virtual machine
PCOPY	Copy (import/export) files between OS/2 and VM
PIPE OS2	Uses the OS2FILE stage command in a pipeline running under CMS to read or write an OS/2 file on an associated OS/2 system
TFA	Activates the Transparent File Access functions in a PC Server System/390 virtual machine

OS/2 Utilities: Several OS/2 utilities are provided with the S/390 Microprocessor Complex programs to help control and operate the PC Server System/390. The interactive functions invoked by the PC Server System/390 icons use some of these utilities to perform their tasks. See "Icons (System/390)" on page 235. The utilities can be invoked from an OS/2 command prompt without using one of the PC Server System/390 interactive interfaces. Some of the utilities can also be used to implement user-written device managers.

The OS/2 utilities and their functions are.

Utility	Function
ALC.EXE	Allocate files as FBA DASD, display volume information and change volume labels
AWSCFG.CMD	Invoke the PC Server System/390 Configurator
AWSCMLT.EXE	Configure logical terminal sessions on PC Server System/390s and OS/2 workstations
AWSMOUNT.EXE	Change the DASD or tape configuration dynamically
AWSPROF.EXE	Record the name and location of the DEVMAP to use as the default for the Configurator and initial program load (IPL)
AWSSTART.EXE	Start PC Server System/390 device managers
AWSSTAT.EXE	Display or change the status of the 370 I/O subsystem and device managers
BLDLIST.CMD	Build a file containing a list of SEND/RECEIVE or COPY commands for all the files in a specified subdirectory
CLRIO.EXE	Issue a CLEAR I/O instruction to devices attached to the S/370 Channel Emulator/A
C370TRC.EXE	Take low level trace of the S/370 Channel Emulator/A
DEV2NAME.CMD	Create an American National Standard Code for Information Interchange (ASCII) file from a DEVMAP file
IPL.CMD	Start the channel processor and IPL the 370 processor
LTRENAME.EXE	Rename the title bar of a CM/2 3270 session
RDEVMAP.CMD	Reconfigure directory and path names in a DEVMAP
SYSSOWN.CMD	Avoid rebuilding the VM central processor (CP) nucleus when you want to add a new volume
9346CMD.EXE	Issue tape positioning commands to the 1/4" tape drive

VSE/ESA TMOUNT Utility: A PC Server System/390 utility program called TMOUNT.JCL is also provided for VSE/ESA. This program runs in a VSE/ESA batch partition and performs the same functions for VM/ESA and OS/2 respectively.

Configuration

In addition to the configuration program for the Server 500 (see "Configuration (Server 500)"), a configuration program is provided for configuring the S/390 Microprocessor complex (see "Microprocessor Complex Configuration (S/390)").

Configuration (Server 500): The Server 500 Configuration Program requires the following information for each card (adapter) and device installed in the computer.

- **.ADF**) and **.DGF** files. (Normally found on the option diskette for the card or device and must be installed on the default drive.)
- A device driver statement in the config.sys file. (Required for the computer to load the necessary files required to support the card or device.)

> **Note**
>
> The device driver statement for the P/390 card should be the last statement (last line) in the config.sys file.

Microprocessor Complex Configuration (S/390): After the S/390 Microprocessor Complex has been successfully initialized, the S/390 Configuration program can be accessed by clicking on the **390 (370) Configuration Icon** in the *System/390 (System 370) Group* on the OS/2 Desktop. See "Icons (System/390)" on page 235.

The Configuration program is a menu driven program that provides two main functions.

- It allows you to describe the mapping between the input/output (I/O) devices available on the PC Server System/390 and the System/370 I/O devices they emulate. See "Device Map" on page 230.
- It provides an easy way for Virtual Machine/Enterprise Systems Architecture (VM/ESA) users to create and maintain new VM userids on the PC Server System/390 and minidisks associated with these userids.

Changes are made to the system configuration by changing the values in the data menus.

The following example of reading a 9336 DASD summarizes how the 370 I/O subsystem emulates I/O operations on the PC Server System/390.

1. The 390 operating system does a system I/O instruction to real device 100.
2. The 390 Licensed Internal Code (LIC) passes all I/O instructions to the 370 I/O subsystem running on the PC Server Processor Complex.
3. The 370 channel emulator executes the 370 channel program and passes the request to the device manager that claims that range of devices in DEVMAP. In this example, it would be an fixed block architecture (FBA) device manager.
4. The FBA device manager gets the request for device 100. It looks in the DEVMAP entry for device 100 to fill out the OS/2 file name for 9336 device 100. The device map points to the OS/2 file that emulates the 370 disk drive, for example, D:\VM\MAINT.191 for a VM system or D:\VSDISRES.140 for a virtual storage extended (VSE) system.
5. A request is issued to OS/2 to read the data from the OS/2 file name MAINT.191 in the \VM directory of disk drive D: or from the OS/2 file name DOSRES.140 in the \VSE directory of disk drive D:/
6. OS/2 issues the request for the data to the PC Server device containing disk drive D:
7. The data is passed back up the line until it is presented to the requesting VM or VSE program.

The Configurator requires the following four files to operator correctly. (For information on the content of these files, refer to the *Introducing the PC Server 500 System/390L* manual (Form Number GC24-5717-00) supplied with the computer.

- DEVMAP.xxx
- DMKRIO.ASM
- DMKSYS.ASM
- USER.DIR

Configurator Structure (S/390):   The following
illustration shows the hierarchy of menus in the PC Server
System/390 Configurator. Online help is available for most
of the menus.
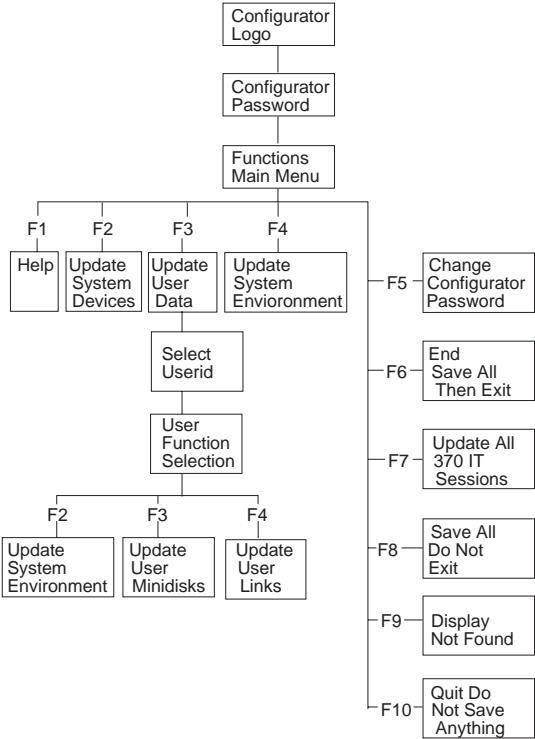
Device Managers

The PC Server System/390 supplies several device
managers to support emulation of 370 I/O devices. The
device managers are OS/2 applications that are started
when S/390 Microprocessor Complex is IPL'ed with a
device map containing device definitions that use the
device managers.

Each device manager is identified by name on the PC
Server/390 Configuration screen that is used to perform
device mapping. See "Microprocessor Complex
Configuration (S/390)" on page 226. (Do not confuse this
configuration program with the PC Server 500
Configuration program. See "Configuration (Server 500)"
on page 226.)

The following is a list of device managers and their
function.

Device Managers Name	Function
AWSCDK	Count, Key, Data (CKD) DASD Emulator
AWSDEV	General interface for device drive emulation of 370
AWSFBA	Fixed Block Architecture (FBA) DASD Emulator
AWSICA	Integrated Communications Adapter (ICA) support
AWSOMA	Optical Media Attach
AWSPCSRV	Allows communication directly between 390PC and OS/2
AWSPOSDD	Supports dynamic POS mode of AWSICADD
AWSSTART	Starts 7432 managers under OS/2
AWSSTOP	Stops 7432 managers under OS/2
AWSTAPE	3803/3420 Emulator
AWSTFA	Transparent File Access (VM)
AWSWAIT	Waits for 7437 managers to start under OS/2
AWS2540	2540 Card Reader Emulator
AWS2703	2703 Emulator
AWS2821	Printer Manager
AWS3172	3172 Local Area Network (LAN) Gateway (SNA)der OS/2
AWS3215	OS/2 Typewriter Keyboard Emulator
AWS3274	3274 Control Unit Emulator (non-SNA)
AWS5080	5080 Driver
AWS9346	SCSI Quarter Inch Tape Drive Manager
AWSC370	S/370 Channel Emulator Device Manager
LAN3088	3088 Emulation over a LAN
LAN3274	LAN 3270 sessions (non-SNA)
LAN3172	3172 LAN channel Station for transmission control protocol/internet protocol (TCP/IP) (VM)

Device Managers Name	Function
LAN3172	3172 LAN channel Station for transmission control protocol/internet protocol (TCP/IP) (VM)

Device Map

The PC Server/390 I/O subsystem uses resources available on the PC Server System/390 to emulate the devices available on larger System/390 systems. The following device mapping is used.

Host Device (System/390 and System/370)	PC Server Equivalent Device)
3270 Information Display	Monochrome or Color Display
CKD and FBA DASD	OS/2 File
5088 Graphics Control Unit	5080 PC Server Adapter
3215	OS/2 Presentation Manager session
2703	Serial (COM) Ports
2540 Card Reader	OS/2 File
1403 Printer	OS/2 Print Spooler
3088 (CTC)	Token Ring
3420 Tape	OS/2 File
Special (VM)	Host Transparent File Access
Special (VM)	Import/Export PC Data
ICA	SDLC/VTAM Connection
3172	LAN/VTAM Connection
3172	LAN/VM TCP/IP Connection
9346	1/4 inch tape

Diagnostic Flow Chart (S/390)

Customer's Responsibility

User Gets Message

Alert Box — No → Refer to the P/390 Software manuals[1] shipped with the computer

Yes

Disabled Wait State — Yes → Refer to the P/390 Software manuals[1] shipped with the computer

No

Servicer's Responsibility

Machine Check Error — Yes → Run the P/390 Diagnostics Program → Falling FRU Identified — Yes → Replace Failing FRU

No

No

1. Configuration Problem
2. OS/2 Software Programming Errors
3. If you suspect a hardware problem, go to "General Checkout in your manual for the system you are servicing

Contact Support
Possible Problems :
1. Configuration (AWSERROR.LOG)
2. Programming Error

[1] Virtual Machine/Enterprise Systems Architecture (VM/ESA) .
Virtual Storage Extended/Enterprise Systems Architecture (VES/ESA) or,
Multiple Virtual Storage/Enterprise Systems Architecture (MVS/ESA) manuals

Documentation and Related IBM Manuals (390)

- **PC Server System/390 Booklets and Manuals**
  - The *PC Server System Library* (form number S19H-1252) contains two manuals:
    - *User's Guide*
    - *User's Reference*
  - *IBM PC Server 500 System/390 Introduction* (form number GC24-5717
  - *IBM PC Server 500 System/390 Installation, Configuration, and User's Guide for VM/ESA* (form number SC24-5718)
  - *IBM PC Server 500 System/390 Installation, Configuration, and User's Guide for VSE/ESA* (form number SC24-5719)
  - *IBM PC Server 500 System/390 Installation, Configuration, and User's Guide for MVS/ESA* (form number SA22-7210)
- **OS/2 Manual**
  - *User's Guide to OS/2 Warp* (part number 83G8300)
- **VM/ESA Manuals**
  - The *Virtual Machine/Enterprise Systems Architecture Library Guide and Master Index for VM/ESA* Release 2.2 (form number GC24-5518)
- **VM/ESA Product Overview**
  - *VM/ESA General Information* (form number GC24-5651)
  - *VM/ESA Introduction and Feature Summary* (form number SC24-5651)
- **VM/ESA Planning, Administration, Installation and Service**
  - *VM/ESA Installation* (form number SC24-5526)
  - *VM/ESA Service Guide* (SC24-557)
  - *VM/ESA Introduction and Feature Summary* (form number SC24-5651)
  - *VM/ESA Planning and Administration* (form number SC24-5519
  - *VM/ESA Connectivity Planning, Administration, and Operation* (form number SC24-5448)
  - *VM/ESA Group Control System Reference for 370* (form number SC24-5531)
  - *VM/ESA Running Guest Operating Systems* (form number SC24-5522)
- **VM/ESA Operation and End Use**
  - *VM/ESA System Operation* (form number SC24-5528)
  - *VM/ESA CMS User's Guide* (form number SC24-5460)
  - *VM/ESA CMS Command Reference* (form number SC24-5461)
  - *VM/ESA Command and Utility Reference* (form number SC24-5519)

- **VM/ESA Diagnosis**
  - *VM/ESA System Messages and Codes* (form number SC24-5529)
  - *VM/ESA Diagnosis Guide* (form number LY24-5250)
  - *VM/ESA CP Diagnosis Reference* (form number LY24-5251)
  - *VM/ESA Dump Viewing Facility* (form number SC24-5530)
- **VSE/ESA Manuals**
  - The *VSE/Enterprise Systems Architecture Library Guide* (form number GC33-6519)
- **VSE/ESA Product Overview**
  - *VSE/ESA General Information* (form number GC33-6501)
- **VSE/ESA Planning and Installation**
  - *IBM VSE/Enterprise System Architecture Planning* (form number SC33-6503)
  - *IBM VSE/Enterprise System Architecture Installation and Service* (form number SC33-6504)
  - *VSE/Enterprise Unattended Node Support* (form number SC33-6512)
- **VSE/ESA Administration and Operation**
  - *VSE/ESA Administration* (form number SC33-6505)
  - *IBM VSE/Enterprise System Architecture Operation* (form number SC33-6506)
  - *VM/ESA Messages and Codes* (form number SC33-6507)
  - *VM/ESA Networking Support* (form number SC33-6508)
  - *VM/ESA Programming and Workstation Guide* (form number SC33-6509)
  - *VM/ESA Guide for Solving Problems* (form number SC33-6510)
  - *VM/ESA Guide to Systems Functions* (form number SC33-6511)
  - *VM/ESA System Control Statements* (form number SC33-6513)
  - *VM/ESA Diagnosis Tools* (form number SC33-6514)
- **MVS/ESA manuals**
  - One of the following:
    MVS/ESA SP V4 Library Guide (form number GC28-1601)
    MVS/ESA SP V5 Library Guide with JES2 (form number GC28-1423)
    MVS/ESA SP V5 Library Guide with JES3 (form number GC28-1424)
  - One of the following:
    DFSM/MVS V1R2 General Information—Library Guide (form number GC26-4902)

> *MVS/DFP V3R3 Guide and Master Index* (form number GC26-4553)
> – One of the following:
>   *VTAM V3R4.1 for MVS/ESA Release Guide* (form number LY43-0054)
>   *VTAM V3R4.2 for MVS/ESA Release Guide* (form number LY43-0062)
>   *VTAM V4R1 for MVS/ESA Release Guide* (form number GC31-6441)
>   *VTAM V4R2 for MVS/ESA Release Guide* (form number GC31-6492)
> – One of the following:
>   *ISPF and ISPF/DPF V3r5 Getting Started* (form number SC34-4256)
>   *ISPF Version 4 Getting Started* (form number SC34-4440)
> – Both of the following:
>   *TSO/E Version 2 Library Guide* (form number CG28-1866)
>   *TCP/IP for MVS V3R1 Planning and Migration Guide* (form number SC31-7189)

- **Operating System Architecture References**
  - *IBM System/370 Principles of Operation* (form number GA22-7000)
  - *Enterprise Systems Architecture/390 Principles of Operation* (form number SA22-7201)
  - *Enterprise Systems Architecture/390 Data Compression* (form number SA22-7208)
- **Softcopy**
  - The *IBM Online Library Omnibus Edition: VM Collection* (form number SK2T-2067)
  - The *IBM Online Library Omnibus Edition: VSE Collection* (form number SK2T-0060)
  - The *IBM Online Library Omnibus Edition: MVS Collection* (form number SK2T-0710)

Error Reporting (P/390)

The S/390 Microprocessor Complex uses the following methods of error reporting.

- **POST Error 165 (configuration)**
  If this error is displayed and the P/390 card **does not** appear on the installed devices list, it is an indication that one or more of the following problems exist:
  - Missing or bad .ADF or .DGS files
  - Missing or incorrect statement in the config.sys file. (The statement for the P/390 should be the last line in the config.sys file.)
- **Dialog Box (Machine Check Errors)**
  If an error is detected during or after initialization of the P390 card, a Dialog Box with a Machine Check error is displayed. If this occurs, run the P/390 Diagnostic and Option diskette. For a list of common

Machine Check errors, see "Machine Check Error Messages" on page 235.

- **AWS Error Log**
  Contains ASKI test information about failures that occurred during operation. Located in the P390 subdirectory on the hard disk drive (path = *C:\P390\AWSERROR.LOG*), this file can be edited with a text editor.

Icons (System/390)

The System/390 (System/370) Group located on the OS/2 Desktop contains the following icons.

IPL 390 (370) Processor	Starts the S/390 Microprocessor Complex programs
End 390 (370) Processor	Stops the S/390 Microprocessor Complex programs
390 (370) Configuration	Starts the 390 (370) Configurator Program
390 Manual Operations	Debugging tool, see "Software Facilities (Server System/390)" on page 238.
370 I/O Trace	Debugging tool, see "Software Facilities (Server System/390)" on page 238.
370 Snap Shot Dump	Debugging tool, see "Software Facilities (Server System/390)" on page 238.

Initialization (S/390)

To Initialize (start) the S/390 Complex, click on the **IPL 390 (370) Processor** icon in the *System/390 (System/370) Group* on the OS/2 Desktop. See "Icons (System/390)."

Machine Check Error Messages

> **Note**
>
> The diagnostic and error reporting programs may refer to the P/390 as a P/370.

If an error is detected during or after the P/390 card is initialized, a dialog box containing a Machine Check error is displayed on the screen. This error may be caused by one or more of the following:

- Missing or bad .ADF or .DGS files
- Missing or incorrect statement in the congif.sys file (The statement for the P/390 should be the last line in the config.sys file.)
- Missing or incorrect code on the P/390 card
- Defective hardware

The following is a list of common machine check errors.

- Can't open/find $s file. RC=$d2
- Control Store Parity Error. Try END P/370 and IPL again.
- Uncorrectable memory error at ' $s'x (daughter card) code= $s
- No status available.
- PS/2 used invalid S/370 address code= $s fic= $s addr= $s
- Internal use of invalid S/370 address. code= $s fic= $s addr= $s
- code = ' $s'x, fic= $s addr=' $s'x

Power-On Self Test (POST)

When you power-on or re-boot the computer, the computer runs the following two power-on self tests (POSTs).

> **Note**
>
> These tests are run consecutively without intervention.

BIOS Code (resides on the system board)	Checks the memory, system board, direct access storage device (DASD), configuration, etc.. If you receive a POST error from the BIOS code, refer to the "Symptom-to-FRU Index (Micro Channel)" on page 26 in the *PS/2 Hardware Maintenance Manual*
Licensed Internal Code (LIC) (written to files on the hard disk drive)	Checks the P/390 processor card and attached memory card.

If you receive a POST error (165) from the P/390 LIC code, see "Error Reporting (P/390)" on page 234.

Product Overview

The IBM PC Server 500 System/390 is a PC Server 500 (see "PC Server 500 - Type 8641" on page 177) with an IBM S/390 Microprocessor Complex (see "Locations" on page 241) installed. The S/390 Microprocessor Complex and S/390 programs provide the hardware and software required to run 390-based applications on the PC Server 500 System/390.
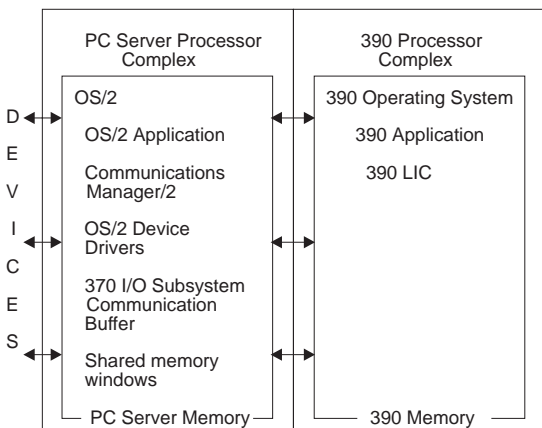
Software Facilities (Server System/390)

> **Note**
>
> Knowledge of System/390 and CP/390 architecture is essential to the proper use of these processor control functions. Information about System architecture is found in *IBM Principles of Operation, GA22-7201.*

VM/ESA and VSE/ESA use the same problem determination tools on the PC Server/390 for debugging 390 operating system and applications problems as they do on 390 mainframe systems.

Standard OS/2 debugging tools can be used to assist with problems with the 390 environment on the PC Server/390 since many of the functions use OS/2 facilities and PC Server devices.

The 390 Processor Complex Programs also have the following tools for controlling and debugging the system.

390 Manual Operations	Provides the function of the 390 hardware console as on mainframe systems.
390 Status Window	Displays the processor status word (PSW) and current status of the 390 processor.
390 I/O Trace	Used to trace I/O request between the 390 processor and its I/O subsystem. The trace can be selected by device and can be written to an OS/2 file. It can also be displayed in a Presentation Manager window by selecting the 390 I/O trace icon. (See "Icons (System/390)" on page 235.)
Snap Shot Dump	Creates a binary file of the I/O subsystem to be used by IBM support personnel during problem determination. This program is selected by clicking on the **Snap Shot Dump** icon.

Microprocessor Complex Diagnostics

(S/390): The IBM P/390 Advanced Diagnostics and Options Diskette contains the programs used to test the S/390 Microprocessor Complex installed in the computer, and the ADF and DGF files required for configuration. To run the S/390 Microprocessor Complex Diagnostics programs, see "Advanced Diagnostics and Options Diskette (S/390)."

Advanced Diagnostics and Options Diskette

(S/390): The Advanced Diagnostics and Options Diskette is a self-booting diskette that contains the P/390 diagnostic programs. The diagnostic programs are designed to be used with the diagnostic diskette and diagnostic information in the IBM PS/2 Hardware Maintenance manual for the computer you are servicing. The results of the diagnostic tests are reported as a success or failure.

To run the P/390 diagnostic programs, do the following.

- **Note**

  First run the diagnostics program for the computer you are servicing. If the P/390 card is recognized by the configuration program (the P/390 appears on the installed devices list), the diagnostics program will instruct you to run the P/390 Diagnostics and Option diskette. If the P/390 card is not recognized by the configuration program (does not appear on the installed devices list), go to "Error Reporting (P/390)" on page 234.

1. Power-off the computer; then power-off all external devices.
2. Insert the P/390 Diagnostics and Option diskette into drive A.
3. Power-on all external devices; then power-on the computer.
4. When the Main Menu appears,
   a. Select **2**
   b. After the information message, press **Enter**.
   c. Select **E** to run the diagnostic programs with expanded messages.

      The diagnostic program will test the adapter and terminate with the message "P/390 in slot X successfully passed all tests, or a failure message that includes an error message and error code. The error message will identify the failing FRU.
   d. If a failure message is displayed, it identifies the failing FRU(s) as:
      1) The adapter card, excluding the memory card

2) The memory card
3) Both the adapter card and the memory daughter card (when the failure cannot be isolated).

e. Record the error code and replace the identified FRU.

Locations

The S/390 Microprocessor Complex consists of a P/390 Processor Card and an optional P/390 32MB, or P/390 96MB Memory Card attached to the P/390 Processor Card.

When the processor card is installed with a memory card attached, the voltages for the memory card are provided by the system-board slot adjacent to the slot occupied by the processor card. Together the P/390 Processor Card and a P/390 32MB, or P/390 96MB Memory Card occupy two adjacent slots on the system board.
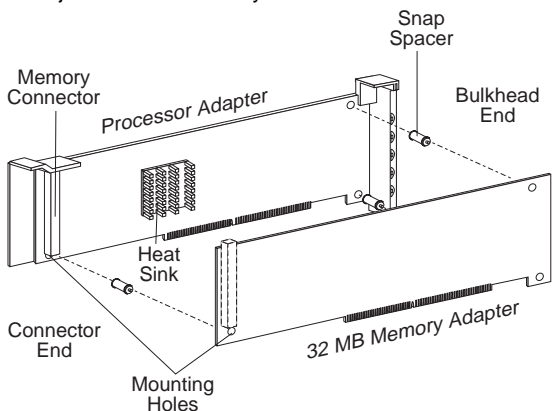
Parts Listing

System Unit - Type 8641

P/390 Microprocessor Complex	17H5372
P/390 32MB Memory Card	26H2931
P/390 96MB Memory Card	26H2978
S/370 Channel Emul./A Adapter	06F3160
S/370 Channel Emul./A Cable	80F1939
4/10GB DDS2 4mm Drive	16G8454

PC Server 520 - Type 8641

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Features

The following features of the PC Server 520 Type 8641 are divided into the following two categories.

- "Models EZO, EZV, EZL, EZS, EZE"
- "Models MZO, MZV, MZS, MZE, MZL" on page 246

--- **Note** ---

All PC Server computers have Selectable Startup.

Models EZO, EZV, EZL, EZS, EZE

Microprocessor

- Pentium with 16KB of internal cache
- Expandable to two microprocessors

Cache Memory

- On each processor: 16KB of level-1 cache
- 512KB of level-2 write-back cache

Memory

- 32MB EOS 70ns expandable to 256MB

--- **Note** ---

Parity memory module kits are supported but **must not** be installed in combination with EOS memory.

Diskette Drive

- Standard: One 3.5-inch, 1.44MB
- Optional (internal):
  - 3.5-inch, 1.44MB
  - 3.5-inch, 2.88MB
  - 5.25-inch, 1.2MB

CD-ROM Drive:

- Standard: SCSI-2 4X CD-ROM

Keyboard

- Standard: 101-key

Mouse

- Standard: IBM Mouse

Expansion Bays and Slots

- Three 32-bit PCI slots
- Six 32-bit combination EISA/ISA slots
- 22 drive bays, 18 of them hot-swap

Video

- SVGA controller
- Compatibility:
  - Video graphics array (VGA)
  - Enhanced graphics adapter (EGA)
  - Color graphics adapter (CGA)
  - Multicolor graphics array (MCGA)

Hard Disk Drive

- Number of drives and drive capacities are model dependent
- Can support up to 20 hard disk drives, 18 of them hot-swap

Security Features

- Door lock
- U-bolt enabled

- Selectable drive-startup
- Cable cover (optional)

Integrated Functions

- Vital product data (VPD)
- LED usability support
- Video connector
- Two serial connectors
- Parallel connector
- Mouse connector
- Keyboard connector
- Battery-backed clock and time/date calendar

Power Supply

- 434 watt with automatic range voltage selection
  (115–230 V ac)
- Built-in overload and surge protection
- Power supply upgrade expansion option
  - 220 watt automatic range voltage selection add-on
  - Built-in overload and surge protection

SCSI-2 Controller

- IBM PC Server SCSI-2 Fast/Wide PCI Adapter on
  non-disk-array models
- IBM PC Server SCSI-2 Fast/Wide PCI RAID Adapter on
  disk-array models

Upgradable POST and BIOS

- Two 256KB flash ROMs

Models MZO, MZV, MZS, MZE, MZL

The features for the PC Server 520 Type 86451 Micro
Channel Models MZO, MZV, MZS, MZE, and MZL are:

Microprocessor

- Pentium with 16KB of internal cache; clock rate varies by
  model
- Expandable to two microprocessors

Cache Memory

- 512KB of level-2 cache

Memory

- 32MB EOS 70ns expandable to 256MB

  - **Note**

  Parity memory module kits are supported but **must not**
  be installed in combination with EOS memory.

Diskette Drives

- Standard: One 3.5-inch, 1.44MB
- Optional (internal):
  - 3.5-inch, 2.88MB
  - 3.5-inch, 1.44MB
  - 5.25-inch, 1.2MB

Hard Disk Drive

- Number and capacity of standard drives varies by model
- Supports up to 18 internal hard disk drives
- Hot swap bays standard on some models; available on all
  models

CD-ROM Drive

- Standard: SCSI-2

Keyboard and Mouse

- 101-key keyboard
- Mouse

Expansion Bays and Slots

- Six 32-bit Micro Channel slots, two 32-bit PCI slots
- 22 drive bays, 18 of them hot-swap

Video

- Super video graphics (SVGA) connector
- Compatibility:
    - Video graphics adapter (VGA)
    - Color graphics adapter (CGA)
    - Multicolor graphics array (MCGA)

Security Features

- Bolt-down capability
- Door lock
- Administrator and power-on passwords
- Selectable startup drive
- Security cover (optional)
- C2 security (optional)

Upgradable POST and BIOS

- Upgradable EEPROM on the system board
- POST/BIOS upgrades (when available)

Integrated Functions

- LED usability support
- Video port
- Two serial ports
- Parallel port
- Auxiliary device port
- Keyboard port
- Battery-backed clock and calendar
- SCSI-2
    - 1 16-bit external connector
    - 2 internal connectors (one 8-bit and one 16-bit)

IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter (disk-array system)

- Two 16-bit internal connectors
- One 16-bit external connector

Power Supply

- 430 watt with voltage switch (115–230 V ac)
- Built-in overload and surge protection
- Power supply upgrade expansion option
    - 220 watt automatic range voltage selection add-on
    - Built-in overload and surge protection

Diagnostics and Test Information (Models EZO, EZV, EZL, EZS, EZE)

The following is a list of problems and references for diagnosing the above named computers.

Notes

- The QAPlus/PRO diagnostic program recognizes the primary processor as LUN 1 and the secondary processor as LUN 2. During testing the program automatically tests LUN 1. You must select LUN 2 if you want the program to test the secondary processor.
- The type of DASD diagnostics required to test the hard disk controller (adapter) and drives is determined by the type of hard disk adapter installed in the computer.
- Always start "General Checkout (QAPlus/PRO)" on page 4.

Problem	Reference
DASD, CD-ROM or SCSI Problems	For non-disk-array models, see "SCSISelect Utility Program" on page 547. For array models, see "Disk Array Configuration" on page 461.
Error Codes/Error Messages	• "Symptom-to-FRU Index" on page 308. • "General Checkout (QAPlus/PRO)" on page 4.
Power Supply Voltages	See "Power Supplies (Type 8641)" on page 283.
Miscellaneous	"General Checkout (QAPlus/PRO)" on page 4.

The Diagnostic program supplied with the server is the primary method of testing the server. Option-specific diagnostic files are supplied with some optional devices and adapters. These files provide a more specialized test of the option. "Installing Additional Test Programs" on page 249 provides additional information about installing and using diagnostic files. Also, refer to the documentation supplied with the option for information on installing and running option-specific diagnostics.

Diagnostic Files

The Diagnostic program supplied with the server is the primary method of testing the server. Option-specific diagnostic files are supplied with some optional devices and adapters. These files provide a more specialized test

of the option. "Installing Additional Test Programs" on page 145 provides additional information about installing and using diagnostic files. Also, refer to the documentation supplied with the option for information on installing and running option-specific diagnostics.

Installing Additional Test Programs

You can add other test programs to the Diagnostic Diskette. These other programs are usually provided on the diskette supplied with a device. After you add the programs to the Diagnostic Diskette, you can include information from the programs in the Test Log.

Before the test programs can find these programs to run as the User Diags test group, information about them must be included in a file called USERDIAG.CFG. This is an ASCII text file. It must include the following three items for each test to run:

- Program Name (.COM and .EXE files only)
- Test Description of the test to be run
- Command-line parameters to be passed to the program identified in the first item of this list

- Notes

1. All of the information for a given test must be on a single line, and a semicolon (;) must separate the items on the line.
2. Make sure you press **Enter** at the end of each line of text in the USERDIAG.CFG file. This creates a carriage return line feed (CR LF) which is necessary for the User Diagnostics to be found and executed.
3. If the program executable file is in a directory other than the QA directory (or other directory you have designated to contain the QA files), that directory must be listed in the PATH= section of the AUTOEXEC.BAT.
4. You can use a .CFG file other than USERDIAG.CFG if you use the command line "USRCONFIG=filename," when running the diagnostic programs. For example, you might use: QAPLPRO /USRCONFIG=MYTESTS.CFG.

USERDIAG.CFG Example

An example USERDIAG.CFG file might look like the
following:

Program Name	Test Description	Command-Line Parameter
BBSMODEM.EXE;	9600 Baud 5 Line Modem;	5
TEST1.EXE;	Generic 1;	
TEST2.EXE;	Generic 2;	
TESTALL.EXE;	CMD 1;	1
TESTALL.EXE;	CMD 2;	2
TESTALL.EXE;	CMD 3;	3

> **Note**
>
> You can have more than one command-line parameter
> for any given test.

When you view these tests on the Test Group window for
the User Diag test group, they appear as follows:

- (♦) 9600 Baud 5 Line Modem
- (♦) Generic 1
- (♦) Generic 2
- (♦) CMD 1
- (♦) CMD 2
- (♦) CMD 3

The diagnostic program automatically assigns a test
number to each test. The test numbers start at 201 and
continue upward as needed. The numbers for the tests
listed above are as follows:

    202 9600 Baud 5 Line Modem
    203 Generic 1
    204 Generic 2
    205 CMD 1
    206 CMD 2
    207 CMD 3

Diagnostics and Test Information (Models MZO, MZV, MZS, MZE, MZL)

The following is a list of problems and references for diagnosing the above named computers.

> **Notes**
>
> - The System Board Diagnostics tests are the primary method for testing the computer. See "System Board Diagnostics" on page 255.
> - The QAPlus/PRO diagnostic program recognizes the primary processor as LUN 1 and the secondary processor as LUN 2. During testing the program automatically tests LUN 1. You must select LUN 2 if you want the program to test the secondary processor.
> - The type of DASD diagnostics required to test the hard disk controller (adapter) and drives is determined by the type of hard disk adapter installed in the computer.
> - Always start with "General Checkout (QAPlus/PRO)" on page 4.

Problem	Reference
DASD, CD-ROM or SCSI Problems	For non-disk-array models, see "SCSISelect Utility Program" on page 547. For array models, see "Disk Array Configuration" on page 461.
Error Codes/Error Messages	• "Symptom-to-FRU Index" on page 308 • Symptom-to-FRU Index (Micro Channel) on page 26 in the PS/2 Hardware Maintenance Manual. • Symptom-to-FRU Index (QAPlus/PRO) on page 61 in the PS/2 Hardware Maintenance Manual.
Power Supply Voltages	See "Power Supplies (Type 8641)" on page 283.
Miscellaneous	"General Checkout (QAPlus/PRO)" on page 4.

Reference and Diagnostic Diskettes

The Reference Diskette and Diagnostic Diskettes, supplied with the server, contain a copy of the system programs. Collectively, these diskettes are referred to as the *System Diskettes*.

The System Diskettes normally are used under the following conditions:

- To configure and test Micro Channel adapters
- To test computer hardware

Using the System Diskettes

> **Note**
>
> Always use the backup copy of the system diskettes when configuring and troubleshooting the server.

To start the System Diskettes:

1. Insert the backup copy of the Reference Diskette into the primary diskette drive.
2. Power-on the system. Or, if the system is powered-on, insert the Reference Diskette and press **Ctrl**+**Alt**+**Del**.

   The system begins the power-on self test. If a power-on or administrator password is set, the system prompts you to enter it.

   > **Note**
   >
   > If an administrator password is set, you *must* enter it to access the Reference and Diagnostic Diskettes.

   After a few moments, the system programs Main Menu appears, and displays the following choices.
   a. Start operating system
   b. Backup of system diskettes
   c. Set/View Micro Channel Configuration
   d. Copy an option diskette
   e. Test the computer
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight a choice; then press **Enter**.

You can get help about any selection by highlighting it and pressing F1. The active keys are shown at the bottom of the screen.

When you finish making changes:

1. Press **F3** to exit without saving the changes.
2. Press **Enter** to save the changes. You are prompted to restart the computer so that the changes will take effect.

You can get online help for each task by pressing F1.

Starting the Operating System

To start the operating system:

1. Select **Start operating system** from the Main Menu, and then follow the instructions on the screen.
2. When prompted, remove the Reference Diskette, then press **Enter** to restart the computer from a diskette or hard disk drive.

The server restarts.

Backing Up System Diskettes

Select **Backup of system diskettes** from the Main Menu to backup the system diskettes or to restore the configuration information from the system diskettes. This is useful in case the battery fails or a change that you made to the configuration information causes a problem and you need to change it back to its previous setting.

--- **Note** ---

Store the original system diskettes in a safe place. Always use the backup copies when configuring and troubleshooting the server.

The system prompts you to switch the diskettes and label the diskette.

--- **Note** ---

You will need to have a formatted diskette for each system diskette that you copy.

Setting Micro Channel Configuration

Select **Set/View Micro Channel Configuration** from the Main Menu to view, change, backup, or restore system configuration of Micro Channel adapters. Follow the instructions on the screen.

The following figure shows a Micro Channel configuration screen.

```
                    Change Configuration


   Slot 1 - IBM Ethernet Adapter/A
    Adapter Media Type Selection . . . . . . . . . . . . . . [Autosense]
    System Interrupt Level . . . . . . . . . . . . . . . . . . . . . [Interrupt]
    Micro Channel I/O Address. . . . . . . . . . . . . . . . [IC00-ICFF]
    Streaming Date Select . . . . . . . . . . . . . . . . . . . . [Enabled]
    Fairness . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . [Fairness ON]
    Arbitration Level . . . . . . . . . . . . . . . . . . . . . . . . . [Level 5]
    Parity Enable/Monitor Feedback . . . . . . . . . . . [Parity OFF/Monitor OFF]
   Slot 2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . [Empty]
   Slot 3 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . [Empty]
   Slot 4 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . [Empty]
   Slot 5 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . [Empty]




   F1=Help  F3=Exit  F5=Previous  F6=Next  F7=Bkwd  F8=Fwd
   F10=Save
```

Press **F3** to return to the Main Menu.

Copy an Option Diskette

Some options come with a diskette that includes test and
configuration information. Select **Copy an option diskette**
from the Main Menu to copy this information to the system
diskettes.

To copy an option diskette:

1. Select **Copy an option diskette** from the Main Menu,
   and follow the instructions on the screen.
2. Remove the option diskette from the diskette drive.
3. Repeat the preceding steps until all option diskettes
   have been copied.
4. Press **Esc** to return to the Main Menu.

Testing the Computer

The Test the computer utility program tests the system
board and installed options.

To verify that your server is working correctly:

1. Select **Test the computer** from the Main Menu.
2. To test the system board, disk drives, video, and
   other system components, select **System board
   diagnostics**; then, press **Enter**. When prompted,
   remove the Reference Diskette and insert the System
   Board Diagnostic Diskette. Follow the instructions on
   the screen.
3. To test Micro Channel adapters, select **Micro
   Channel diagnostics**; then press **Enter**. When
   prompted, remove the Reference Diskette and insert
   the Micro Channel Diagnostic Diskette.
4. When all tests are completed, the system prompts
   you to remove the Diagnostic Diskette and press
   Enter to restart the system.

To get help information about any of the diagnostic tests, then press **F1**.

System Board Diagnostics

To run the system board diagnostics, the system should first be booted from the reference diskette. Then, select either option 5 **Test the computer** or press **Ctrl+A** to bring up the test menu options in customer or advanced diagnostic mode respectively. To run the system board diagnostic select option 1 from this menu and insert the system board diagnostic diskette when prompted. For additional information see "Diagnostics and Test Information (Models MZO, MZV, MZS, MZE, MZL)" on page 251.

The following is the step by step procedure for running the diagnostic diskette to test the system board. This procedure can also be used with the Module Tests option from the Diagnostics Menu.

1. Boot the Reference Diskette.
2. From the **Main Menu**, select option 5 **Test Computer**.
3. From the **Test the Computer** menu, select option 1 **System Board Diagnostics**.
4. Remove the Reference Diskette and insert the QAPlus/PRO Diagnostics Diskette.
5. Follow prompts. (Initialization takes approximately 4 minutes.)
6. At the QAPlus/PRO Main Menu, select **Diagnostics**.
7. Select **Quick Check**.
8. At the System Board Group, look for LUN 1 of 2 or LUN 2 of 2. This indicates which CPU the diagnostics are actually testing. Use the + and − keys to change the CPU selected. (The LUN message is at the top right of the display.)
9. Use the **Spacebar** and **Cursor** keys to select or de-select groups.

Additional Service Information

The following information is for the PC Server 520 - Type 8641.

Configuration (Models EZO, EZV, EZL, EZS, EZE)

- **Note**

  DASD and other adapters may require additional configuration information.

Configuration is the allocation of the server resources to organize and interconnect hardware devices and software programs. The steps required to configure the above named servers depend on the number and variety of devices and programs installed.

For information about configuring the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter, see "Starting the RAID Configuration Program" on page 465.

These servers support the following types of adapters.

- Peripheral Component Interconnect (PCI)
- Extended Industry Standard Architecture (EISA)
- Industry Standard Architecture (ISA)

The following hardware configuration utility programs are supplied with the server.

- Built-in Setup program
  Configures system board functions, such as the integrated drive electronics (IDE) controller and serial and parallel port assignments that you install. It also allows you to set passwords for starting up and accessing the Setup program.
- PC Server 520 EISA Configuration Diskette

Configures EISA and ISA adapters (boards).
- Built-in SCSI-2 adapter utility program (SCSISelect Utility program)
  Configures SCSI devices installed in non-disk-array models
- Configuration Option Diskette
  Configures SCSI devices in disk-array models

EISA, ISA, and PCI Adapters: Before installing a new device or program, read the documentation supplied with it. Reading the instructions helps you determine the steps required for installation and configuration. The following list provides a preview of the actions that might be required to configure the server.

When installing different types of adapters at the same time, install and configure them in the following sequence:

1. ISA
2. EISA
3. PCI

- **Note**

  During POST, the server automatically configures ISA Plug and Play and PCI devices.

1. Run the Setup program and record the current configuration settings.
2. Backup the EISA Configuration Diskette.

   See "Backing Up the EISA Configuration Diskette" on page 261.
3. Start the EISA Configuration Diskette and:
   a. Record the current settings.
   b. Install configuration files (.CFG).

      - **Note**

        If the .CFG files were not supplied with the adapter, see "Files" on page 258.

   See "Recording EISA Configuration Settings" on page 262 and "Starting the EISA Configuration Diskette" on page 263.
4. Set jumpers or switches on the server system board.

   See "System Board Jumpers" on page 299.
5. Set jumpers or switches on the device.

   See the instructions supplied with the adapter.
6. Install the adapter in the server.
7. Install software programs.

   See the installation instructions supplied with the software.
8. Resolve configuration conflicts.

   See "Configuration Conflicts" on page 274.

ISA or EISA Features and Options: Some ISA and most EISA devices are supplied with option diskettes. These diskettes can contain any or all of the following types of information:

- Configuration files (.CFG)
- Diagnostic files (.DGS)
- Device drivers
- Sample applications (mini-applications)

Files: A configuration file is required to configure the server for ISA or EISA adapters. You must copy this configuration file, which has a file-name extension of *.CFG*, from the device diskette to the EISA Configuration Diskette before installing the device in the server. The configuration file reserves the system resources that the adapter needs to function properly.

Some ISA adapters are supplied with a diskette that contains the CFG file for the adapter. If ISA adapters are installed that were not supplied with their own CFG files, you must use the PC Server EISA Configuration Diskette for the system you are servicing to create a unique CFG file for each adapter.

- **Note**

  The unique .CFG files are slot sensitive. That is, they should not be used to configure identical adapters in multiple systems unless you install the adapters in the same expansion slots within each system.

To create a unique CFG file for an ISA adapter, do the following:

1. Insert the IBM PC Server EISA Configuration Diskette for the system you are servicing into diskette drive A.
2. Start the configuration utility program.
3. At the main menu, select Step 2, **Add or remove boards.**
4. At the next menu, select the slot in which you installed the adapter.
5. At the next screen, select **OK.**
6. At the next screen, press **F5**; then select **Create .CFG file**.
7. Press **Enter**.
8. At the Create a board CFG file screen, type in the adapter manufacturer and description (for example IBM Token Ring); then press **Enter**.
9. Refer to the adapter documentation for information about specific configuration parameters (such as IRQ or DMA channel) required for the adapter. Then, follow the instructions on the screen to enter the appropriate parameters on the menu.

Notes:

   a. Normally, ISA adapters do not use every
      parameter. Most adapters require only a PORT
      address.

   b. The SVGA video adapter in the server requires
      specific memory and I/O address assignments to
      function properly. To avoid configuration
      conflicts, do not assign the following SVGA
      memory and I/O addresses to other adapters or
      options in the server:

      • Memory address space:

             A000H — C7FFH

      • I/O address spaces:

             02E0h — 02EFh
             03B0h — 03DFh
             46E8h

10. After you type in all of the appropriate parameters,
    press **F10**.
11. At the next screen, carefully verify that the information
    is correct; then press **Enter**.
12. At the Add Confirmation window, press **Enter** again.
13. In the next window (add), press **Enter**.

    The adapter description appears in the selected slot.
14. Verify the installation; then press **F10**.
15. At the next menu, select **Save and exit the
    configuration utility**.

Note

PCI devices do *not* require .CFG files.

Device Drivers: Device drivers are programs designed
to support a specific type of hardware device. They
provide instructions that enable the computer to interact
with the device, or to take advantage of a device's special
feature. The device driver might ship with the operating
system, the application program, or on the option diskette.
Not all devices require device drivers. Refer to the
documentation supplied with the option for additional
information.

Sample Applications: Some optional devices provide
small applications or sampler files. These applications
demonstrate the capabilities of the device and serve as
software examples for programming the device. Refer to
the documentation supplied with the option for additional
information.

To configure the server for an ISA or EISA adapter:

1. Read the documentation supplied with the adapter.
2. Copy any files with the extension of *.CFG* from the
   option diskette to the EISA Configuration Diskette.

See "Files" on page 258 for important information about configuring ISA adapters.

3. Start the EISA Configuration Diskette (see "Starting the EISA Configuration Diskette" on page 263).
4. Record the new configuration information (see "Recording EISA Configuration Settings" on page 262).
5. Save the new configuration settings to the EISA Configuration Diskette and to the nonvolatile random access memory (NVRAM) (see "Starting the EISA Configuration Diskette" on page 263).
6. Set any jumpers or switches on the adapter.
7. Install the adapter in the server.

PCI Features and Options: PCI devices automatically communicate with the server's configuration information. This usually results in automatic configuration of a PCI device. If a conflict does occur, refer to "Configuration Conflicts" on page 274.

Assigning Interrupt Levels: A rotational interrupt technique to is used to configure PCI adapters. This technique enables you to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

Always use the IBM PC Server EISA Configuration Diskette for the system you are servicing when assigning interrupts for EISA and ISA adapters. You cannot assign an EISA or ISA adapter the same interrupt that you have assigned to a PCI adapter. This is because the server does not support interrupt sharing among PCI, EISA, and ISA adapters.

If a situation occurs where you need an additional interrupt, you can use an interrupt from another function that you might not need, such as the IDE controller (Interrupt 14) or COM2 (Interrupt 3).

Memory: After you add (or remove) extended memory, you must update the EISA Configuration Diskette.

Note

Not performing the following procedure could result in memory errors, and in the operating system not recognizing the added (or removed) memory.

---

1. Start the EISA Configuration Diskette (see "Starting the EISA Configuration Diskette" on page 263).
2. Select **Step 3: View or edit details**. The system information appears.
3. Under **Advanced System Feature Setup**, select **Total System Memory**.
4. Select the correct amount of memory, then press **F10**.

> **Note**
>
> It is possible to install
> single-inline-memory-modules (SIMMs) in
> combinations where the total amount of memory
> installed does not appear on the memory
> configuration screen. In the unlikely event that
> this occurs, select the next lower setting on the
> memory configuration menu, and all of the
> installed memory will be supported on the server.

5. Return to the Main Menu, save the configuration, and
   exit from the utility program.

EISA Configuration Diskette: You must use the
EISA Configuration Diskette anytime you want to change
resource allocations, such as:

- Adding or removing devices
- Moving devices
- Changing device function
- Resolving conflicts
- Adding or removing PCI adapters

Each time you use the EISA Configuration Diskette to
configure the server, the configuration information is saved
in a *System Configuration Information (SCI)* file and in the
NVRAM configuration. Only devices that you install and
configure correctly appear on the EISA Configuration
screens.

Backing Up the EISA Configuration Diskette:
Use an operating system command, such as the DOS
DISKCOPY command, to make a *complete* backup copy of
the EISA Configuration Diskette. Using the backup copy
can prevent damage to the original diskette. The operating
system documentation provides information on backing up
diskettes.

Making Menu Selections: When you start the EISA
Configuration Diskette, an introductory screen appears.
Type **CF** at the prompt. After you press Enter, the main
menu, **Steps in configuring the computer**, appears. The
EISA Configuration program main menu contains five
steps:

Step 1

Important EISA configuration information: This step
provides information about the differences between the ISA
configuration process and the EISA configuration process.

Step 2

Add or remove boards: If the server is configured
correctly, this step provides a list of the devices installed in
the EISA expansion slots. The **Add** choice allows you to
add ISA devices to the configuration. If EISA adapters are

installed in the server, and you have not copied the *.CFG* file to the EISA Configuration Diskette, you are prompted to insert the adapter's configuration diskette into the diskette drive. The *.CFG* file is copied to your diskette. If the adapter's *.CFG* file is copied to the EISA Configuration Diskette before starting the diskette, and the adapter is installed in the server, EISA devices are added automatically.

Step 3

View or edit details: After adding EISA or ISA adapters in Step 2, use the **Edit** selection of this step to configure them. Use the **Edit Resources** selection of this step for complex configurations. If you change a setting in this step, you might have to change a switch or jumper setting on the system board or on a device.

Step 4

Examine switches or print report: After Steps 1 and 2 have been completed correctly, this step displays the correct switch and jumper settings for the installed devices that have switches and jumpers. Also, you can choose to print a system configuration report.

Step 5

Save and exit: This step allows you to save the configuration or to discard the changes before exiting the program.

Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your selection; then press **Enter** to make your selection. To help you track your progress, a checkmark (√) appears on the main menu next to the completed steps.

You can access help information through:

- Help windows, which remain active.
- Information windows, which appear automatically as a result of some configuration activities.
- The Help=F1 prompt, which allows you to access the Help Menu for screens displaying the prompt. To remove the Help Menu, press **Esc**.

Recording EISA Configuration Settings: Record the configuration settings you made in **Step 3, View or edit details** and **Step 4, Examine switches or print report** on a separate sheet and store it in a safe place for future reference. If a printer is attached to the server, you can use the **Print Screen** key to print these settings. The settings are helpful when you install additional options. Also, record the new settings each time you make changes. Be sure to record the current configuration settings for the user.

Starting the EISA Configuration Diskette: Using a
backup copy of the EISA Configuration Diskette can
prevent damage to the original diskette (see "Backing Up
the EISA Configuration Diskette" on page 261).

To start the EISA Configuration Diskette, do the following:

1. Insert the EISA Configuration Diskette into the
   diskette drive.
2. Power-on the computer, or if it is already on, shut
   down the operating system and restart the computer.
3. When the first screen appears, type **CF** and press
   Enter. Follow the instructions on the screen until the
   main menu, **Steps in configuring the computer**,
   appears.
4. Use the Up Arrow (↑) or Down Arrow (↓) key to
   advance through the items on the screen. Use the
   Tab key to select choices on the bottom of the
   screen. Press the Esc key to return to a previous
   menu.
5. Press **Enter** to make a selection.
6. Follow the instructions on the screen to view or
   change (edit) the configuration information.

   > **Note**
   >
   > Adapters installed in the server appear
   > automatically on the EISA Configuration screens
   > *after* you copy the adapter's configuration file (file
   > with an extension of *.CFG*) to the EISA
   > Configuration Diskette. If you want to manually
   > add an adapter that you have not yet installed in
   > the server, add it using Step 2 from the menu.
   > To configure ISA adapters, follow the instructions
   > on the screen.

Using EISA Configuration Diskette Advanced
Function: Locking an ISA adapter reserves the selected
resources and prevents the system from using them to
resolve resource conflicts. Use the **Advanced** function to
lock ISA boards. An exclamation mark (!) appears next to
locked adapters.

To use the Advanced functions, do the following:

1. Start the EISA Configuration Diskette (see "Starting
   the EISA Configuration Diskette").
2. At the main menu, select **Step 3,** The View or edit
   details screen appears.
3. Press **F7**. The Advanced functions screen appears.
4. Follow the instructions on the screen to:
   a. Lock or unlock boards
   b. View additional system information
   c. Set verification mode
   d. Maintain SCI files

Configuration (Models MZO, MZV, MZS, MZE, MZL)

The Configuration/Setup utility programs are stored in CMOS. These programs allow you to do the following.

- Set the system date and time
- Define input and output device parameters
- Define system security

The PC Server 520 Reference Diskette and the PC Server 520 Diagnostic Diskettes, supplied with the server, provide additional configuration and diagnostic support for the system board, disk drives, and other system components. The PC Server 520 Micro Channel Diagnostic Diskette supports the Micro Channel adapters.

The PC Server 520 (Models MXO, MXT, MYO, MYT, MYR) supports the following types of adapters.

- Peripheral Component Interconnect (PCI)
- Micro Channel Architecture

Three hardware configuration utility programs are supplied with the server.

- Configuration/Setup
- SCSISelect
- System programs on the Reference and Diagnostic Diskettes

The built-in Configuration/Setup utility program configures system board functions, such as serial and parallel port assignments and the startup sequence for drives installed in the server. It also allows you to set passwords for starting up and accessing the Configuration/Setup utility program.

The built-in SCSI-2 utility program (SCSISelect Utility program) allows you to configure the SCSI devices that you install in the server. Use SCSISelect to change default values, resolve configuration conflicts, and perform a low-level format on a SCSI hard disk drive in a non-array model. See, "SCSISelect Utility Program" on page 547.

The Reference and Diagnostic diskettes provide additional support for configuration and diagnostic activities. The Reference Diskette provides options for backing up and restoring the system diskettes, copying option diskettes, configuring Micro Channel adapters, and testing the computer. The PC Server 520 System Board Diagnostic Diskette provides diagnostic tests for the system board, disk drives, and other system components. The PC Server 520 Micro Channel Diagnostic Diskette provides diagnostic tests for Micro Channel adapters.

> **Note**
>
> Before installing a new device or program, read the documentation supplied with it. Reading the instructions helps you determine the steps required for installation and configuration.

The following is a preview of the actions that might be required to configure the server.

1. Run the Configuration/Setup utility program and record the current configuration settings.
2. Set jumpers or switches on the server's system board.

   See "System Board Jumpers" on page 307.
3. Set jumpers or switches on the device.

   See the device installation instructions.
4. Install the device in the server.
5. Start the Reference Diskette and:
   a. Record the current settings.
   b. Install the configuration files (.CFG).
6. Install software programs.

   See the installation instructions supplied with the software.
7. Resolve configuration conflicts.

   See "Configuration Conflicts" on page 274.

Using the Configuration/Setup Utility: The built-in Configuration/Setup utility program provides a convenient method to configure various system settings. The configuration information is stored in CMOS. In most cases, the server will operate using the default settings.

Always run the Configuration/Setup utility program if you have added or removed any hardware option, or if you receive an error message instructing you to do so. Review the following information and the information supplied with the device before making changes.

> **Note**
>
> Record the current settings before making any changes.

The following menu appears when you start the Configuration/Setup utility program. Included with each selection is a short description of its purpose.

Note

When a power-on password is entered and an administrator password also is set, a limited version of the menu appears. To change the settings, the administrator password must be entered.

- **System Summary**: Displays the current settings for all system functions, such as processor type, speed, and memory. You cannot change any information from this screen.
- **Micro Channel Configuration**: Displays the status of adapters in the Micro Channel expansion slots. For additional information, or to change the information displayed, you are prompted to insert the Reference Diskette.
- **Product Data**: Displays specific information about the server.
- **Devices and I/O Ports**: Displays a menu from which you can view or change the current settings for the serial and parallel ports, mouse, diskette drives, and video.
- **Date and Time**: Allows you to change the current date and time in the battery-backed memory.
- **System Security**: Allows you to set a power-on password, or to set an administrator (or supervisor-level) password. You also use this option to control access to a diskette drive, and to define a system owners name that displays on startup.
- **Start Options**: Allows you to select startup options such as the keyboard speed. You can also set the startup sequence of diskette and hard disk drives.
- **Advanced Setup**: Allows you to change system functions such as cache control and ROM shadowing.

Changing Settings: In most cases, the server will operate using the default settings, and you need to change the settings only to resolve configuration conflicts or to enable or change device function (for example, defining diskette types).

You can advance through the screens by pressing the Page Up (PgUp) or Page Down (PgDn) key. Use the Up Arrow (↑) or Down Arrow (↓) key to advance through the items on the screen. Change selections by first advancing to the item you want to change, then use the Right Arrow (→) or Left Arrow keys (←) to make the change.

Press **F1** for on-line Help information on for each selection.

Starting the Configuration/Setup Utility Program

Note

If a configuration error occurs, a prompt appears before the operating system starts (see "Configuration Conflicts" on page 274).

To access the Configuration/Setup utility program:

1. Power-on the server and watch the screen.
2. When the message `Press F1 to enter Configuration/Setup` appears, press **F1**.
3. Follow the instructions on the screen to view or change the configuration.
4. Select **Exit Setup** and press **Enter**.

   If you changed any settings, the utility program prompts you to confirm the changes. When you press **Enter**, the system restarts.

Note

You must *correctly* exit from the Configuration/Setup utility program to save the configuration information. Press **Esc** or move the cursor to the **Exit Setup** option on the menu bar, and then select **Save changes and exit**.

System Summary: Select **System Summary** to view information about the system, including the type and speed of the microprocessor, amount of memory, and the number of disk drives connected to the server.

Changes that you make on other menus are reflected on this summary screen. You cannot edit any of the fields.

The System Summary choice appears on the full Configuration/Setup menu, and also on the limited Configuration/Setup user's menu.

Micro Channel Configuration: Select **Micro Channel Configuration** to view or change the configuration of Micro Channel devices.

The Micro Channel Configuration screen appears, displaying the status of adapters in the Micro Channel slots.

To configure a Micro Channel adapter, or to change configuration settings on a Micro Channel adapter, the system prompts you to insert the Reference Diskette.

The system programs Main Menu appears, and displays the following choices.

1. Start operating system

2. Backup of system diskettes
3. Set/View Micro Channel Configuration
4. Copy an option diskette
5. Test the computer

The Set/View Micro Channel Configuration utility program allows you to work with the configuration information for Micro Channel adapters. See "Using the System Diskettes" on page 252 for additional instructions.

Press **F3** to return to the Configuration/Setup menu without changing the Micro Channel adapter configuration.

Micro Channel adapters and some other options are supplied with an Option Diskette. This diskette has files that the server uses to recognize the new option and set it up to operate correctly.

The Micro Channel Configuration choice appears only on the full Configuration/Setup menu.

Product Data: Select **Product Data** to view specific information about the PC Server 520, such as the machine type and model, the system serial number, the system board identifier, and the revision level or issue date of the flash EEPROM and BIOS.

Changes that you make on other menus are reflected on this summary screen. You cannot edit any of the fields.

The Product Data choice appears on the full Configuration/Setup menu, and also on the limited Configuration/Setup user's menu.

Configuring Devices and I/O Ports: You can view or change the assignments for devices and ports. Some programs and devices require specific assignments. Review the documentation that comes with the device for more information.

To view or change the assignments for devices, video, or serial or parallel ports:

1. Power-on the system. When the **F1** prompt appears, press **F1**. The Configuration/Setup Utility menu appears.
2. Select **Devices and I/O Ports**.
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the assignment that you want to change. Use the Left Arrow (←) and Right Arrow (→) keys to scroll through the list of available choices and make a selection. If the assignment conflicts with another assignment, an asterisk appears next to the conflicting setting. You must change one of the conflicting settings to a value that does not conflict.
4. When you complete all changes to the menu, press **Esc** to return to the Configuration/Setup menu.

Assigning Serial Ports: The system comes with two 9-pin serial ports. You can add serial ports by installing a serial adapter in one of the expansion slots.

Software recognizes serial ports from their serial-port assignments. No two serial ports can have the same serial-port assignment. This normally is handled by the Configuration/Setup utility program, but you might have special hardware or software that requires you to change these assignments.

You can set either serial port as Serial 1 through Serial 4.

Configuring Video Options: The server supports a wide assortment of displays. Because characteristics of display types vary, you should review the documentation that came with the display to determine the display type and refresh rate.

Select **Video Setup**, then use the Left Arrow ($\leftarrow$) and Right Arrow ($\rightarrow$) keys to advance through the list of available choices and make your selection.

Date and Time: Select **Date and Time** to change or set values for the system date and time. You use this option to set the real-time clock in the server.

The system time is in a 24-hour format: hour/minute/second.

The system date is in standard format for your country, for example, in the United States, the format is **Month/Day/Year**.

Select **Date and Time**, then use the Left Arrow ($\leftarrow$) and Right Arrow ($\rightarrow$) keys to advance through each data field. Type the new information; the system saves the information as you type it.

The **Date and Time** choice appears only on the full Configuration/Setup menu.

Defining System Security: To control access to the server, you can implement several of the security measures described in the *User's Reference*, including defining two levels of password protection, securing diskette access, and a system owners name that displays during startup.

After you set the power-on or administrator password, Enter password appears on the screen each time you power-on the server. (The passwords do not appear on the screen as you type them.) When you enter the correct password, OK appears on the screen. If you enter the wrong password, Incorrect password appears on the screen, and Enter password is again displayed. After three incorrect attempts, you must power-off the server and start again.

Setting an Administrator Password: The administrator password (sometimes called the supervisor password) allows the administrator to control who has access to some features of the server, including the Configuration/Setup utility program. If an administrator password is set, the password must be entered to display the complete menu for the Configuration/Setup utility program. Otherwise, a limited version of the Configuration/Setup utility program menu appears; the user cannot change any settings.

┌─ **Notes** ──────────────────────────────┐
│   │
│ 1. If an administrator password is set and then │
│   forgotten, it cannot be overridden or removed. │
│ 2. Before you set an administrator password, you │
│   must set the administrator password jumper to │
│   the change position. │
└──┘

To set an administrator password:

1. Select **Administrator Password** on the System Security screen; then press **Enter**.

   The **Administrator Password** screen appears.
2. Type the password in the **Enter Administrator Password** data field.
3. Verify that you typed the correct password. If you did not type the correct password, press **Esc**, and type the correct password.

4. Repeat steps 2 on page 270 through 3 on page 270 for the **Enter Administrator Password Again** data field.
5. Select **Set or Change Administrator Password** to save the new password; then press **Enter**. The system prompts you to change the administrator password jumper to the locked position after changing the password.

The password becomes effective immediately after you select **Set or Change Administrator Password**.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the administrator password. Keep a record of the password in a secure place.

To delete an administrator password:

1. Select **Administrator Password** on the System Security menu; then press **Enter**.

   The **Administrator Password** screen appears.
2. Select **Delete Administrator Password**; then press **Enter**.
3. A confirmation window appears. Press **Enter** to delete the administrator password. Press **Esc** to cancel the request and return to the System Security menu.

Setting a Power-on Password: When a power-on password is set, you must enter a password each time you start the system.

If you forget the power-on password, and an administrator password has been set, use the administrator password at the power-on prompt; then start the Configuration/Setup utility program and change the power-on password. If no administrator password has been set, you must remove the battery before you can set a new password.

To set a power-on password:

1. Select **Power-on Password** on the System Security menu; then press **Enter**.

   The **Power-on Password** screen appears.
2. Type the password in the **Enter Power-on password** data field.
3. Verify that you typed the correct password. If you did not type the correct password, press **Esc**, and type the correct password.
4. Repeat steps 2 through 3 for the **Enter Power-on Password Again** data field.
5. Select **Set or Change Power-on Password** to save the new password.

   You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the power-on password. Keep a record of the password in a secure place.

To delete a power-on password:

1. Select **Power-on Password** on the System Security menu; then press **Enter**.

   The **Power-on Password** menu appears.

2. Select **Delete Power-on Password**; then press **Enter**.

3. A confirmation window appears. Press **Enter** to delete the power-on password. Press **Esc** to cancel the request and return to the System Security menu.

Defining a System Owners Name: When you specify a system owners name, that name will be displayed each time that your server is started. If the administrator password is enabled, the password must be entered before you can set, change, or delete the system owners name.

1. Select **System Owners Name** on the System Security screen, and press **Enter**.

   The **System Owners Name** screen appears.

2. Type the name in the **Enter System Owners Name String** data field.

3. Press the Down Arrow (↓) key to select the **Set or Change System Owners Name** data field.

4. Press **Enter** to set the name or change a previously defined name.

You can use any combination of up to 15 characters and spaces in your system owners name.

To delete the system owners name, select **Delete Stored System Owners Name** and press **Enter**.

Restricting Access to Diskette Drives: The setting for the **Secure Diskette Drives** option controls who has access to the diskettes (user and administrator, or administrator only). Your server comes with this feature set to **Enable**, so that both the user and administrator have access to diskette drives.

To change this setting so that the access to the diskette drives is disabled, select the System Security menu option and then select **Secure Diskette Drives**. Press the Left Arrow (←) or Right Arrow (→) key to toggle the entry to **Disable** in the **Diskette Drive Access** data field. If the administrator password is enabled, the password must be before you can change this setting.

Defining the Start Options: Start options take effect when you start the server.

You can select keyboard operating characteristics, such as the keyboard speed. You can also specify whether the keyboard number lock starts on or off.

The server uses a startup sequence to determine the diskette drive, hard disk drive, or network adapter from which the operating system will be loaded. You can specify up to four devices in the **Startup Device** data fields. For example, you can define a startup sequence that checks for a startable diskette in the primary diskette drive, then checks the hard disk drive in bay 1.

You can enable the server to run without checking for the presence or state of a monitor, keyboard, or diskette drive. The devices are disabled after the power-on self test (POST) completes and the operating system has loaded. This allows you to enter a password and update the Configuration/Setup utility program in keyboardless operation, and to start the system programs from the Reference Diskette in disketteless operation.

You can select the tests that the server runs at startup. This includes the SureTest BIOS test tool and a virus detection test. In addition, you can also choose whether to run the power-on self test (POST) in enhanced or quick mode.

Select **Start Options**, then use the Left Arrow (←) and Right Arrow (→) keys to advance through each data field.

The **Start Options** choice appears only on the full Configuration/Setup menu.

Advanced Setup: Select **Advanced Setup** to change values for advanced hardware features such as cache control and ROM shadowing. A warning message appears when you select this choice, to alert you that the system may malfunction if these options are configured incorrectly. Follow the instructions on the screen carefully.

Select **Advanced Setup**, then use the Left Arrow (←) and Right Arrow (→) keys to advance through each data field.

When you restart the server after adding or replacing an &cash., you must enable the cache. Use the following procedure:

1. Start the Configuration/Setup utility program.
2. Select **Advanced Setup**.
3. Select **Cache Control**.
4. Select **Cache State**.
5. Press the Left Arrow (←) or Right Arrow (→) key to change the cache state to **Enabled**.

The **Advanced Setup** choice appears only on the full Configuration/Setup menu.

Configuration Conflicts

The resources used by a server consist of interrupt request levels (IRQs), direct memory access channels (DMAs), I/O ports (for example, serial and parallel), and memory. This information is useful when a resource configuration conflict occurs.

Conflicts in the configuration occur if:

- A device is installed that requires the same resource as another device. (For example, if you install an ISA network adapter and an EISA network adapter, both requesting *IRQ 5*, only one of the adapters can be configured.)
- A device resource is changed (for example, changing jumper settings).
- A device function is changed (for example, assigning *COM 1* to two different serial ports).
- An installed software program requires the same resource as a hardware device (for example, an expanded memory specification (EMS) device driver that uses the address required by the SVGA video adapter).

The steps required to resolve a configuration error are determined by the number and variety of hardware devices and software programs install in the system.

The following information for resolving these types of conflicts are divided by machine type and model number.

- General type and model information
- Resolving Hardware Configuration Conflicts
- Resolving Software Configuration Conflicts
- Changing the Software Configuration

Type 8641 (Models EZO, EZV, EZL, EZS, EZE): If a hardware configuration error is detected, a *configuration error* message appears after the server completes POST, but before the operating system starts. You can bypass the error or start one of the configuration utility programs. Press **F1** to bypass the error and load the operating system. Press **F2** to start the Setup program. To start the EISA Configuration Diskette, insert the diskette in the diskette drive and press **F1**.

The Setup program and the EISA Configuration program configure only the system hardware. These programs do not consider the requirements of the operating system or the application programs.

Resolving Hardware Configuration Conflicts:
Use the following information to help resolve hardware configuration conflicts:

1. Run the Setup program to view and change resources used by the system board functions. Record the current settings before making any changes. (See "Setup Program (Type 8641)" on page 286 for instructions.)

2. Determine which adapter or device is causing the error. The EISA Configuration program specifies how the server checks for resource conflicts. Initially, this verification mode is set to automatic. When the mode is set to automatic, the EISA Configuration program tries to resolve configuration conflicts for you. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to change the setting (see "Using EISA Configuration Diskette Advanced Function" on page 263).

   If the automatic verification mode is set, the configuration program attempts to resolve conflicts for you. However, this might disable adapters or system board features. For example, if you choose IRQ 4 for an adapter, the program disables Serial Port 1, which uses IRQ 4. If this happens, and you do not want this feature disabled, choose another IRQ for the adapter.

   If you set the verification mode to *manual*, the configuration utility program does *not* try to resolve a conflict. Instead, you have to determine if a resource conflict has occurred and then resolve the conflict. When the verification mode is set to manual, an asterisk (*) appears on the View or edit details screen next to adapters in conflict.

   If the EISA Configuration program cannot resolve a configuration error, it *deactivates* the adapter and displays the deactivated status (<>) on the View or edit details screen. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to update or copy the server's system configuration information file (see "Using EISA Configuration Diskette Advanced Function" on page 263).

3. Change configuration resource allocations. Use the built-in Setup program to view or change system board resource allocations. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to view the available or the used system resources (see "Using EISA Configuration Diskette Advanced Function" on page 263). Use the **Edit Changes** selection to change resource allocations for complex configurations.

4. Change adapter jumpers or switches. Jumpers and switches define the system resources that a device can use. If the settings are incorrect or set to use a resource that cannot be shared, a conflict occurs and the device remains deactivated by the configuration

program. Use the EISA Configuration Diskette's Step 4, **Examine switches or print report** screen to verify switches (see "Making Menu Selections" on page 136). Read the documentation supplied with the device.

5. Change system board jumpers or switches. Remove the cover; then, refer to the system-board diagram inside the server.

6. Remove the device or adapter. Some configurations are not supported (for example, you cannot operate the server with two ISA SVGA adapters installed).

Resolving Software Configuration Conflicts: The memory-address space and interrupt levels (IRQs) used by some hardware options might conflict with addresses defined for use through application programs or the EMS. (EMS is used only with DOS.)

If there is a conflict, one or more of the following conditions might exist:

- The system cannot load the operating system.
- The system does not work.
- An application program does not operate, or it returns an error.
- Screen messages indicate a conflict exists.

You can resolve conflicts by changing either the software or the hardware configuration.

Note

Start the EISA Configuration Diskette to view the addresses used by the system board functions. Use the **Advanced** function of Step 3, **View or edit details** to view the addresses used by the adapters. (See "Using EISA Configuration Diskette Advanced Function" on page 263 for instructions.)

The best way to resolve memory-address conflicts is to change the addresses used by the application program or the device driver. To do this, use the EISA Configuration program.

If a device driver is causing a memory-address conflict, refer to the operating-system documentation or the documentation supplied with the device drivers.

Type 8641 (Models EZO, EZV, EZL, EZS, EZE): If a hardware configuration error is detected, a configuration error message appears after the server completes POST and before the operating system is loaded. You can bypass the error by pressing **Esc** while the error message is displayed.

The Configuration/Setup utility program configures only the system hardware. The program does not consider the

requirements of the operating system or the application programs.

Resolving Hardware Configuration Conflicts:
Use the following information to help resolve hardware configuration conflicts:

1. Run the Configuration/Setup utility program to view and change resources used by the system board functions. Record the current settings before making any changes. (See "Setup Program (Type 8641)" on page 286 for instructions.)
2. Determine which adapter or device is causing the error.
3. Change configuration resource allocations. Use the built-in Configuration/Setup utility program to view or change system board resource allocations. Jumpers and switches define the system resources a device uses. If the settings are incorrect or set to use a resource that cannot be shared, a conflict occurs and the device will remain deactivated by the configuration program.
4. Change system board jumpers or switches. Refer to the system-board diagram inside the server or "System Board Jumpers" on page 307.
5. Remove the device or adapter. Some configurations are not supported (for example, you cannot operate the server with two PCI SVGA adapters installed).

Resolving Software Configuration Conflicts: The memory-address space and interrupt levels (IRQs) used by some hardware options might conflict with addresses defined for use through application programs or the EMS. (EMS is used only with DOS.)

If a conflict exists, one or more of the following conditions might exist:

- The system cannot load the operating system.
- The system does not work.
- An application program does not operate, or it returns an error.
- Screen messages indicate a conflict exists.

You can resolve conflicts by changing either the software or the hardware configuration.

Note

Start the Configuration/Setup utility program to view the addresses used by the system board functions.

Changing the Software Configuration: The best way to resolve memory-address conflicts is to change the addresses used by the application program or the device driver. This can be done by using the Configuration/Setup utility program.

If a device driver is causing a memory-address conflict, refer to the operating-system documentation or the documentation supplied with the device drivers.

Internal Drives (Type 8641)

Adding different types of drives allows the server to read different types of media and store more data. Several types of drives are available, such as:

- Diskette
- Hard disk
- Rewritable optical disc
- Tape

The server has hardware that allows you to replace a failed hard disk drive without powering off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

Hot-swap drives have a green light on the knob of the tray that contains the drive. If the drive has a good electrical connection upon installation, the light illuminates. The light blinks briefly during power-on. For disk-array models, the light also blinks if the drive malfunctions. For non-disk-array models, the light turns off if the drive malfunctions.

Each hot-swappable drive that you plan to install must have a hot-swap drive-tray attached. Trays are available for two drive types: narrow and wide. The narrow tray has a 50-pin drive connector. The wide tray has a 68-pin drive connector.

Internal drives are installed in *bays*. A diskette drive and a CD-ROM drive are preinstalled in bay A in all models. A removable CD storage compartment is shipped in bay B1. You can install two drives in bay B. You can install hot-swappable hard disk drives in banks C, D, and E only. Banks C, D, and E each contain six bays. Bank C supports up to six drives. However, the total number of SCSI drives that you can install in bay B and bank C combined is six, on a single SCSI cable. The number of preinstalled hard disk drives in bank C varies according to the model. You can install up to six drives in bank D and up to six drives in bank E.

- **Note**

  The bank letter-designations are located on both vertical rails on the front of the server. The bay-slot numbers are located on the top of bank C and the bottom of bank E.

Open Bays

CD-ROM Drive (Bay A1)

Diskette Drive (Bay A2)

B1 B2

Bank C
Bays 1 - 6

Open Bays

Bank D
Bays 1 - 6

Bank E
Bays 1 - 6
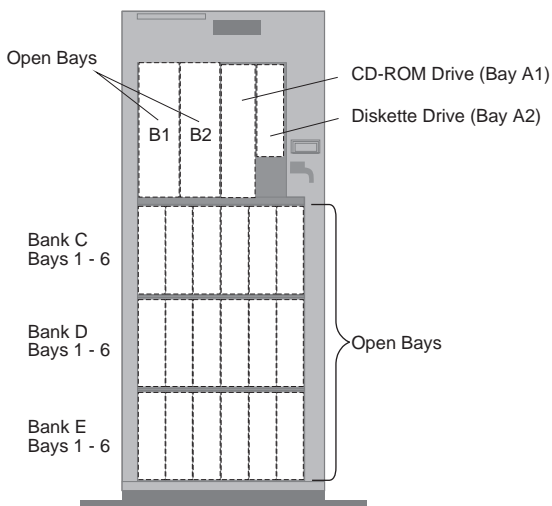
A *bezel* (sometimes called a *cover plate* or *face plate*)
covers the front of bay B2 only. If you install a drive that
uses removable media, such as diskettes, optical discs, or
tapes, you might have to change this bezel.

Considerations

- Bay A comes with one SCSI CD-ROM drive and one 3.5-inch, 1.44MB diskette drive. Bay A supports one 5.25-inch and one 3.5-inch, half-high diskette-interface device.
- Bay B supports:
  - One 5.25-inch, full-high, removable-media or non-removable-media device, or
  - One 5.25-inch, half-high, removable-media device and one 3.5-inch, half-high or one-inch high, removable-media device, or
  - Two 3.5-inch or two 5.25-inch, slim-high or half-high, removable-media devices

  ---- **Note** ----

  Unless you install an additional SCSI cable, only one of the devices that is installed in bay B can be a SCSI device.

- You cannot install hot-swappable drives in bay B.
- The PC Server 520 supports eighteen 3.5-inch, slim-high, hot-swap hard disk drives, or nine 3.5-inch, half-high hard disk drives in the bottom three banks (C, D, and E).

  Banks C, D, and E can accommodate six slim-high drives or three half-high drives, or a combination of both drive sizes. If you use a combination, remember that one half-high drive uses the equivalent space of two slim-high drives.

- If you install drives in bank D or E, you must remove the fan assembly on the rear of the server, install a direct access storage device (DASD) *backplane* in bank D or E, and install an optional 220-watt power supply.

  For non-disk-array models, you might need to install an additional SCSI-2 adapter.

- An address jumper is located on the rear of each backplane. You must set the jumpers on these backplanes as described in "Hot-Swap Backplane (FRU No. 06H8388)" on page 512.

SCSI Drives: Some drives have a special design called *small computer system interface*, or "SCSI." This design allows you to attach multiple drives to a single SCSI-2 adapter.

---- **Note** ----

Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.

The server comes with a SCSI-2 adapter. The number of preinstalled SCSI hard disk drives varies according to model. If you install additional SCSI devices, each SCSI

device that is connected to the adapter needs a unique identification (ID) so that the SCSI-2 adapter can identify the devices and ensure that different devices do not attempt to transfer data at the same time. If you need to set IDs for SCSI devices, refer to the instructions that came with those devices.

The server automatically sets SCSI IDs for hot-swap drives. These IDs are determined by the drive locations in the bays. The SCSI ID for the preinstalled 4X CD-ROM drive in bay A is set to 6, and the SCSI ID for the SCSI-2 adapter is set to 7.

The processing sequence for SCSI devices is set according to their IDs. Through the SCSISelect utility program, you can specify the scanning order for these devices. That is, you can specify whether the scanning sequence proceeds from 0 to the highest-numbered SCSI ID, or whether it proceeds in descending order. The standard scanning sequence proceeds from 0 to 6, then 8 to 15. However, this convention does not apply if you use the *reverse scan* feature of the SCSISelect Utility program. Use the processing sequence that best suits the system configuration. See "Configure/View Host Adapter Settings" on page 547 for information about setting the scanning order.

The SCSI-2 adapter has both internal and external ports. Depending on the server configuration, you can attach additional SCSI drives by *chaining* them (connecting them together with cables). Depending on the type of SCSI-2 adapter installed in the server, the adapter supports a total of 14 or 15 SCSI drives (internal and external).

To configure the SCSI devices that you install in a non-disk-array model, use the built-in SCSI-2 adapter utility program, SCSISelect. See "SCSISelect Utility Program" on page 547. For disk-array models use the RAID configuration program. See "Disk Array Configuration" on page 461.

There are two types of SCSI devices: wide and narrow. You must use 16-bit cables to attach wide devices. Use 8-bit cables to attach narrow devices. Wide device IDs can be set to any number from 0 to 15. Narrow devices can only have their IDs set from 0 to 7. The preinstalled 4X CD-ROM drive in bay A is a narrow device.

Two devices connected to the same bus (internal or external) cannot have the same ID; however, you can use the same ID for an internal device and an external device. The primary partitions on SCSI drives that are connected to the internal bus on a given adapter are assigned drive letters before the external drives that are connected to the same adapter are assigned drive letters. If multiple adapters are installed in the server, the drives that are

connected to the adapter in the lowest number expansion slot are assigned drive letters first.

When SCSI devices are chained, both ends of the chain (cable) require a *terminator*. The purpose of these terminators is to ensure that the quality of the signal is maintained throughout the SCSI chain. If you attach SCSI devices (internal or external), you must terminate the last device in the chain, or the end of the cable must be terminated.

Note

The backplanes automatically set termination for all the drives in the hot-swap bays.
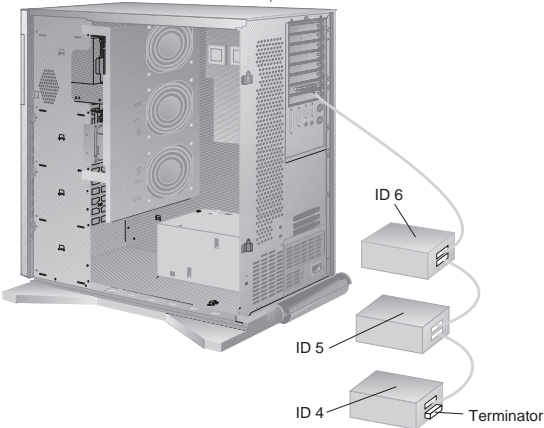
The SCSI-2 adapter automatically adjusts for termination.

Power Supplies (Type 8641)

The 520 computer is shipped with a primary power supply. An additional or optional power supply can be added to the computer. Connectors are used to transfer the primary power supply voltages and signals from the primary power supply to the optional power supply. The following illustrations show how the two power supplies are connected.

```
─── Attention ───────────────────────────

When replacing the primary power supply cover plate,
rotate the plate 180°. (This will leave an opening for
the primary power supply connector cable that
connects to the optional power supply.) Failure to do
so will cause the power supply connector cable to be
crimped when the plate is replaced.
```

```
─── Note ────────────────────────────────

Tabs are located on the side of each power supply to
secure them together.
```

Power Supply LED and Button: The power-good LED and button are located on the side of the primary power supply button. The LED (when lit) indicates that the power supply is good. If the LED fails to come on when the computer is powered-on, do the following:

- While observing the LED on the power supply, press the power supply button. If the LED fails to light (while you are holding the button in), you may have a defective power supply. If the LED lights when the button is pressed, go to "Power Supply Shutdowns" on page 285.

Primary Power Supply Voltages:
If the voltages are correct and the power supply fan runs, the power supply is OK.

Power-Supply Connector
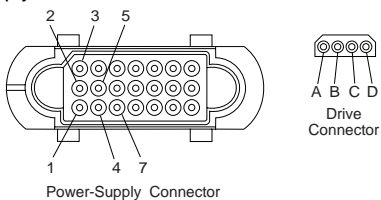
Drive Connector

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
5	3	+4.8	+ 5.25
5	4	+11.52	+12.6
5	7	−10.8	−13.2
B	D	+4.8	+ 5.25
B	A	+11.52	+12.6

Connectors P11, P12, and P13

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2	1	+11.52	+12.6

Optional Power Supply Drive Connector Voltages:
If the voltages are correct and the power supply fan runs, the power supply is OK.
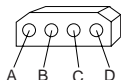
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
B	D	+ 4.8	+ 5.25
B	A	+ 11.52	+12.6

Power Supply Shutdowns: If the power supply shuts down, or *appears* to fail at power-on, you might have one of the following problems:

- Too many devices are set to start instantly. See "Setting the Motor-Start Jumper" on page 549.
- There are too many large-capacity devices installed (such as hard disk drives). The nominal operating current of the devices installed collectively exceeds the available current of the power supply. See the "Personal System/2 Installation Planning" guide (form number G41G-2927) for more information.

Attention

Unplug the power cord and wait two minutes before checking voltages to give the power supply capacitors time to discharge.

Note

Verify that the voltage-select switch (if applicable) is set for the correct voltage.

If the voltages are correct and the Symptom-to-FRU index does not solve the problem, go to "Undetermined Problems" on page 552.

Setup Program (Type 8641)

To access the Setup program:

1. Remove all diskettes from the server.

   > **Note**
   >
   > Never start the Setup program while using the
   > EISA Configuration program.

2. Power-on the server and watch the screen. Be ready
   to act quickly.

3. After the IBM logo screen appears and then quickly
   disappears, you are prompted to Press <F1> or <F2>
   to enter SETUP. As soon as you see that prompt,
   press the correct **F-key (F1 or F2)**. If the Setup
   program screen doesn't appear, restart the system
   and try again.

   > **Note**
   >
   > If a configuration error occurs, a prompt appears
   > before the operating system starts (see
   > "Configuration Conflicts" on page 274).

4. Follow the instructions on the screen to view or
   change the configuration.

   You must *correctly* exit from the Setup program to
   save the configuration information.

5. Press **Esc** or move the cursor to the **Exit menu**
   option on the menu bar.

6. Select **Exit menu** from the menu bar.

7. Select **Save changes and exit.**

Setup Program Default Settings Type 8641 (Models EZO, EZV, EZL, EZS, EZE)

Option	Default Value
Boot sequence	A: then C:
Cache State	Enabled
COM1 Port	3F8, IRQ 4
COM2 Port	2F8, IRQ 3
Diskette access	User
Diskette check	Disabled
Diskette controller	Enabled
Diskette Drive A	1.44MB, 3.5 in.
Diskette Drive B	Not installed
Hard disk boot sector	Normal
Large disk DOS compatibility	DOS
LPT Port	378, IRQ 7
LPT mode	Output only
Memory gap	Disabled
Memory (Extended)	15MB
• Bank 0 Socket 1	8MB Kit
• Bank 0 Socket 2	8MB Kit
• Bank 1 Socket 3	
• Bank 1 Socket 4	
• Bank 2 Socket 5	
• Bank 2 Socket 6	
• Bank 3 Socket 7	
• Bank 3 Socket 8	
• Total Memory	16MB
Memory (System)	640MB
Password on boot	Disabled
Post errors	Enabled
Set supervisor password	Press Enter
Set user password	Press Enter
Setup prompt	Enabled
Supervisor Password is	Disabled
Swap diskettes	Normal
User password is	Disabled
Video BIOS	Shadowed
Video System	SVGA

Setup Program Default Settings (Models MZO, MZV, MZS, MZE, MZL)

Option	Default Value
Cache State	Enabled
Cache Size	256KB
Diskette Drive A:	1.44MB 3.5 in
Diskette Drive B:	not installed
Disketteless Operation	Disabled
Keyboard Numlock State	On
Keyboard Speed	Fast
Keyboardless Operation Mode	Disabled
Machine Type/Model	8641
Memory (Extended)	360KB
• Bank 0 socket	16MB Kit
• Bank 0 socket	16MB Kit
• Bank 1 socket	
• Bank 1 socket	
• Bank 2 socket	
• Bank 2 socket	
• Bank 3 Socket	
• Bank 3 Socket	
• Total Memory	32MB
Memory (System)	640KB
Memory (Type)	EOS
Microprocessor	Pentium
Microprocessor Speed	100 MHz
Monitor Horizontal Frequency	Not Used
• Refresh Rate For (640x480)	60 Hz
• Refresh Rate For (800x600)	Undefined
• Refresh Rate For (1024x768)	Undefined
• Refresh Rate For (1280x1024)	Undefined
• Refresh Rate For (1600x1200)	Undefined
Monitorless Operation	Disabled
Mouse	Installed
Parallel Port	3BCh – IRQ 7
Parallel Port Mode	Standard
Parallel Port Mode (Extended)	
Power On Self Test	Enhanced
ROM Shadowing	
• F0000h – FFFFFh (System BIOS)	Enabled
• E8000h – EFFFFh	Enabled
• E0000h – E7FFFh	Enabled
• DC000h – DFFFFh	Disabled
• D8000h – DBFFFh	Disabled
• D4000h – D7FFFh	Disabled
• D0000h – D3FFFh	Disabled
• CC000h – CFFFFh	Disabled
• C8000h – CBFFFh	Disabled
• C0000h – C7FFFh (Adapter Video BIOS)	Enabled
Secure Diskette Drives	Disabled
Serial Port A Address	3F8h – IRQ 4
Serial Port B Address	2F8h – IRQ 3
Shadow RAM	384KB
Startup Drive (First)	Diskette Drive 0
Startup Drive (Second)	Hard Disk 0
Startup Drive (Third)	Disabled
Startup Drive (Fourth)	Disabled
SureTest	Disabled
System ROM	F000h — FFFFh
Video Controller	SVGA
Video Display Type	User Defined
Video Memory	1024KB
Virus Detection	Enabled

Specifications (Type 8641)

Size

- With pedestal:
    - Depth: 755 mm (29.7 in.)
      835 mm (32.8 in.) with cable cover
    - Height: 622 mm (24.5 in.)
    - Width: 353 mm (13.9 in.)

Weight

- Minimum configuration as shipped: 31.29 kg (69 lb)

Environment

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

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour
    - Minimum configuration: 150 BTU (44 watts)
    - Maximum configuration: 3600 BTU (1055 watts)

Electrical Input

- Sine-wave input (50 to 60 Hz is required
- Input voltage
    - Low range
        - Minimum: 90 V ac
        - Maximum: 137 V ac
    - High range
        - Minimum: 180 V ac
        - Maximum: 265 V ac
    - Input kilovolt-amperes (kVA) approximately
        - Minimum configuration as shipped: 0.16 kVA
        - Maximum configuration: 1.0 kVA

Total Power Available for Drives

- Nominal operating current allowed&:
    - +5 V dc line: 10 A base; 23 A with upgrade
    - +12 V dc line: 10 A base; 23 A with upgrade

Symmetric Multiprocessors/Multiprocessing

Some PC Server computers incorporate a 100MHz Pentium processor and a second upgradeability processor socket on the system board to support Symmetric Multiprocessors/Multiprocessing (SMP). The SMP capability extends processing performance by allowing tasks to be dispatched to the next available processor rather then being queued until the busy processor has completed its task. The SMP capability also provides a level of high availability in that with some operating systems, such as OS/2 SMP, run in a uni-processor mode if one of the processors should experience a failure. This function will allow the LAN to continue operation so that service can be scheduled at a non-critical time.

System Board Replacement (Type 8641)

Notes

- The clock speed jumper must be set to match the speed of the processor(s) installed on the system board.
- For system board socket and jumper locations, see:
  - "Locations (Models EZO, EZV, EZL, EZS, EZE)" on page 294 nopage., "System Board Locations" on page 298 for PCI/EISA models
  - "Locations (Models MZO, MZV, MZS, MZE, MZL)" on page 301 nopage., "System Board Locations" on page 305 for micro-channel models.

Type 8641 computers have one or two processors, and other components installed on the system board. When replacing the system board, remove all of the installed components from the old system board and install them on the new system board. If the problem remains, check the following:

- The primary processor is installed and seated correctly in the primary processor socket on the system board
- If installed, the secondary processor is seated correctly in the secondary processor socket on the system board.
- All other components removed from the old system board are installed and seated correctly on the new system board.

Note

If the processor(s) are not seated correctly, intermittent problems can occur.

Type 5 Adapter Installation (Type 8641, Models MZO, MZV, MZS, MZE, MZL)

The PC Server Type 8641 (Models MZO, MZV, MZS, MZE, MZL) supports type 5 Adapters in Micro Channel expansion slots 5 and 6. However, because Type 5 adapters are longer and wider than standard Micro Channel adapters, the adapter support bracket must be repositioned.

- **Note**

  If the server was shipped with a PeerMaster adapter installed, the bracket has already been repositioned.

1. Remove the fan assembly:
   a. Disconnect the three fan assembly cables from the power supply.

      - **Attention**

        To avoid damage and ensure proper server operation, handle the fan assembly carefully.

   b. Remove the two screws that hold the fan assembly in place.
   c. Remove the fan assembly by pulling it up and out.
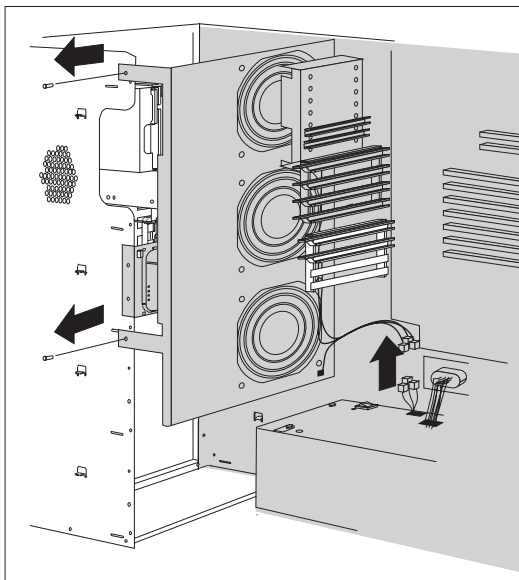
2. Press the raised area in the middle of the bracket; then, press the bracket toward the rear of the server and lift out. You might need a screwdriver to release the bracket from the server.
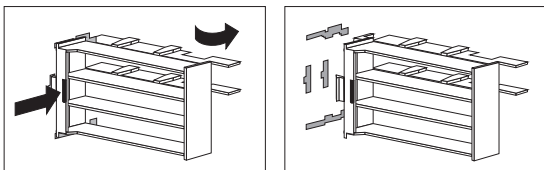
3. Reposition the card guides on the adapter support bracket:
   a. Lift the tabs on the top of the top card guide to release it from the bracket.
   b. Align the card guide tabs with the slots closest to the front of the bracket. The card guide will extend beyond the bracket.
   c. Hook the tabs on the bottom edge of the card guide on the flange on the back of the bracket; then press the card guide forward until it snaps into place.
4. Holding the bracket at an angle, insert the tabs on the back of the card guide into the slots closer to the front of the server.
5. Press the bracket to the right until it snaps into place.
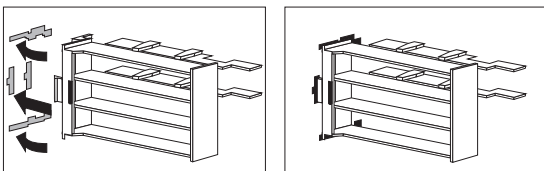
6. Carefully reinstall the fan assembly with the two screws that you removed in step 1b on page 291.
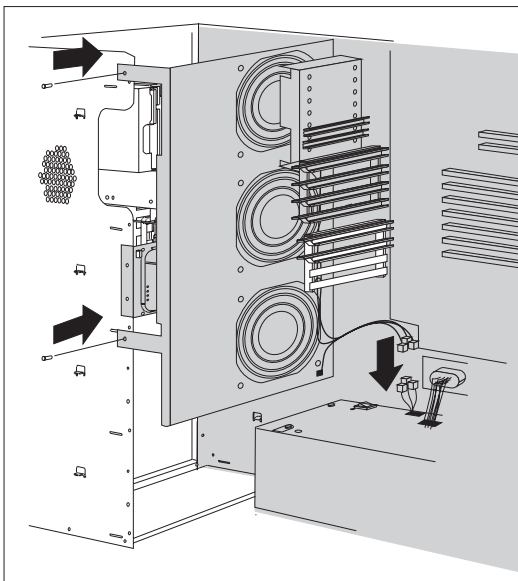
7. Reconnect the fan assembly cables.

Locations (Models EZO, EZV, EZL, EZS, EZE)

Controls/Indicators

Power OK Indicator

Hard Disk Drive
Activity Indicator
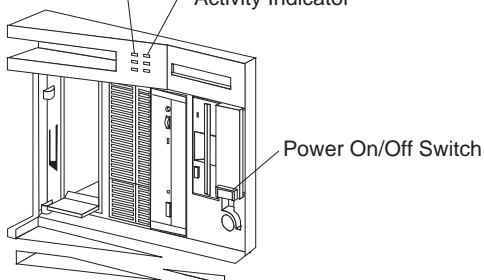
Power On/Off Switch

Expansion Bays
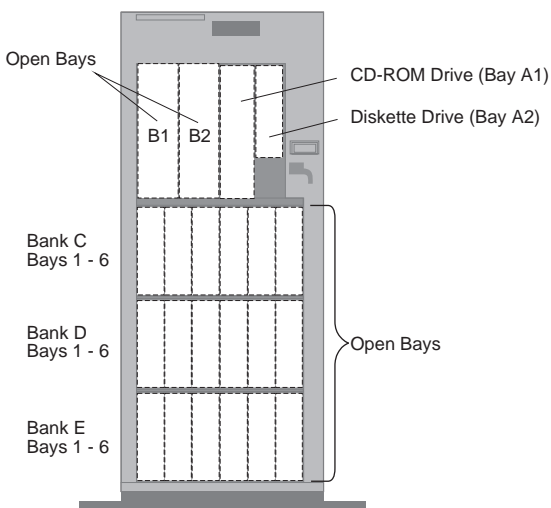
Not

For additional internal drive information, see "Internal Drives (Type 8641)" on page 278.

The server comes with one 3.5-inch, 1.44MB diskette drive, a SCSI CD-ROM drive, and a removable CD-ROM storage compartment. The number of preinstalled hard disk drives in your server varies according to the model.

CD-ROM Drive: All models come with a SCSI-2 CD-ROM drive.

Diskette Drive: The 3.5-inch, 1.44MB diskette drive uses 1MB and 2MB diskettes.

Open Bays: Your server has a special design that gives you the flexibility to use up to 18 hot-swappable, 3.5-inch hard disk drives. There is additional open space in the top left bay for two more diskette drives or an additional SCSI drive. For installation instructions and information on the types of drives that you can install in each bay, see "Configuration (Models MZO, MZV, MZS, MZE, MZL)" on page 264 or "Configuration (Models EZO, EZV, EZL, EZS, EZE)" on page 256.

Hard Disk Drive: All models come with a SCSI-2 adapter. The number and capacity of the hard disk drives varies, depending on your model.

Input/Output Connectors
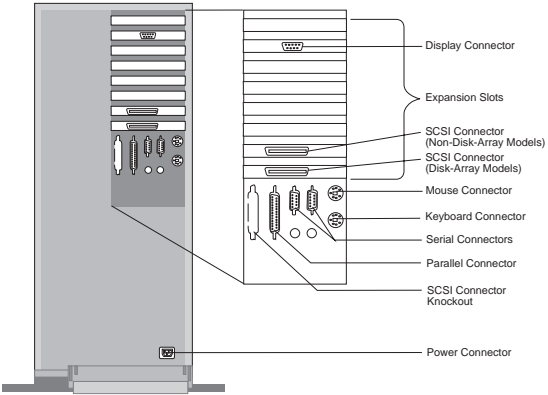
Power Connector: The power cable connects here.

Keyboard Connector: The keyboard cable connects here.

Mouse Connector: The mouse cable connects here. This port also is called an auxiliary-device or pointing-device port.

Parallel Connector: One 25-pin parallel connector is provided. This is where the signal cable for a parallel printer or other parallel device connects to your server.

SCSI Connector Knockout: This knockout allows access to the internal connector on a second SCSI-2 adapter.

Serial Connectors: Two 9-pin serial connectors (A and B) are provided. The serial signal cable for a modem or other serial device usually connects here. If you are using a 25-pin signal cable, you need a 9-pin-to-25-pin adapter cable.

SCSI Connector: External small computer system interface (SCSI) devices attach here.

Display Connector: The display signal cable attaches to the connector on this adapter.

Memory Module Connectors

System Board Locations

Note

A black square (■) indicates pin 1.

System Board Connections

Header	Configuration	Connect To
W12/W31	Speaker	Speaker
W18/W37	Power LED	Pins 1-3
W24/W38	IDE Hard Drive LED	IDE Hard Drive
W35	CPU Fan Connector	Fan
W36	CPU Fan Connector	Fan
J1/J2/J26	Power Supply Connector	P1 to J1 P2 to J2 P3 to J26
J6	Mouse Connector	Mouse
J8	Keyboard Connector	Keyboard
J9	Parallel Port Connector	Parallel Device
J10	Floppy Drive Connector	Diskette Drive
J11	Serial Port COMM A Connector	Serial Device
J12	Serial Port COMM B Connector	Serial Device
J13	ISA IDE Connector	IDE Hard Drive
N/A	SCSI LED	SCSI Option Card
N/A	SCSI Device Connector	SCSI Option Card

System Board Jumpers

Jumper	Description	Setting
W1	L1 Cache Mode	Open - L1 Write-Back (Default) Closed - L1 Write-Through
W2	Reserved	Open
W5	L2 Cache Size	Pins 1-2 - L2 Cache Size = 256K (Default) Pins 2-3 - L2 Cache Size = 512K
W6	CPU Clock	Pins 1-2 Pentium 60/90MHz Pins 2-3 Pentium 66/100MHz
W10	Reserved	Pins 2-3 (Default)
W16	Reserved	Pins 1-2 (Default)
W17	Reserved	Closed (Default)

Jumper	Description	Setting
W20	Monitor Selection	Open - Monochrome Monitor Setting Closed - Color Monitor Setting (Default)
W21	Reserved	Open - AT Style Keyboard Closed - PS/2 Style Keyboard and Mouse (Default)
W22	Reserved	Open (Default)
W23	Reserved	Open (Default)
W25	ISQ IDE IRQ Select	Pins 1-2 - ISA IDE using IRQ 14 Primary IDE Controller (Default) Pins 2-3 - ISA IDE using IRQ 15 Secondary Controller
W30	Reserved	Open (Default)

Locations (Models MZO, MZV, MZS, MZE, MZL)

- "Controls/Indicators."
- "Expansion Bays" on page 302.
- "Input/Output Connectors" on page 303
- "Memory Module Connectors" on page 304
- "System Board Locations" on page 305
- "System Board Connections" on page 306
- "System Board Jumpers" on page 307

Controls/Indicators
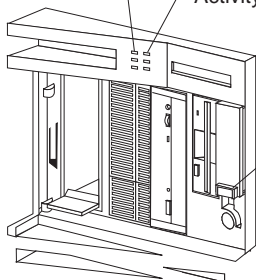
Expansion Bays
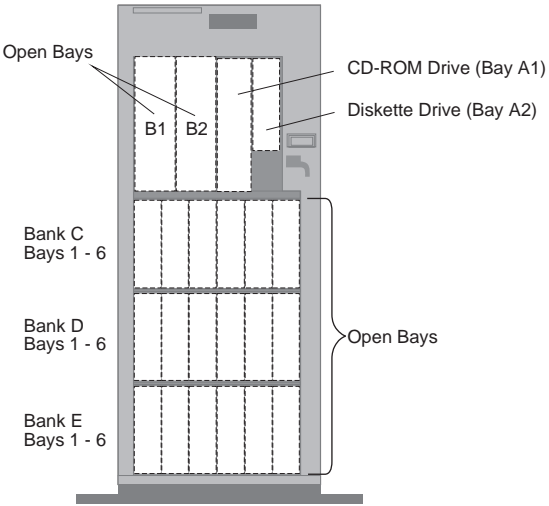
Note

For additional internal drive information, see "Internal Drives (Type 8641)" on page 278.

Open Bays: Your server's special design gives you the flexibility to use combinations of 3.5-inch or 5.25-inch hard disk, tape, and rewritable optical disk drives. Your server can use up to 18 hot-swappable 3.5-inch hard disk drives. For additional internal drive information, see "Internal Drives (Type 8641)" on page 278.

CD-ROM Drive: All models come with a SCSI 4X CD-ROM drive.

Diskette Drive: The 3.5-inch, 1.44MB diskette drive uses 1MB or 2MB diskettes.

Hard Disk Drive: The number and capacities of the hard disk drives vary, depending on your model.

Input/Output Connectors

Monitor Connector

SCSI Connector
(Disk-Array Model)

Expansion Slots

Mouse Connector
Keyboard Connector

SCSI Connector
(Non-Disk-Array Model)
Serial Connectors
Parallel Connector

Power Connector
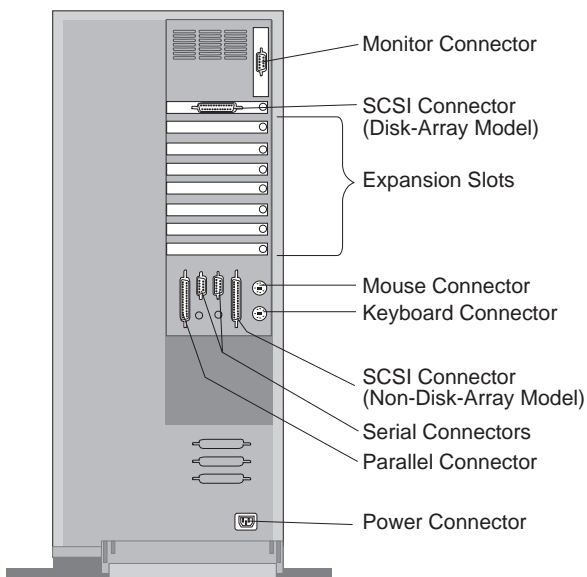
Display Connector: The display signal cable attaches to this connector.

Mouse Connector: The mouse cable attaches to the server through this connector. The mouse connector sometimes is called an auxiliary-device or pointing-device port.

Keyboard Connector: The cable from your keyboard connects here.

SCSI Connector: External SCSI devices attach here.

Serial Connectors: The server has two 9-pin serial connectors (A and B). The serial signal cable for a modem or other serial device usually connects here. If you are using a 25-pin signal cable, you need a 9-pin-to-25-pin adapter cable. For port assignments, see "Configuring Devices and I/O Ports" on page 268.

Parallel Connector: The server has one 25-pin parallel port. This is where the signal cable for a parallel printer or other parallel device connects to your server.

Power Connector: The server power cable connects here.

Memory Module Connectors
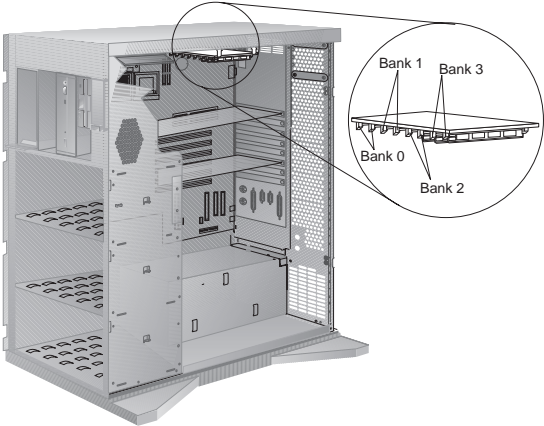
Bank 1 Bank 3

Bank 0

Bank 2

System Board Locations

Note

A black square (■) indicates pin 1.
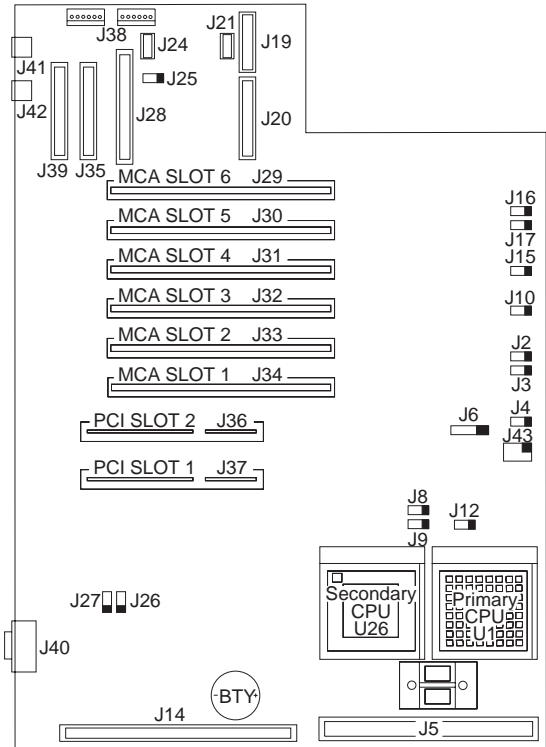
System Board Connections

Header	Configuration	Connect To
J2	SCSI LED connector	Yellow SCSI LED
J3	IDE Hard Drive connector	IDE hard drive
J4	System Fan connector	System fan
J5	Cache Card Slot	Cache Card
J6	Speaker connector	Speaker
J8	Primary CPU Fan connector	Fan
J9	Secondary CPU Fan connector	Fan
J10	Power LED connector	Pins 1-3
J13	IDE Hard Drive connector	IDE hard drive
J19	Parallel Port connector	Parallel device
J20	Diskette Drive connector	Diskette drive
J21	Serial Port COM 'B' connector	Serial device
J24	Serial Port COM 'A' connector	Serial device
J28	SCSI Standard connector	SCSI device
J35	SCSI Fast/Wide internal connector	Internal SCSI Fast/Wide device
J38	Power supply connector	P1 and P2
J39	SCSI Fast/Wide external connector	External SCSI Fast/Wide
J40	Video connector	Video
J41	Keyboard connector	Keyboard
J42	Mouse connector	Mouse

System Board Jumpers

Jumpers	Description	Setting
J12	Spare Jumper	Parked = Pin 1 only Default
J15	Password Write	Disabled = Pins 1-2 Enabled = Pins 2-3 Default
J16	C2 Cover Open	
J17	C2 Key Lock	
J25	Reset switch	
J26	SCSI Select	System Board = Pins 1-2 Default Adapter = Pins 2-3
J27	Video Select	System Board = Pins 1-2 Default Adapter = 2-3
J43	Clock Select	60MHz = Pins 1-2 50Mhz = Pins 2-3

Symptom-to-FRU Index

This index supports Type 8641 computers.

Always start with "General Checkout (QAPlus/PRO)" on page 4.

The Symptom-to-FRU Index (QAPlus/PRO) Supplement lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this Symptom-to-FRU Index and the Symptom-to-FRU Index (QAPlus/PRO) in the PS/2 Hardware Maintenance Manual to help you decide which FRUs to have available when servicing the computer.

In the following error codes and model numbers, *X* can be any number or letter.

Where the model number is used to identify an error, *XX* used in place of the last 2 digits can be any number or letter.

> **Note**
>
> For IBM devices not supported by the QAPlus/PRO diagnostics code, refer to the manual for that device.

For information on:	Go to:
Additional service help. (For example, voltage checks, 0S/2 Trap errors, or processor board errors)	"Related Service Information" on page 107 in the PS/2 Hardware Maintenance Manual.
Possible software and hardware mismatch problems. (Not repairable by replacing FRUs)	"Software/Hardware Mismatch Problems" on page 181 in the PS/2 Hardware Maintenance Manual.
Memory Configuration Problems	"Memory" on page 260. "Resolving Memory-Address Conflicts" on page 408 in the PS/2 Hardware Maintenance Manual.
Replacing the system board does not correct the problem.	See "System Board Replacement (Type 8641)" on page 290.

Error Code/Symptom	FRU/Action
101, 102 (System and microprocessor error)	1. **System Board**
0103 (System Timer error)	1. **System Board**
106 (System and microprocessor error)	1. **System Board**

Error Code/Symptom	FRU/Action
0110 (Parity Check 1 XXXX, run Setup)	1. **Memory SIMM** 2. System Board
111 (I/O channel check error)	1. **Memory SIMM** 2. System Board
114 (Adapter read-only memory error)	1. **Run Diagnostics** 2. Failing Adapter
0115 (Parity Check 1 XXXX, run Setup)	1. **Memory SIMM** 2. System Board
0120 (Previous boot incomplete, default configuration used)	1. **Run Setup** 2. Battery/CMOS Chip 3. System Board
0130 (Invalid NVRAM media type)	1. **Battery/CMOS Chip** 2. System Board
151 (Real time clock error)	1. **Run Diagnostics** 2. System Board
161 (Real time clock battery error)	1. **Battery**
0162 (Models EXX) (Configuration error for slot XX, run Setup; then, run the EISA Configuration Utility)	1. **Battery/CMOS Chip** 2. System Board
162 (Type 8641 Models MXX) (Configuration error)	1. **Run Configuration/Setup**
0163 (Models EXX) (Real-Time Clock error)	1. **Battery/CMOS Chip** 2. System Board
163 (Type 8641 Models MXX) (Time of day not set)	1. **Run Configuration, set time and date**
164 (Memory configuration changed)	1. **Run Configuration**
165 (Micro Channel adapter configuration changed)	1. **Run Configuration, insert Reference diskette**
0171 (System battery is dead)	1. **Battery/CMOS Chip** 2. System Board
0173 (System CMOS checksum bad)	1. **Run Setup** 2. Battery/CMOS Chip 3. System Board
0174 (Invalid ISA Configuration)	1. **Run Setup** 2. Look for configuration conflicts. 3. Battery/CMOS Chip

Error Code/Symptom	FRU/Action
0175 (Models EXX) (EISA Configuration Error, run the configuration utility)	1. **Run Setup** 2. Run EISA Configuration Utility 3. Battery/CMOS Chip 4. System Board
175 (Type 8641 Models MXX) (Hardware error)	1. **Run Diagnostics** 2. System Board
176 (Computer cover or cable cover was removed without a key being used)	1. **Run Configuration/Setup**
177, 178 (Hardware error)	1. **Run Diagnostics** 2. System Board
184 (Power-on password corrupted)	1. **Run Configuration/Setup**
185 (Drive startup sequence information corrupted)	1. **Run Configuration/Setup**
186 (System board or security hardware error)	1. **Run Configuration/Setup** 2. System Board
189 (An attempt was made to access the computer with an invalid password)	1. **Run Configuration, enter the administrator password**
201 (Memory test error)	1. **Memory SIMM** 2. System Board
0214 (System RAM failed at offset XXXX)	1. **Memory SIMM** 2. System Board
0215 (Failing Bits XXXX)	1. **Memory SIMM** 2. System Board
0216 (Extended RAM failed at offset XXXX)	1. **Memory SIMM** 2. System Board
0221 (Shadow RAM failed at offset)	1. **Memory SIMM** 2. System Board
0254 (System board Cache error, Cache disabled)	1. **System Board Cache** 2. System Board
229 (Cache memory test error. Be sure the cache memory is enabled.)	1. **Cache memory** 2. System Board
0301 (Keyboard or keyboard controller error)	1. **Keyboard** 2. System Board

Error Code/Symptom	FRU/Action
0302 (Keyboard locked)	1. **Unlock the keyboard** 2. Keyboard 3. System Board
0303 (Keyboard Error, stuck key)	1. **Keyboard** 2. System Board
604 (Diskette drive error)	1. **Diskette Drive** 2. Drive Cable 3. System Board
0610 (Incorrect drive A type)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
0612 (Incorrect drive B type)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
0632 (Diskette drive A error)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
0642 (Diskette drive B error)	1. **Run Setup** 2. Diskette Drive 3. System Board 4. Diskette Drive Cable
662 (Diskette drive configuration error)	1. **Run Configuration/Setup**
762 (Processor configuration error)	1. **Run Configuration/Setup** 2. Run Diagnostics
962 (Parallel port error)	1. **Disconnect external cable on parallel port.** 2. Internal Cable 3. System Board
1162 (System-board serial port 1 or 2 error)	1. **Disconnect external cable on serial port.** 2. Run Configuration
1300 (Operating system not found)	1. **Run Setup with known good diskette** 2. Fixed Disk Drive 3. Fixed Disk Adapter 4. Diskette Drive 5. System Board
1701 (Fixed Disk X failed)	1. **Run Setup** 2. Fixed Disk Drive 3. Fixed Disk Adapter 4. System Board
1702 (Fixed Disk Drive Controller failed)	1. **Run Setup** 2. Fixed Disk Adapter 3. Fixed Disk Drive 4. System Board

Error Code/Symptom	FRU/Action
1801 (No room for PCI option ROM)	1. **Run Reference Diskette** 2. Failing Adapter 3. System Board
1802 (No more I/O space available for PCI adapter)	1. **Run Reference Diskette** 2. Failing Card 3. System Board
1803 (No more memory (above 1MB for PCI adapter)	1. **Run Reference Diskette** 2. Failing Card 3. System Board
1804 (No more memory (below 1MB for PCI adapter)	1. **Run Reference Diskette** 2. Failing Card 3. System Board
1805 (PCI option ROM checksum error)	1. **Remove Failing PCI Card** 2. System Board
1962 (No valid boot device found, be sure the drive you want to start from is the boot sequence)	1. **Run Configuration/Setup** 2. Run Diagnostics 3. Drive Cable 4. Hard Disk Drive 5. System Board
2401 (Monitor type does not match CMOS)	1. **Run Setup and enter correct monitor type** 2. Video Display 3. Video Adapter 4. System Board
2462 (Video controller error)	1. **Display** 2. System Board
000**247**100 **(Type 8641)** L2 processor cache was disabled, do the following • Boot the system diagnostics. • Run the processor tests. • When asked if you want to turn on the processor cache, reply, "yes," and the error will be cleared.	1. **N/A**
I9990301 (Fixed boot sector error, no operating system installed)	1. **Install operating system to hard disk drive.**
8601, 8603 (Pointing Device Error)	1. **Pointing Device** 2. System Board

Checkpoint Codes

During POST, the computer displays the status of the components being tested in the form of Checkpoint (CP) codes in the lower left-hand corner of the screen. The following is a list of the CP codes followed by the routine in process and the boot mode.

CP Code	Routine	Boot Mode
01	Its_A_Reset	Cold+Warm+Restore+Mfg+SAD
0D	Init Chip_NS	Cold+Warm+Restore+Mfg+SAD
12	Periph Init	Cold+Warm+Restore+Mfg+SAD
03	Disable Video	Cold+Warm+Restore+Mfg+SAD
05	Phase 1 Enter Big Real	Cold+Warm+Restore+Mfg+SAD
B0	Enable Local APIC	Cold+Warm+Restore+Mfg+SAD
06	Cache Init	Cold+Warm+Restore+Mfg+SAD
07	Init Refresh	Cold+Restore+Mfg
08	Wait For RTC	Cold+Restore+Mfg
0A	Std CMOS Checksum NS	Cold+Warm+Restore+Mfg
0B	Mid CMOS Checksum NS	Cold+Warm+Restore+Mfg
0C	Ext CMOS Checksum NS	Cold+Warm+Restore+Mfg
0E	C SET_INIT	Cold+Warm+Restore+Mfg+SAD
10	Check Parity NonParity	Cold+Warm+Restore+Mfg
11	Disable Parity	Cold+Warm+Restore+Mfg+SAD
B1	Init Seattle	Cold+Restore+Mfg+SAD
13	Test CPU Regs	Cold+Restore+Mfg
14	Init RTC	Cold+Warm+Restore+Mfg+SAD
16	Init Timer 0	Cold+Warm+Restore+Mfg+SAD
17	Init Timer 2	Cold+Warm+Restore+Mfg+SAD
18	Test DMA	Cold+Warm+Restore+Mfg+SAD
19	Test Page Regs	Cold+Warm+Restore+Mfg+SAD
1A	Verify Refresh	Cold+Restore+Mfg
1B	Enable Parity	Cold+Warm+Restore+Mfg+SAD
1C	Save ID Warm	SAD
1D	Test First 64k	Cold+Restore+Mfg
1E	Clear First 64k	Cold+Warm+Restore+Mfg
1F	POST with Stack	Cold+Warm+Restore+Mfg+SAD
20	Enable BIOSE000	SAD
21	BIOS Shadow	Cold+Warm+Restore+Mfg
B2	Shadow SCSI	Cold+Warm+Restore+Mfg
23	Phase 2 POST	Cold+Warm+Restore+Mfg+SAD
24	Enable BIOS F000	SAD
24	Shadow VPD	Cold+Warm+Restore+Mfg

CP Code	Routine	Boot Mode
25	Init Key Board Data	Cold+Warm+Restore+Mfg+SAD
26	Save ID	Cold+Warm+Restore+Mfg+SAD
B3	Check P54C	Cold+Mfg
27	Init Q Boot	Cold+Warm+Restore+Mfg
28	Periph Config	Cold+Warm+Restore+Mfg+SAD
2A	Init Timeout Tables	Cold+Warm+Restore+Mfg+SAD
2B	Pos_Setup	Cold+Warm+Restore+Mfg
2F	Test DMA Locations	Cold+Warm+Restore+Mfg+SAD
B4	Init DMA Regs	Cold+Warm+Restore+Mfg+SAD
30	Test PICs	Cold+Warm+Restore+Mfg+SAD
31	Init Vector Table	Cold+Warm+Restore+Mfg+SAD
32	Enable Timer Int	Cold+Warm+Restore+Mfg+SAD
33	Init Keyboard	Cold+Warm+Restore+Mfg+SAD
34	Clear Memory Size Error	Cold+Restore+Mfg
35	Check Configuration	Cold+Warm+Restore+Mfg
36	Mfg Boot Fork	Cold+Restore+Mfg
37	PCI Reset	Cold+Warm+Restore+Mfg
B5	NVRAM check	Cold+Warm+Restore+Mfg
38	PCI Video	Cold+Warm+Restore+Mfg
3B	Sign On	Cold+Warm+Restore+Mfg
3C	Test Timer Tick	Cold+Restore+Mfg
3F	Enable Video	SAD
40	CSET BFR SIZMEM	Cold+Warm+Restore+Mfg+SAD
41	Size Memory Above 64k	Cold+Warm+Restore+Mfg
42	CSET AFT SIZ MEM	Cold+Warm+Restore+Mfg
43	Test Timer 2	Cold+Warm+Restore+Mfg
44	Password Not Entered	Cold+Restore
45	Test PS/2 Mouse	Cold+Warm+Restore+Mfg
46	Check For Mouse Buttons	Cold+Restore
47	Init Key Board Flags	Cold+Warm+Restore+Mfg+SAD
48	Test Key Board	Cold+Warm+Restore
4B	Memory Test Prompt	Cold+Warm+Mfg
4C	Test Memory	Cold+Restore+Mfg
4D	Clear EBDA	Warm
4E	CSET AFT M TEST	Cold+Warm+Restore+Mfg
4F	Allocate EBDA	Cold+Warm+Restore+Mfg
B6	Set Planar Info	Cold+Restore+

CP Code	Routine	Boot Mode
50	xfer ebda vars	Cold+Warm+Restore+Mfg
B7	Init P54M	Cold+Warm+Restore+Mfg
B8	Init MP Structures	Cold+Warm+Restore+Mfg
B9	CPU Speed	Cold+Warm+Restore+Mfg+SAD
51	Set Warm Boot Flag	Warm
52	Clear Speed Bits	Cold+Warm+Mfg+SAD
53	E FLOB	Cold+Warm+Restore+Mfg+SAD
54	Enable System Interrupts	Cold+Warm+Restore+Mfg+SAD
55	C2 Security Check	Restore
56	Init Key Board	Cold+Warm+Restore+SAD
57	Test RTC	Cold+Warm+Restore+SAD
58	Check For NPX	Cold+Warm+Restore+Mfg+SAD
59	reset hdctl	Cold+Warm+Restore+Mfg+SAD
5A	FD INIT	Cold+Warm+Restore+Mfg+SAD
5B	Set Floppy Config	Cold+Warm+Restore+Mfg+SAD
BA	Unlock Early	Cold+Restore
5C	Init A20	Cold+Warm+Restore+Mfg+SAD
5D	Cache Config	Cold+Warm+Restore+Mfg+SAD
5E	HD SETUP	Cold+Warm+Restore+Mfg+SAD
62	Verify CMOS Config	Cold+Warm+Restore+Mfg
70	Check For Setup Hot Key	Cold+Warm
63	Clear Screen	Cold+Warm+Restore+SAD
BB	Init IRQ Levels	Cold+Restore
65	IBM Cirrus DDC	Cold
BC	PACP Arbitration	Cold+Warm+Restore+Mfg+SAD
BD	Enable Planar SCSI	Cold+Warm+Restore+Mfg+SAD
66	CSET BFR OPROM	Cold+Warm+Restore+Mfg
BE	Do ROM Scan	Cold+Warm+Restore
2C	TCPC	Cold+Warm+Restore+Mfg
49	TCPC Errors	Cold+Warm+Restore
2D	Find Serial Ports	Cold+Warm+Restore+Mfg
2E	Find Parallel Ports	Cold+Warm+Restore+Mfg
68	CSET AFT OPROM	Cold+Warm+Restore+Mfg
BF	Get MC Data	Cold+Warm+Restore
69	PCI Configure	Cold+Warm+Restore+Mfg
6A	MFG Hook 65	MFG
6B	Init Time Of Day	Cold+Warm+Restore+Mfg+SAD

CP Code	Routine	Boot Mode
6C	Check For Locked Key Board	Cold+Warm+Restore+SAD
6D	Init Enable NMI	Cold+Warm+Restore+Mfg+SAD
6E	Set Boot Speed	Cold+Warm+Restore+Mfg
6F	Set Key Board LEDs	Cold+Warm+SAD
71	Init Flush Key Board	Cold+Warm+Restore+SAD
72	Move Error Log To EBDA	Cold+Warm+Restore+Mfg
73	Init Disable Mouse	Cold+Warm+Restore+Mfg+SAD
74	Sys Reset	MFG
75	Phase 2 Exit Big Real	Cold+Warm+Restore+Mfg+SAD
76	BOOT STRAP 1	Cold+Warm+MFG+SAD
78	SAD BOOT PROC	SAD
79	Start Boot Sequence	N/A
7A	Read Boot Sector	N.A
7B	Boot Sector Read Complete	N.A
7C	Check for CE Boot Override	N.A
7F	Xfer to boot code	N.A

The following codes also produce a series of beeps. The series of beeps are listed for each code followed by an explanation of the code.

CP Code	Beeps	Definition
82	1-1-3	CMOS write/read failure
83	1-1-4	BIOS ROM checksum failure
84	1-2-1	Programmable Interval Timer test failure
85	1-2-2	DMA initialization failure
86	1-2-3	DMA page register write/read test failure
87	1-2-4	RAM refresh verification failure
88	1-3-1	1st 64K RAM test failure
89	1-3-2	1st 64K RAM parity test failure
90	2-1-1	Slave DMA register test in-progress or failure
91	2-1-2	Master DMA register test in-progress or failure
92	2-1-3	Master interrupt mask register test failure
93	2-1-4	Slave interrupt mask register test failure
95	2-2-2	Key-board controller test failure

CP Code	Beeps	Definition
99	2-3-2	Screen memory test in-progress or failure
9A	2-3-3	Screen retrace tests in-progress or failure
9B	N/A	Search for video ROM in-progress
9C	N/A	Screen believed operable - mode in low two bits
9D	N/A	Screen believed operable - mode in low two bits
9E	N/A	Screen believed operable - mode in low two bits
9F	N/A	Screen believed operable - mode in low two bits
A0	3-1-1	Timer tick interrupt test failure
A1	3-1-2	Interval timer channel 2 test failure
A3	3-1-4	Time-Of-Day clock test failure
A7	3-2-4	Comparing CMOS memory size against actual
A8	3-3-1	Memory size mismatch occurred
D0	N/A	Cache State
D1	N/A	Cache Init
D2	N/A	Cache Restore
D3	N/A	Cache Config
D4	N/A	Cache Flush
D5	N/A	Cache Enable
D6	N/A	Cache Disable
D7	N/A	Cache Custom
e1h	N/A	CSET BFR VIDROM
e5h	N/A	CSET AFT CMCFG

Parts Listings
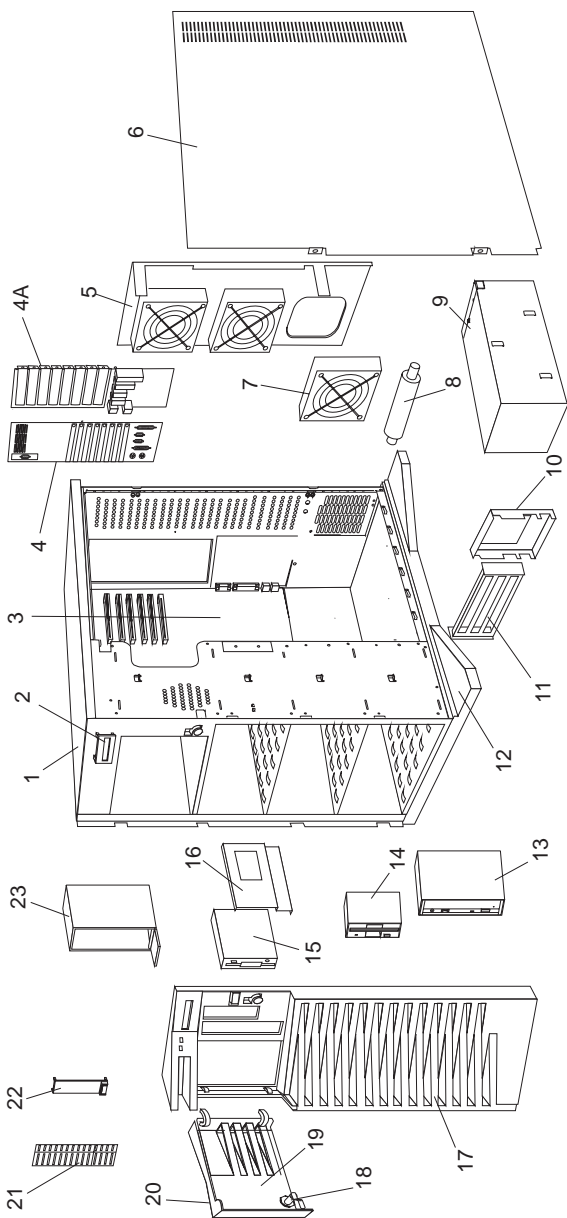
System

> **Note**
>
> The model(s) listed for the following FRUs indicates
> FRUs that the models may contain at the time of
> shipping. However, other FRUs are supported in each
> model as options.

Index System Unit (PC Server 520 - Type 8641)

Index	Description	FRU
1	Base Frame	06H8028
2	LED Panel Assembly	06H8031
3	System Board with 512K Cache, without SVGA, SCSI (Models ED1, EDE, EDL, EZ1, EZS, EZE, EZL, ED0, EDV, EZ0, EZV)	06H9989
3	System Board with SVGA & SCSI, without Cache (Models MDE, MDL, MZS, MZE, MZL, MD0, MDV, MZO, MZV)	96G2648
4	Die Cast Assembly (Models ED1, EDE, EDL, EZ1, EZS, EZE, EZL, ED0, EDV, EZ0, EZV)	06H9360
4A	Die Cast Assembly (Models MDE, MDL, MZS, MZE, MZL, MD0, MDV, MZO, MZV)	06H9361
5	Fan Mounting Support	82G3618
6	Right Side Door	82G3594
7	3-Fan Assembly	06H3407
8	Pedestal Wheel with Axle	82G3609
9	434W Power Supply Assembly	06H3596
10	8-Card Guide	06H8057
11	4-Card Guide Support (Models MDE, MDL, MZS, MZE, MZL, MD0, MDV, MZO, MZV)	82G3603
12	Pedestal	82G3608
13	CD-ROM Drive, see DASD (PC Server 520 - Type 8641)	
14	Diskette Drive see DASD (PC Server 520 - Type 8641)	
15	Hard Disk Drive, see DASD (PC Server 520 - Type 8641)	
16	DASD Tray Assembly - Hot Swap with Cable (Models ED1, EDE, EDL, ED0, EDV, MDE, MDL, MD0, MDV)	06H8631
16	DASD Tray Assembly - Hot Swap Wide (Models EZ1, EZS, EZE, EZL, EZ0, EZV, MZS, MZE, MZL, MZO, MZV)	06H3956
17	Front Bezel with Shield	06H8973
18	Keylock with Key	82G3606
19	DASD Door	82G3596
20	IBM Logo (restricted)	82G3601
21	5.25-Inch Hard Disk Drive Bezels with Spacer	06H8684
22	Control Panel Bezel	06H3595
23	CD Storage Tray	06H5060

Index	System Unit (PC Server 520 - Type 8641 continued)	
	16/8 Bit SCSI Converter	92F0324
	512K Cache (Models MDE, MDL, MZS, MZE, MZL, MD0, MDV, MZO, MZV)	96G2413
	16MB EOS Memory SIMM (Models ED1, EDE, EDL, EZ1, EZS, EZE, EZL, ED0, EDV, EZ0, EZV)	11H0634
	16MB EOS Memory SIMM (Models MDE, MDL, MZS, MZE, MZL, MD0, MDV, MZO, MZV)	11H0646
	DASD Hot Swap Backplane Assembly (Models ED1, EDE, EDL, ED0, EDV, MDE, MDL, MD0, MDV)	06H8629
	DASD Hot Swap Backplane Assembly Models EZ1, EZS, EZE, EZL, EZ0, EZV, MZS, MZE, MZL, MZO, MZV)	06H8388
	DASD Mounting Plate	82G3602
	Ethernet PCI Card (Models EDL, EZL, MDL, MZL)	82G3602
	Hinges (2 each)	82G3600
	Hot Swap Cam Spring, Shaft & Knob	06H5059
	Keyboard with Cable, see "Keyboards (101/102 Key)" on page 323	
	LED/Speaker, Power Switch Cable Assembly	06H8037
	Memory High Rise Card (Models MDE, MDL, MD0, MDV)	96G3692
	Memory High Rise Card (Models MZS, MZE, MZL, MZ0, MZV)	96G1339
	Miscellaneous Parts Kit	82G3611
	• C2 Spring	
	• EMI Ground Clips (4 each)	
	• Lock Pawl	
	• Screws (4 each)	
	• System Board Mounting Boss (2 each)	
	Mouse	06H4595
	P54C 66/100MHz Processor Chip with Heat Sink (Models EZ1, EZS, EZE, EZL, EZ0, EZV)	75H8846
	P54C 66/100MHz Processor Chip with Heat Sink (Models MZS, MZE, MZL, MZO, MZV)	96G2415
	P54C 66/133MHz Processor Chip with Heat Sink (Models ED1, EDE, EDL, ED0, EDV)	96G2423
	P54C 66/133MHz Processor Chip Models MDE, MDL, MD0, MDV)	06H9492
	Power Supply Adapter Board	06H8977
	SCSI-2 Hard File Card (Models ED1, EDE, EDL)	06H5078
	SCSI-2 RAID PCI Card (Models EZ1, EZS, EZE, EZL)	06H5078
	SCSI Fast/Wide Card (Models ED0, EDV, EZ0, EZV)	06H8574
	Speaker with Bracket	33F8444
	SVGA Card (Models ED1, EDE, EDL, ED0, EDV)	06H9114
	SVGA Card (Models EZ1, EZS, EZE, EZL, EZ0, EZV)	71G0031

Cables (PC Server 520 - Type 8641)

Index	Cables (PC Server 520 - Type 8641)	
1	System Status Cable (1X4)	06H3404
2	Diskette Drive Signal Cable	06H9345
	Diskette Drive Power Cable	06H8982
3	SCSI-Fast/Wide Cable (1X)	06H6876
3	SCSI-Fast/Wide Cable (2X)	06H3751
3	SCSI-Fast/Wide Cable (3X)	06H6675
	(Models ED0, EDV, MD0, MDV	
	SCSI-Fast/Wide Cable (3X)	06H6661
	(Models ED1, EDE, EDL, MDE, MDL)	
4	Hard Disk Drive Power Cable (1X)	82G3610
5	SCSI Fast/Wide Flex Cable (1X)	06H6145
	DASD Status Cable	06H9343
	C2 Cable	82G3612
	(Models MDE, MDL, MD0, MDV)	
	C2 Cable	06H8059
	(Models MZS, MZE, MZL, MZ0, MZV)	
	Parallel Data Cable (Models ED1, EDE, EDL, EZ1, EZS, EZE, EZL, ED0, EDV, EZ0, EZV)	06H2166
	POS ID Select Cable (Narrow)	06H3592
	SCSI Fast/Wide ID Select Cable	06H3957
	Serial Data Cable 2x (Models ED1, EDE, EDL, EZ1, EZS, EZE, EZL, ED0, EDV, EZ0, EZV)	06H2165

Keyboards (101/102 Key)

Keyboards (101/102 Key)	
Arabic	1391490
Belgium-Dutch	1391414
Belgium-French	1391526
Bulgarian	1399583
Czech	1399570
Danish	1391407
Dutch	1391511
Finnish	1391411
French	1391402
German	1391403
Greek	1399046
Hebrew	1391408
Hungarian	1399581
Iceland	1391495
Italy	1393395
Latvia	1391406
Norwegian	1391409
Polish	1399580
Portuguese	1391410
Romanian	1399582
Russian-Cyrillic	1399579
Serbian-Cyrillic	1399578
Slovak	1399571
Slovenia/Croatia/Bosnia	1393669
South Africa	1396790
Spanish	1391405
Swedish	1391411
Swiss-French	1391412
Swiss-German	1391412
Turkish 179	8125409
Turkish 440	1393286
U.K. English	1391406
U.S. English	06H9743
U.S. English (E/ME/A use only)	1396790

Power Cords

Power Cords	
Arabic	14F0033
Belgium	1339520
Bulgaria	1339520
Czech Republic	1339520
Denmark	13F9997
Finland	1339520
France	1339520
Germany	1339520
Hungary	1339520
Israel	14F0087
Italy	14F0069
Latvia	1339520
Netherlands	1339520
Norway	1339520
Poland	1339520
Portugal	1339520
Serbia	1339520
Slovakia	1339520
South Africa	14F0015
Spain	1339520
Switzerland	1339520
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	1339520

PC Server 720 - Type 8642

Features

In addition to the following features, the Type 8642 Server is shipped with a ServerGuide package that contains a set of ServerGuide Compact Discs (CDs). The easiest and most efficient way to set up the Type 8642 server, install an operating system, and take advantage of the latest software for the network environment is to use the ServerGuide compact discs. See the ServerGuide CD documentation.

Type → Feature ↓	8642-0Z0	8642-1Z0	8642-2ZS	8642-4ZS
Processor	Pentium	Pentium	Pentium	Pentium
Speed	66/100MHz	66/100MHz	66/100MHz	66/100MHz
Processor Qty	1	1	2	4
Memory (60ns ECC)	64MB	64MB	64MB	64MB
Video	SVGA	SVGA	SVGA	SVGA
Hard Disk Drive	Open	Open	2x2 25GB	4x2 25GB
RAID	No	Yes	Yes	Yes
CD-ROM Drive	Yes	Yes	Yes	Yes
Diskette Drive	2.88MB	2.88MB	2.88MB	2.88MB

PC Server 720 computers incorporate additional processor slots on the system board for installing up-to six 66/100MHz Pentium processor cards to support Symmetric Multiprocessors/Multiprocessing (SMP). The SMP capability extends processing performance by allowing tasks to be dispatched to the next available processor rather then being queued until the busy processor has completed its task. The SMP capability also provides a level of high availability in that with some operating systems, such as OS/2 SMP, the system will run in a uni-processor mode if one of the processors should experience a failure. This function will allow the LAN to continue operation so that service can be scheduled at a non-critical time.

Note

The following is a list of minimal requirements for the Type 8642 computer to successfully complete POST:

- Bridge Card (1 each)
- Memory Card 64MB (1 each)
- Processor Card (1 each)

Diagnostic Information

The Server 720 is supported by the following diagnostic information and procedures. Additional information may be required for optional features not originally shipped with the computer.

Important

- "General Checkout (Micro Channel)" on page 19 in the PS/2 Hardware Maintenance Manual.
- "Symptom-to-FRU Index (Micro Channel)" on page 26 in the PS/2 Hardware Maintenance Manual.
- "Related Service Information" on page 107 in the PS/2 Hardware Maintenance Manual.
- "Symptom-to-FRU Index" on page 376.
- "Additional Service Information" on page 330.
- "Self Diagnostics (AHA-2940/2940W Adapters)" on page 543.

The following list contains problems and references for diagnosing a PC Server 720.

Problem	Reference
Adapter LEDs	"LEDs—System Board and Adapter" on page 346.
Adaptec adapter LED stays on.	"LED (AHA-2940/2940W Adapters)" on page 531.
Hot-Swap Tray LED fails to light or blinks continuously	"DASD Tray SCSI IDs/LED (Hot-Swap)" on page 339.
Diagnostic errors	• "Symptom-to-FRU Index" on page 376. • "Symptom-to-FRU Index (Micro Channel)" on page 26 in the PS/2 Hardware Maintenance Manual.
Display problems	• "Micro Channel Error Symptoms/Codes" on page 384. • "Symptom-to-FRU Index (Micro Channel)" in the PS/2 Hardware Maintenance Manual. • "Related Service Information" on page 107 in the PS/2 Hardware Maintenance Manual.
Check point codes	"Corollary Error Codes" on page 376.

Problem	Reference
Memory	"General Checkout (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual*. (Run the memory tests.)
Micro Channel adapter problems/errors	• "Micro Channel Error Symptoms/Codes" on page 384. • "Symptom-to-FRU Index (Micro Channel)" in the *PS/2 Hardware Maintenance Manual*.
Miscellaneous	"General Checkout (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual*.
PCI error	"PCI Error Format and Error Codes/Messages" on page 395.
POST error codes/messages	"Corollary Error Codes" on page 376.
Power supply shuts down, or appears to fail, at power-on.	"Power Supply Shutdowns" on page 358.
Power supply light goes out while the computer is powered-on.	"Corollary Error Codes" on page 376.
Power supply voltages	"Power Supplies" on page 356.
SCSI Fast/Wide Adaptec Adapter (AHA-2940W, FRU No. 06H6431) problems	"Self Diagnostics (AHA-2940/2940W Adapters)" on page 543.
SCSI-2 Fast/Wide RAID Adapter (FRU No. 06H3059) problems	"SCSI/Non-SCSI Error Code Format" on page 388.
System board LEDs	"LEDs—System Board and Adapter" on page 346.
System slows down or boots slowly. See "Undetermined Failing Processor Diagnostics" on page 369.	Check the processors and the system board.

Additional Service Information

The following information is for the PC Server 720 Type 8642.

Administration Monitoring Utilities

Several of the operating systems that your server supports also support (for disk-array models) RAID monitoring programs. The monitoring programs are:

- OS/2 RAID Controller Administration and Monitor
- OS/2 RAID NetFinity/Alert Manager
- OS/2 RAID Controller Administration for NetWare
- IBM RAID Controller Administration for Banyan Vines

These programs include many of the functions contained in the IBM RAID configuration program, but unlike that program, they reside on top of your operating system and do not require you to start the program from a startable diskette or from a startable compact disc. You can start these programs from your active operating system desktop.

Each of these monitoring programs allow you view the RAID configuration, reconfigure the array when replacing a defective drive, and perform tuning tasks such as changing the write policy.

To monitor the drive status with OS/2, Novell NetWare, Microsoft Windows, and Banyan Vines, you must run the administration programs. The RAID controller diskette contains files that must be installed when you use OS/2, NetWare, or Banyan Vines.

See the README file on the RAID controller diskette for installation and usage instructions for OS/2 RAID Controller Administration and Monitor, OS/2 RAID Controller Administration for NetWare, and IBM RAID Controller Administration for Banyan Vines. For OS/2 RAID NetFinity Alert Manager, see the ServerGuide CD documentation.

Advanced Functions

You can select several utilities from the Advanced Functions menu. They include:

- Backup configuration to diskette
- Restore configuration to diskette
- Change the write policy
- Change the RAID parameters
- Format a drive

Backing Up Your Disk-Array Configuration:

The RAID adapter maintains a record of the disk-array configuration information in its EEPROM (electronically erasable programmable read-only memory) module. The disk-array configuration is *vital information.* To protect this information, back up the information to diskette as soon as you have completed your tasks. You need a blank, formatted, 3.5-inch diskette.

To back up the disk-array configuration information to diskette:

1. Label the blank diskette "Disk Array Configuration Backup," and date it.
2. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.
3. Select **Advanced functions** from the Main Menu.
4. Select **Backup config. to diskette**.
5. Remove the RAID controller diskette from the drive and insert the blank diskette.
6. Follow the instructions on the screen.

Restoring the Disk-Array Configuration: To restore the disk-array configuration information in the RAID adapter EEPROM module, use the RAID controller diskette and an up-to-date Disk Array Configuration Backup diskette.

--- **Note** ---

Because dynamic changes in the configuration of your disk array occur due to hot-spare drive replacement or other drive maintenance activity, the configuration backup information on the diskette might be different from that in the adapter. It is important that you back up the disk-array configuration information frequently, to keep the backup information on the diskette current.

To restore the RAID configuration information:

1. Insert the IBM RAID controller diskette into the primary drive and power-on the system. If the system is already on, press **Ctrl**+**Alt**+**Del**.
2. Select **Advanced functions** from the Main Menu.
3. Select **Restore config. from diskette**.
4. Follow the instructions on the screen.

Using the Advanced Functions: This section gives the procedures for using the advanced functions, such as changing the write policy, changing the RAID parameters, and formatting a drive.

Warnings appear throughout this section to alert you to potential loss of data and should be heeded before answering yes to the confirmations requested by the RAID configuration program.

Changing the Write Policy: When you configure a logical drive, the RAID adapter automatically sets the write policy to *write-through* (WT) mode, where the completion status is sent *after* the data is written to the hard disk drive. To improve performance, you can change this write policy to *write-back* (WB) mode, where the completion status is sent *after* the data is copied to cache memory, but *before* the data is actually written to the storage device.

Although you gain performance with write-back mode, it creates a greater risk of losing data due to a power failure. This is because the system gets a completion status message when the data reaches cache memory, but *before* data is actually written to the storage device.

To change the write policy:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.
2. Select **Advanced functions** from the Main Menu.
3. Select **Change write policy** from the Advanced Functions menu. The cursor will be active in the Logical Drive list.
4. Select the logical drive for which you want to change the write policy. The Advanced Functions screen appears.

   --- **Note** ---

   Your information might be different from that shown in this screen.

   The Logical Drive list shows you the logical drive ID, the size in megabytes of each logical drive, the RAID level you assigned to that logical drive, and the date you created it.

   The status of the logical drive is also shown.

   Good   All is well with the drive.
   Critical   Replace the hard disk drive and rebuild the logical drive. (You will have received a message telling you what has happened to the drive.)
   Offline   The logical drive is unrecoverable; the data in that drive is lost.
5. Locate the **Wrt pol** (Write Policy) field in the Logical Drive list.

   The write policy is shown as either **WT** (write-through, which is the default setting) or **WB** (write-back).
6. Use the Up Arrow (↑) key or the Down Arrow (↓) key to select the logical drive for which you want to change the write policy.

   --- **Warning** ---

   If you change the write policy to write-back, wait at least 10 seconds after your last operation before you power-off the server. It takes that long for the system to move the data from the cache memory to the storage device. Failure to follow this practice can result in lost data.

7. Press **Enter** to change the write policy.

   Notice that **WT** changes to **WB**. You can press **Enter** to alternate between **WT** and **WB**.
8. When you have made your choice, press **Esc** to return to the Advanced Functions menu.

9. Select **Exit**. The Confirm pop-up window appears asking you to confirm your action.

10. To return the setting to its original state, select **No**. To save your changes, select **Yes**.

11. Back up the disk-array configuration information to diskette. Refer to "Backing Up Your Disk-Array Configuration" on page 331 for more information.

Formatting Drives: You can perform a low-level format on drives with **RDY** (ready), **OFL** (offline), or **UNF** (unformatted) status.

- **Note**

  The **Format drive** choice on the Advanced Functions menu provides a low-level format. If you install a new hard disk drive that requires a standard format, use the Format command provided by your operating system.

The Format program works like the low-level format program in the advanced diagnostics portion of the system programs. It is provided in the IBM RAID configuration program so that you can perform a low-level format on a drive controlled by the RAID adapter.

To perform a low-level format:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.

2. Select **Advanced functions** from the Main Menu.

   - **Warning**

     A low-level format erases all data and programs from the drive.

3. Select **Format drive**. The low-level format program starts.

4. Follow the instructions on the screen.

   You can perform a low-level format on more than one drive at a time.

Changing the RAID Parameters: You can change the RAID parameters using the advanced functions by selecting **Change RAID parameters**.

The default settings are:

- Stripe unit size — 8K

  The stripe unit size is the amount of data written on a given disk before writing on the next disk. To maximize the overall performance, this stripe unit should be chosen such that the stripe-unit size is close to the size of the system I/O request. The default is set to 8K data bytes.

- Rebuild priority — Equal.

  Rebuild priority can be set to equal, high, or low. When set to equal, the rebuild I/O request and system I/O request get equal priority in the execution order.

  When set to high, the rebuild I/O request will get a higher priority than a system I/O request. In a heavily loaded system (with a high rate of system I/O requests), the high-priority rebuild can significantly reduce the disk rebuild time at the expense of degraded handling of I/O requests.

  When the rebuild priority is set to low, the rebuild I/O requests can execute only if there is no pending system I/O requests. In a moderate to heavily loaded system, low rebuild priority will increase the disk rebuild time significantly and provide better system performance.

  > **Note**
  >
  > Rebuild priority can be changed without affecting data in the logical drives.

- Parity placement — RA.

  > **Warning**
  >
  > Once a parity placement scheme is chosen and data stored, it cannot be changed without destroying data.

  Parity placement defines how parity is placed in the disk array with respect to data. The following illustration shows both the Left Symmetric (LS) and Right Asymmetric (RA) parity placement in a four-drive disk array. Here AAA, BBB, and CCC are the data stripe units, and PP0 is the corresponding parity. Similarly DDD, EEE, and FFF are the data stripe units, and PP1 is the corresponding parity.

```
   Right Asymmetric (RA)      Left Symmetric (LS)

  Disk  Disk  Disk  Disk     Disk  Disk  Disk  Disk
   1     2     3     4        1     2     3     4
  PP0   AAA   BBB   CCC      AAA   BBB   CCC   PP0
  DDD   PP1   EEE   FFF      EEE   FFF   PP1   DDD
  GGG   HHH   PP2   III      III   PP2   GGG   HHH
  JJJ   KKK   LLL   PP3      PP3   JJJ   KKK   LLL
```

In some situations you may want to try LS parity placement to improve performance. The default parity placement is RA.

- Read ahead — On.

  Normally the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter transfers data from disk to its local cache in steps of stripe-unit size. This provides excellent overall performance when workloads tend to be sequential. However, if the workload is random and system I/O requests are smaller than stripe-unit size, reading ahead to the end of the stripe unit will result in a wasted SCSI bus bandwidth and wasted disk utilization. When read-ahead is set to Off, the size of data transfer from the disk to local cache is equal to the system I/O request size, and no read-ahead to the end of the stripe unit is performed.

Notes

1. The Read-ahead setting can be changed without destroying data in a logical drive.
2. When the configuration is saved on a diskette, the RAID parameters are saved also.

Configuring the Disk Array

The following information applies only to disk array models. Use this information to perform the tasks necessary to configure, add, change, or delete one or more disk arrays.

- If you did not create an IBM RAID controller diskette, see the ServerGuide CD documentation.
- Familiarize yourself with the information contained in this manual and the RAID (redundant array of independent disks) information in the *User's Reference* shipped with the server.
- Verify the disk-array configuration. The disk-array model comes configured as one logical drive.
  - To view the disk-array configuration, go to "Viewing the RAID Configuration" on page 369 and select **View Configuration** from the Main Menu.
  - To create a disk array, go to "Creating a Disk Array" on page 351.
- Back up the disk-array configuration. See "Backing Up Your Disk-Array Configuration" on page 331.

After you configure the disk array, you can complete setup by installing an operating system (from the ServerGuide compact disc that was shipped with the server or from the diskettes that came with the operating system). To install an operating system from the ServerGuide CD, see the ServerGuide CD documentation.

RAID Technology: RAID is the technology of grouping several hard disk drives in a server into an *array* that can be defined as a single logical drive. This *logical* drive then appears to the operating system as a single *physical* drive. This grouping technique greatly enhances logical-drive capacity and performance. In addition, if one of the hard disk drives fails (becomes defective), the server continues to run (with no operator intervention required) at reduced performance. The defective drive can be replaced without powering off the server (*hot-swap*). For more information about hot-swappable hard disk drives, see "Installing Internal Drives (Type 8642)" on page 345.

Hard Disk Drive Capacities: With a server, it is important to understand the implications of hard disk drive capacities and how they influence the way you create disk arrays.

Drives in the disk array can be of different capacities. For example, if the model came with two 1GB hard disk drives and you install a 2GB hard disk drive to create a RAID 5 disk array, the total capacity of the array is 3GB instead of 4GB. Therefore, when creating arrays it is wise to add drives of equal capacity.

Additional Storage Capacity: When you add hard disk drives to the server, you must configure a new disk array before the drives can be used. You can either reconfigure the existing disk array to include the capacity offered with the added drives, or group the added drives into their own array (see "Adding Drives to Create an Additional Array" on page 352). You also can create an array with only one drive.

The RAID Configuration Program Screens:

When you configure the disk array, or even just view its configuration, you will be using the IBM RAID configuration program on the IBM SCSI-2 Fast/Wide Streaming-RAID Adapter/A Option Diskette (also called the IBM RAID controller diskette). The following figure is a compilation of many of the IBM RAID Controller Disk Array Configuration (also called the IBM RAID configuration program) screens. The list below the figure gives explanations of the numbered areas of the figure.

1. This pop-up allows you to select the RAID level you want to assign to the logical drive you are defining, and it allows you to select the logical drive size. You can enter the size, in megabytes, or you can accept the default value shown.

   When you need to confirm an action, the Confirm pop-up appears in this area.
2. You can select any of the choices that appear on the menus.

3. The Bay/Array selection list shows each bay in the server (for each channel) numbered 1 through 7. The abbreviation in the bay indicates the status of the drive installed in the bay. Selections are made from this list to determine which bays (hard disk drives) are in the arrays. The letter to the right of the bay, identifies the array in which the hard disk drive in that bay is grouped.

> **Note**
>
> The Channel/Bay/Array area on the screen does not reflect the physical configuration of the server. The hard disk drives are installed in horizontal banks of bays (in banks C, D, and E there are 6 bays, numbered 1 through 6 from left to right). See "Installing Internal Drives (Type 8642)" on page 345 to see the physical location of the hard disk drives.

4. The Array list shows you the array ID and the size (in megabytes) of the array.

> **Note**
>
> The capacity (size) is shown in binary equivalent.

When a drive is being rebuilt, this area, along with the Logical Drive list area, shows the progression of the rebuilding process.

5. The Logical Drive list identifies the logical drive (for example, A1), the size of the logical drive, the RAID level assigned to the logical drive, the date it was created, and the write policy.

The status of the logical drive also is shown.

Good   All is well with the drive.

Critical   You must replace the drive or do a rebuild operation. (You will have received a message telling you the drive is in a **Critical** state.)

Offline   The logical drive is unrecoverable; the data in that drive is lost.

When a drive is being rebuilt, this area, along with the Array list area, shows the progression of the rebuilding process.

> **Note**
>
> The capacity (size) is shown in binary equivalent.

During an initialization process, the Write Policy area displays the percent initialized; during a synchronization process, it displays the percent synchronized.

6. The information area tells you the action you can perform on this screen or pop-up.

DASD Tray SCSI IDs/LED (Hot-Swap)

The SCSI IDs for DASD installed in the DASD Hot-Swap Tray Assembly (FRU number 06H3956) are set by the automatic configuration program for the computer.

When a drive is initialized, the LED (mounted on the back of the tray in which the drive is installed) should blink a few times and then stay on. Continuous blinking or failure of the LED to stay on might be caused by one of the following.

Note

Always run the diagnostic programs for the computer you are servicing before replacing a FRU.

- The tray is not seated properly
- The computer is not configured properly
- The tray, backplane, or drive is defective

Drive Maintenance

The following section provides information about status indicators for logical and hard disk drives, and the results of a hard disk drive failure. It also contains procedures for replacing defective drives and for redefining the space in an array by replacing logical drives.

Obtaining Drive Status: To see the ID, capacity, and other information about each of the hard disk drives attached to the RAID adapter:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.
2. Select **Drive information**.
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight each of the drives shown in the Bay/Array selection list. As a drive is highlighted, the information for that drive is shown at the bottom of the screen.
4. Press **Esc** to return to the Main Menu.

--- **Note** ---

The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.

Bay/Array Selection List: The status of the drives in the Bay/Array selection list is defined as follows:

Status	Meaning
CDR	CD-ROM drive installed.
DDD	Disk Drive Defunct. The drive is an online or hot-spare drive that does not respond to commands. If a **RDY** drive is defective or powered down, it shows an empty bay (a blank status), not a **DDD** status.
FMT	Format. The drive is being reformatted.
HSP	Hot spare. The drive will replace a similar drive that becomes defective in real time. At that time, its status changes to **ONL**, and its array association is displayed.
OFL	Offline. The drive is a good drive that has replaced a defective drive in a RAID level 1 or level 5 array. It is associated with an array, but does not contain any valid data. The drive state remains OFL during the rebuild phase.

Status	Meaning
ONL	Online. The drive is part of an array. If this drive fails, logical drives defined in the array in which this drive is grouped will have a status of offline (if the logical drive is assigned RAID level 0 with a good status) or Critical (if the logical drive is assigned RAID level 1 or level 5 with a good status).
RDY	Ready. The drive is recognized by the adapter and is available for definition.
TAP	Tape drive installed.
UFM	Unformatted. The drive requires a low-level format before it can be used in an array.
Blank Status	Any of the following circumstances can cause the status area to be blank: • No hard disk drive is installed in that bay. • The bay contains a hard disk drive, but the drive is not inserted correctly. • An array was deleted and a defective drive is still in the bay. • A new drive was installed and the configuration program has not been restarted. (The status will change to **RDY** when the RAID configuration program is restarted.)

Results of a Hard Disk Drive Failure:

Depending on the circumstances, there can be several possible results from a drive failure.

Example 1:

- Only one hard disk drive fails.
- A hot-spare drive is defined that is the same or greater size than the failed drive.
- The logical drives in the array are assigned RAID level 1, level 5, or a combination of these two levels.

Then the hot spare will take over immediately.

- **Note**

Data for logical drives assigned RAID levels 1 and 5 is maintained; however, system performance will be reduced. Hot-spare drive capability does not apply to logical drives assigned RAID level 0.

Example 2:

- Only one hard disk drive fails.
- A hot-spare drive is not defined.
- The logical drives in the array are assigned RAID levels 1, 5, or a combination of these two levels.

Then no data will be lost, but the system will operate at reduced performance until the defective drive is replaced and rebuilt.

Example 3:

If more than one drive fails, all data is lost. Therefore, it is important that you replace and rebuild a defective drive as soon as possible.

Logical and Hard Disk Drive Status

Indications: The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.

- A single hard disk drive failure (indicated by a **DDD** status in the Bay/Array selection list) causes logical drives in that array that are assigned levels 1 and 5 to have a **Critical** status. Data remains in logical drives with a **Critical** status, but you must replace the one defective hard disk drive promptly, because if two hard disk drives were to fail, all of the data in the array would be lost.

  After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **OFL** if there is a **Critical** logical drive. After the Rebuild process, the hard disk drive status changes from **OFL** to **ONL**.

- A single or multiple hard disk drive failure causes logical drives in that array that are assigned level 0 to have an offline status. Data in logical drives with an offline status is lost. However, with a *multiple* disk drive failure, when the defective drives are part of the same array, logical drives in that array will have an offline status. This means that data is lost in all the logical drives in that array, regardless of which RAID level is assigned.

Replacing a Faulty Drive

Note

The hard disk drive indicator light will blink when the drive has failed and needs to be replaced (DDD state only).

To replace a faulty drive:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.

   If the drive failed while the system was powered down, a screen appears the next time the system is powered on showing you which drive is defective.

2. If the drive is not damaged (for example, it is not inserted correctly):
   a. Power-off the system.

b. Correct the problem.

c. Remove the diskette from the drive.

d. Restart the system.

3. If the drive is defective:

   a. Press **Y** (Yes) to reconfigure the system.

   b. Press **Ctrl**+**Alt**+**Del** when instructed to restart the system. The Main Menu appears.

   c. Select **Rebuild device**.

      At this point, the drive status shows **DDD**.

      > **Warning**
      >
      > Removing the wrong hard disk drive can cause loss of all data in the array.

   d. Replace the defective drive. Refer to "Removing a Drive from Bank C, D, or E" on page 361.

   e. After you have replaced the drive, press **Enter**. The system will reconfigure to include the drive, and the status of the drive will change to **OFL**.

   f. Allow the system to complete the configuration (the screen displays a completion message); then select **Rebuild drive**.

   g. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **OFL** (offline) drive you want to rebuild; then press **Enter**.

      The progress of the rebuilding process appears on the screen.

   h. When the rebuilding process completes, press **Esc** to return to the Main Menu. The new configuration will be saved automatically.

   i. Back up the new configuration (see "Backing Up Your Disk-Array Configuration" on page 331).

   j. Select **Exit** to end the RAID configuration program.

   k. Remove the diskette and press **Ctrl**+**Alt**+**Del** to restart the system.

Drivers

The RAID adapter requires the installation of device drivers. See the README file on the RAID controller diskette for detailed instructions.

If you install OS/2 from the ServerGuide CD, the device drivers will be installed automatically. If, however, you install OS/2 from diskette, you will need to install the device drivers. See the README file on the RAID controller diskette.

Front Operator Panel

The front panel (front operator panel) incorporates the standard function for System Maintenance Adapter Reporting Trouble (SMART).

This panel consist of the following:

- "Light Emitting Diodes" on page 349.
- A 2-line by 16-character LCD display
- "Menu Buttons and Enter Button."
- "Power Enable Button."
- "Start/Stop Button" on page 345.

Front Panel Buttons: The front operator panel contains seven buttons.
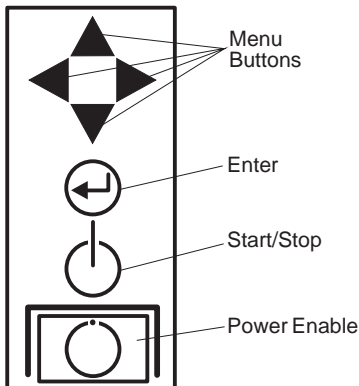
Menu Buttons and Enter Button: These buttons are currently non-functional.

Power Enable Button: The power enable button acts as a logical emergency power-off switch. When pressed (set to off), the computer's power is immediately removed, all automatic and remote power-on functions are disabled, and the computer will not power-on until the power enable button is pressed again.

Note

This power enable button does not remove AC power from the power supply or the service processor logic on the system board. (See also "Starting or Stopping the System" on page 365.)

Start/Stop Button: The start/stop button implements manual power-on/off functions under software control. (See also "Starting or Stopping the System" on page 365.)

Installing Internal Drives (Type 8642)

The Type 8642 server supports the following drive types:

- Diskette
- Hard disk
- Rewritable optical disc
- Tape

The server has hardware that lets you replace a failed hard disk drive without powering-off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are also known as *hot-swappable* drives.

Hot-swappable drives have a green LED that shines through the knob on the tray containing the drive. If the drive has a good electrical connection upon installation, the LED illuminates. The LED blinks briefly during power-up, and also blinks if the drive malfunctions.

Internal drives are installed in *bays*. A diskette drive and a CD-ROM drive are preinstalled in bay A in all models. A removable CD storage compartment is shipped in bay B1. You can install two drives in bay B. You can install hot-swappable hard disk drives in banks C, D, and E only. Banks C, D, and E each contain six bays. Bank C supports up to six drives. However, the total number of SCSI drives that you can install in bay B and bank C is six. The number of preinstalled hard disk drives in bank C varies according to the model you purchased. You can install up to six drives in bank D and up to six drives in bank E.

Note

The bank letter-designations are located on both vertical rails on the front of the server. The bay-slot numbers are located on the top of bank C and the bottom of bank E.

A *cover plate* (sometimes called a *bezel* or *face plate*) covers the front of bay B2 only. If you install a drive that uses removable media (diskette, optical disc, tape), you might install and adjust the cover plate after you install the drive in bay B2.

Considerations

- Bay A comes with one SCSI CD-ROM drive and one 3.5-inch, 2.88MB diskette drive.
- Bay B supports:
  - One 5.25-inch, full-high, removable-media or non-removable-media device, or
  - One 5.25-inch, half-high, removable-media device and one 3.5-inch, half-high, removable-media device, or
  - Two 3.5-inch or two 5.25-inch, slim-high or half-high, removable-media devices.

  Note

  Only one of the devices installed in bay B can be a SCSI device.

- You cannot install hot-swappable drives in bay B.
- Supports eighteen 3.5-inch, slim-high, hot-swappable hard disk drives, or nine 3.5-inch, half-high hard disk drives in the bottom three banks (C, D, and E).

  Banks C, D, and E can accommodate six slim-high drives or three half-high drives, or a combination of both drive sizes. If you use a combination, remember that one half-high drive uses the equivalent space of two slim-high drives.
- If you install drives in bank D or E, you will remove the fan assembly on the rear of the server, install a direct access storage device (DASD) *backplane* in banks D and E, and install an optional 220-watt power supply.
- Each backplane has six connectors, to support up to six hard disk drives.

LEDs—System Board and Adapter

LED(s) are located on the system board, bridge card, processor card, and memory card. The LEDs indicate conditions listed on the following pages.

Component	LED On	LED Off
System Board Slot LEDs:		
• B1 (bridge card slot)	During and after normal initialization of the bridge card	Software problem preventing initialization of the card Defective LED Defective bridge card
• M1 (memory card slot)	During initialization of the memory card	Successful initialization of the memory card complete
• M2/P1 (with memory card installed)	During initialization of the memory card	Successful initialization of the memory card complete
• M2/P1 (with processor card installed)	During initialization and when there is activity on the processor	No activity on the processor Software problem preventing initialization of the card Defective LED Defective processor card
• P2 thru P6 (with processor card installed)	During initialization and when there is activity on the processor	No activity on the processor Software problem preventing initialization of the card Defective LED Defective processor card
• Micro Channel slots	When the computer is powered-on	When the computer is powered-off

Component	LED On	LED Off
Bridge card LED	During and after normal initialization of the bridge card	Software problem preventing initialization of the card Defective LED Defective bridge card
Memory card LED(s)	During initialization of the memory card	Successful initialization of the memory card complete
Processor card LED(s)	During initialization and when there is activity on the processor	No activity on the processor Software problem preventing initialization of the card Defective LED Defective processor card

Light Emitting Diodes/Liquid Crystal Display
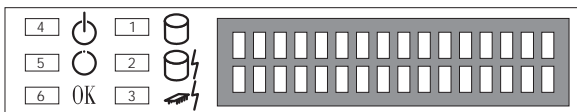
Light Emitting Diodes: The following is a list of the front operator panel light emitting diodes (LEDs) followed by the definition for each LED.

Color Indications

- Green = proper operation
- Yellow = alert condition

LED Number	Definition
1	Hard disk drive activity
2	DASD error
3	Processor Complex Error
4	Color green (POWER GOOD)
5	Color green (POWER Enabled)
6	Color green (All subsystems good)

Liquid Crystal Display: The Liquid Crystal Display (LCD) on the front operator panel contains a 2-line by 16-character LCD (front panel display) driven by the 80C752 microprocessor. The front panel display receives and transmits ASCII characters. The LCD supports the upper- and lower-case ASCII character set.

Errors detected by the computer might be displayed on the LCD and/or on the standard display attached to the computer. This is helpful when a display is not attached to the computer or the attached display is inoperative.

Performing Common Tasks (RAID Configuration)

The Create/Delete Array menu of the RAID configuration program contains the more common tasks for configuring disk arrays. Procedures to complete these tasks are contained in this section as follows:

Defining a Hot-Spare Drive: To define a drive as a hot-spare drive:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.
2. Select **Create/delete array** from the Main Menu. The Create/Delete Array screen appears.
3. Select **Define hot-spare drive**. The cursor will become active in the Bay/Array selection list.

   Note

   Only SCSI hard disk drives are shown as RDY, ONL, DDD, OFL, or HSP state. SCSI tape and CD-ROM drives are not shown. They appear when you select drive information. Refer to "Bay/Array Selection List" on page 340 for the drive status meanings.

   The numbers shown on the left are the bay IDs. See "Installing Internal Drives (Type 8642)" on page 345 for an explanation of the bay IDs.

4. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **RDY** (ready) drive you want to define as the hot spare; then press **Enter.** The **RDY** changes to **HSP** (hot spare). You can press **Enter** again to toggle between **HSP** and **RDY**.
5. Press **Esc** when you have finished. The cursor will become active in the Create/Delete Array menu.
6. If you want to create a disk array, go to "Creating a Disk Array" on page 351.
7. If you are finished:
   a. Select **Exit** or press **Esc**. A pop-up window will appear asking you to confirm your change.

      Note

      The changes you make are not saved until you confirm them by selecting **Yes** in the Confirm pop-up window.

   b. Select **No** if you do not want the drive you selected to be a hot spare; select **Yes** to define it as a hot-spare drive.
   c. Back up the disk-array configuration information to diskette. Refer to "Backing Up Your Disk-Array Configuration" on page 331 for instructions.

Deleting a Disk Array: The last array created must be the first deleted.

Warning

All the data and programs in the array are lost during this procedure. Before proceeding, back up any data and programs that you want to save.

To delete a disk array:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.
2. Select **Create/delete array** from the Main Menu.
3. Select **Delete disk array** from the Create/Delete Array menu. The cursor will be active in the Array list.
4. Review the Date Created column in the Logical Drive list; then press the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the most recently defined array.
5. Press **Del**. The Confirm pop-up window appears.
6. If you do not want to delete the array, select **No**. To delete the array, select **Yes**.

> **Note**
>
> To use hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array.

If a defective drive is still in a bay, the status shows a blank bay, as though there is no drive in that bay. When you replace the drive, the status will show **RDY** after you reconfigure and select **Yes** in the Confirm pop-up window.

> **Note**
>
> In some operating systems, deleting an array and associated logical drives might change the drive letters assigned to the existing drives.

Creating a Disk Array: To create a disk array:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.

   > **Note**
   >
   > To create an array using hard disks in an existing array, refer to "Redefining Space in an Array" on page 359.

2. Select **Create/delete array** from the Main Menu.
3. Select **Create disk array** from the Create/Delete Array menu.

   The cursor will be active in the Bay/Array selection list.

> **Important**
>
> In the following step, when you press Enter to select a drive for an array, you cannot deselect it by pressing Enter again, as you can with the hot-spare selection process. Carefully determine which drives you want to include in the array before beginning the selection process.
>
> If you change your mind after selecting the drives for an array, you can delete the array (by selecting **Delete disk array** from the Create/Delete Array menu) and begin again.

4. Select each drive you want in the array by using the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the drive and then pressing **Enter**. As you select each drive, the status will change from **RDY** (Ready) to **ONL** (Online).
5. When you have selected all the drives you want to include in the array, press **Esc**. The cursor will become active in the menu.
6. If you have drives you did not use in this array and you want to create another array, you can do one of the following:
   - Define the logical drive or drives for this array; then create another array and its logical drives. See "Defining Logical Drives" on page 353.
   - Create another array now by repeating steps 2 through 5 in this procedure; then define logical drives for both arrays.

     > **Note**
     >
     > You must define at least one logical drive for each created array before you can exit the configuration program.

   - Continue with "Defining Logical Drives" on page 353.

Adding Drives to Create an Additional Array:
To add storage capacity to your server without disturbing existing data:

1. Install the additional hard disk drive or drives. (See "Installing Internal Drives (Type 8642)" on page 345.)
2. Start the RAID configuration program. (See "Starting the RAID Configuration Program" on page 366.)
3. Create a new disk array and define logical drives. (See "Creating a Disk Array" on page 351 for additional information.)

Defining Logical Drives: After you have created an array, you must define a logical drive. (You cannot leave the RAID configuration program until you define the logical drives for any created arrays.)

To define a logical drive:

1. Select **Define Logical drive** from the Create/Delete Array menu. The Create/Delete Array menu screen appears; the cursor is active in the Array list.
2. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the array you want to define; then press **Enter**. The Select RAID Level pop-up window appears, and the cursor is active in the window.

    ─── **Note** ───

    The system automatically assigns RAID level 0 to any logical drives defined in an array containing only one hard disk drive. When this is the case, the Select RAID Level pop-up window will not appear.

    If you have only two hard disk drives in the array, the Select RAID Level pop-up window appears, but RAID level 5 is not selectable because you need at least three hard disk drives in an array to assign RAID level 5 to one of the logical drives. You can define more than one logical drive for your array. **The only restriction is that the maximum number of logical drives you can define is eight.**
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the RAID level you want to assign to these logical drives, then press **Enter**.

    ─── **Note** ───

    Because the level you assign can influence the space needed for the drive, you must assign a RAID level before you enter the size of the logical drive.

    The Logical Drive list shows you the logical drive ID, the size of each logical drive, the RAID level you assigned to that logical drive, and the date that the logical drive was created.

    The status of the logical drive also is shown.
Good	All is well with the drive.
Critical	You must replace the hard disk drive or do a rebuild operation. (You will have received a message telling you what has happened to the drive.)
Offline	The logical drive is unrecoverable; the data on that drive is lost.

    The Logical Drive Size pop-up window shows the space in this array that is available for logical drives.

4. Type the size, in megabytes, that you want for the logical drive; then press **Enter**. A pop-up window appears asking you to confirm your action.

   Information about the new logical drive appears in the Logical Drive list.

   ---— **Note** ———

   The size appearing in the Logical Drive list might be different from the size you typed because it appears in binary equivalent.

   The size of a logical drive is determined by a number of factors, but basically the size must be divisible by the number of drives in the array.

   Consider the following examples:

   Example 1:
   There are three 1GB drives in the array. You assign RAID level 0 (which uses all the drives in the array with no parity storage), and type "1000MB." The "Size (MB)" will be 999, which is the number closest to and lower than 1000 that is divisible by 3.

   Example 2:
   There are three 1GB drives in the array, and you assign RAID level 5. Data is striped across all three drives in the array, but the space equivalent to that of one drive is used for redundant storage. Therefore, if you type "1000MB," the "Size (MB)" remains 1000 because it is divisible by 2 (drives), which is the space available for data.

   If you do not use the entire array for this logical drive, you can create another by assigning either the same or a different RAID level for an additional logical drive. You can have as many as eight logical drives among four disk arrays.

5. To return to the Create/Delete Array menu, press **Esc**. To define more logical drives, repeat steps 1 through 5 of this procedure.

6. To leave this screen, select **Exit** or press **Esc**. A pop-up window appears asking you to confirm your action.

7. To save your changes, select **Yes**. To maintain the disk-array configuration that was in place before you made changes, select **No**.

8. If you are using RAID level 1 or RAID level 5, *you must select* **Initialize logical drive** *for proper operation*. This sets the drive to a predetermined state. Any data existing on the drive is overwritten with zeros, and corresponding parity is initialized to the correct value.

   a. Select **Initialize/synchronize array** from the Main Menu; then select **Initialize logical drive**.

b. Select the logical drives you want to initialize from the Logical Drive list by pressing the Spacebar (the selected drives will appear highlighted). To start the initialization, press **Enter**. A pop-up window appears asking you to confirm your action.

> --- **Warning** ---
>
> If you select **Yes** in the Confirm pop-up window, information in the logical drive will be overwritten with zeros.

c. Select **Yes** to confirm that you want to initialize this logical drive.

The initialization process begins, and you can see its progress in the **Pct. Int.** (Percent Initialized) column of the Logical Drive list.

d. To stop the initialization at any time, press **Esc**. Then press **Esc** again to return to the menu, or press **Enter** to continue initializing the drive.

9. To back up the disk-array configuration to diskette, you will need a 3.5-inch formatted diskette. To back up the disk-array configuration:

a. Select **Advanced functions** from the Main Menu.

b. Select **Backup config. to diskette**.

Follow the instructions on the screen. A pop-up window shows the default file name of CONFIG. You can change the file name by typing over the default.

Power Supplies

> **Caution**
>
> Always unplug the power cord and wait two minutes before replacing the power supply to give the power supply capacitors time to discharge.

The Type 8642 computer is shipped with a primary power supply. An additional or optional power supply can be added to the computer. Connectors are used to transfer the primary power supply voltages and signals from the primary power supply to the optional power supply. The following illustrations show how the two power supplies are connected.

> **Caution**
>
> When replacing the primary power supply cover plate, rotate the plate 180°. (This will leave an opening for the primary power supply connector cable that connects to the optional power supply.) Failure to do so will cause the power supply connector cable to be crimped when the plate is replaced.

> **Note**
>
> Tabs are located on the side of each power supply to secure them together.

Power Supply LED and Button: The
power-good LED and button are located on the side of the primary power supply button. The LED (when lit) indicates that the power supply is good. If the LED fails to come on when the computer is powered-on, do the following:

- While observing the LED on the power supply, press the power supply button. If the LED fails to light (while you are holding the button in), you may have a defective power supply. If the LED lights when the button is pressed, go to "Power Supply Shutdowns" on page 358.

Primary Power Supply Voltages: If the voltages are correct and the power supply fan runs, the power supply is OK.

Power-Supply Connector
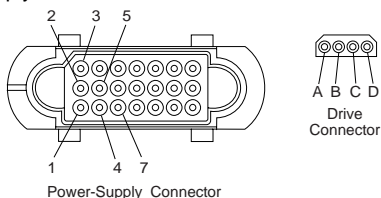
Drive Connector

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
5	3	+4.8	+ 5.25
5	4	+11.5	+12.6
5	7	−10.8	−13.2
B	D	+4.8	+ 5.25
B	A	+11.5	+12.6

Connectors P11, P12, and P13

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2	1	+11.5	+12.6

Optional Power Supply Drive Connector Voltages:
If the voltages are correct and the power supply fan runs, the power supply is OK.
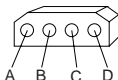
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
B	D	+ 4.8	+ 5.25
B	A	+ 11.5	+12.6

Power Supply Shutdowns: If the power supply shuts down, or *appears* to fail at power-on, you might have one of the following problems:

- Too many devices are set to start instantly. See "Setting the Motor-Start Jumper" on page 549.
- There are too many large-capacity devices installed (such as hard disk drives). The nominal operating current of the devices installed collectively exceeds the available current of the power supply. See the "Personal System/2 Installation Planning" guide (form number G41G-2927) for more information.

Also ensure that the fans operate when the machine is powered on.

 Note

Verify that the voltage-select switch (if applicable) is set for the correct voltage.

If the voltages are correct and the Symptom-to-FRU index does not solve the problem, go to "Undetermined Problems" on page 552.

Redefining Space in an Array

You can redefine space in a disk array in a number of ways. For example, you can combine a number of small logical drives to create a larger one or you can redefine the existing logical drive into several smaller drives. Also, you can install additional hard disk drives to create a larger logical drive than was possible with the existing storage capacity.

One method to redefine space in an array is to change the RAID level assigned to a logical drive. For example, if you assigned RAID level 1 to a logical drive and then decided you needed the capacity offered with RAID level 5, you can use this procedure to replace the existing logical drive with a logical drive assigned the new RAID level.

To redefine the space in a disk array, first you must delete the array. The last disk array defined must be the first deleted.

Warning

In all cases, when you delete an array, all the data and programs in the array are lost.

If you have data and programs that you want to save, they must be backed up and then restored. It is suggested you use a high-speed backup device, such as a tape drive.

To redefine the space in an array:

1. Back up all data and programs in the array.
2. If needed, install additional hard disk drives.

   Refer to the *User's Reference* for information about selecting drive sizes.

3. Insert the IBM RAID controller diskette; then press **Ctrl**+**Alt**+**Del** to start the RAID configuration program.
4. Delete the existing array:
   a. Select **Create/delete array** from the Main Menu. The Create/Delete Array menu will disappear.
   b. Select **Delete disk array**. The cursor will be active in the Bay/Array list.
   c. Review the Logical Drive List Date Created column; then press the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the most recently defined array.

      Note

      You must delete disk arrays in descending order; the last one created must be the first one deleted.

      ---

   d. Press **Del**. The Confirm pop-up window appears.

> **Warning**
>
> All the data in the array will be lost during this procedure. Be sure to back up all data and programs that you want to save.

  e. If you do not want to delete the array, select **No**. To delete the array select, **Yes**.

> **Note**
>
> To use the hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array. After you make your selection, the Confirm pop-up window will disappear, and the cursor will be active in the menu.

5. If you want a drive defined as a hot spare, refer to "Defining a Hot-Spare Drive" on page 350 for step-by-step instructions.
6. Create a new disk array and define logical drives.

   See "Creating a Disk Array" on page 351 for instructions on creating a disk array and defining logical drives.
7. After you have established the new array and logical drive or drives, select **Initialize/synchronize array** from the Main Menu; then select **Initialize logical drive** to prepare the drives in the array to receive data. This sets the drive to a predetermined state. Any data existing in the drive is overwritten with zeros, and corresponding parity is initialized to the proper value.
8. Insert a 3.5-inch formatted diskette in the primary drive, select **Advanced functions** from the Main Menu; then select **Backup config. to diskette**. Follow the instructions on the screen.
9. Exit the RAID configuration program by pressing **Esc** or selecting Exit while on the Main Menu. A pop-up window will appear asking you to confirm your action.
10. Reinstall your operating system and device drivers, then restore your data and programs.

Removing a Drive from Bank C, D, or E

Locate the drive you are removing. You do not have to power-off the server to remove a drive from banks C, D, or E.

Warning

If you are removing a failed hard disk drive that is part of a *disk array* in bank C, D, or E, you must not accidentally remove a good drive. Before you attempt to remove a defective drive, thoroughly review the information displayed on your server's screen to determine the location of the failed drive. "Logical and Hard Disk Drive Status Indications" on page 342 explains the codes that your server uses to indicate a defective drive. When a hard disk drive fails, a blinking green indicator light illuminates on the knob of the drive tray. When a hard disk drive is good, a solid green indicator light illuminates on the knob of the drive tray.

If you partially or completely remove a good drive instead of the defective one, your server might lose valuable data. This situation is especially relevant if you assigned RAID level 1 or 5 to the logical drives in your disk array. However, the RAID controller can rebuild the data you need, provided that certain conditions are met. See "Starting the RAID Configuration Program" on page 366 for more details.

If you have a non-disk-array model, an illuminated drive tray knob means the drive is a good one. An unilluminated drive tray knob means the drive is defective, or no power is being supplied to the drive.

To remove a drive from bank C, D, or E, do the following:

1. Find the drive you plan to remove.
2. If you have a disk-array model and a drive has failed, ensure that you have selected the correct drive for removal by verifying that the light on the tray's knob is blinking.
3. Unlock the drive by turning the knob directly above it 90 degrees.
4. Disconnect the drive from the connector on the backplane, by grasping the handle on the drive tray and pulling the drive out of the server. Store the drive in a safe place.

Note

If you have a disk-array model, you must reconfigure your disk arrays after removing hard disk drives. See "Starting the RAID Configuration Program" on page 366 for details.

Service Processor Requirements

The service processor (SP) follows the following rules for each power-on and -off cycle.

The following functions are complete at power-up. (See also "Starting or Stopping the System" on page 365.)

- Because the SP runs continuously in this version, an internal interrupt is generated each time the Start/Stop button is pressed. This interrupt will set the Power-State bit in the RTC's SRAM and set the PAB bit to zero (0) turning on the power supply.
- At SP power-on, the RTC's Power-State bit is checked to determine if the system should stay powered-on after an AC power failure.

Specifications

Size

- Depth: 755 mm (29.7 in.)
- Height: 622 mm (24.5 in.)
- Width: 353 mm (13.9 in.)
- Depth with cable cover: 807 mm (31.8 in.)

Weight

- Configured with one hard disk drive: 31.3 kg (69 lb)

Environment

- Air temperature
    - System on: 10° to 35° C (50° to 95° F)
      Altitude: 0 to 914 mm (3000 ft.)
    - System on: 10° to 32° C (50° to 90° F)
      Altitude: 914m (3000 ft.) to 2133 m (7000 ft.)
    - System off: 10° to 43° C (50° 110° F)
      Maximum Altitude: 2133 m (7000 ft.)
    - Storage: 1° to 60° C (34° to 140° F)
- Humidity
    - System on: 8% to 80%
    - System off: 8% to 80%
- Maximum altitude: 2133 m (7000 ft.)

Heat Output

- Approximate heat output in British Thermal Units
  (BTU) per hour
    - Minimum configuration: 155 BTU (44 watts)
    - Maximum configuration: 3.600 BTU (1055 watts)

Electrical Input

- Sine-wave input (50 to 60 Hz is required
- Input voltage
    - Low range
        - Minimum: 90 V ac
        - Maximum: 137 V ac
    - High range
        - Minimum: 180 V ac
        - Maximum: 265 V ac
    - Input kilovolt-amperes (kVA) approximately
        - Minimum configuration as shipped: 0.16
          kVA
        - Maximum configuration: 1.0 kVA

Total Power Available for Drives

- Nominal operating current allowed (base with
  expansion upgrade)
    - +5 V dc line: 10 A base/23 A with upgrade
    - +12 V dc line: 10 A base/23 with upgrade

Acoustical Noise Emission Values

- Average sound pressure levels at operator position
  - 1 hard disk drive (low fan speed)
    - 40 dB operating
    - 38 dB idle
  - 1 hard disk drive (high fan speed)
    - 42 dB operating
    - 41 dB idle
  - 3 hard disk drives (low fan speed)
    - 40 dB operating
    - 38 dB idle
  - 3 hard disk drives (high fan speed)
    - 42 dB operating
    - 42 dB idle
- Average sound pressure at bystander position (1 meter)
  - 1 hard disk drive (low fan speed)
    - 36 dB operating
    - 35 dB idle
  - 1 hard disk drive (high fan speed)
    - 38 dB operating
    - 38 dB idle
  - 3 hard disk drives (low fan speed)
    - 36 dB operating
    - 35 dB idle
  - 3 hard disk drives (high fan speed)
    - 38 dB operating
    - 38 dB idle
- Declared (upper limit) sound power levels
  - 1 hard disk drive (low fan speed)
    - 5.5 bels operating
    - 5.4 bels idle
  - 1 hard disk drive (high fan speed)
    - 5.7 bels operating
    - 5.6 bels idle
  - 3 hard disk drives (low fan speed)
    - 5.5 bels operating
    - 5.4 bels idle
  - 3 hard disk drives (high speed)
    - 5.7 bels operating
    - 5.7 bels idle

Starting or Stopping the System

See the following topics:

- "Starting or Powering-On the System"
- "Stopping or Powering-Off the System"
- "Power-On/Off Scenarios" on page 366

(See also "Service Processor Requirements" on page 362.)

Starting or Powering-On the System: To power-on the computer under normal conditions, you must have the power enable button active and push the start/stop button.

When the computer is powered-on, it may be shut down by pressing the start/stop button. This causes one of the following scenarios to occur in the service processor (SP):

- A non-maskable interrupt (NMI) is generated and sent to the host processor and a count-down timer to power-off the computer is started. When the timer reaches zero (0) the system is powered-off. This option requires a NMI device driver to flush cache and close the file system before the time out.
- An SP interrupt is generated and sent to the host processor and a count-down timer to power-off the computer is started. When the timer reaches zero, the computer is powered-off. This option requires an SP device driver to interface to the operating system to close the file system before the timeout.
- No interrupt is generated and the computer is powered-off after the count-down timer times out. The default value for the count down timer is zero or power-off immediately.
- A message is displayed requesting that the enter button be pressed to power-off the computer.

Note

When changing the Real-Time Clock module or resetting the CMOS RAM, you must press and hold the start/stop button in until a message is displayed saying the real-time clock (RTC) has been updated or reset.

Stopping or Powering-Off the System: When the Start/Stop button is pressed, the service processor (SP) sends an interrupt causing the count-down timer to start. When the timer reaches zero (0), the computer is powered-off. The default value for this timer is zero (0) seconds. The SP also interrupts the host system through the SP or NMI interrupts if these features are enabled. The SP will display a message on the LCD indicating that the computer will power-off in XX seconds. If enabled, this feature can be canceled by pressing the Enter button.

Power-On/Off Scenarios: The computer is designed with a soft power-on and -off function. This function requires the following changes in how the computer is powered on and off. The SMART function looks at the hardware at power-on and takes control of the power-off function.

- The first change is a Power Enable button. This button is a logical emergency power off (EPO) switch that does not remove all power from the computer; it continues power to the bus as long as AC is connected, but it will power-off all other components of the computer immediately and prevent it from being powered-on until the Power Enable button is pressed again.
- The second change is that after any AC power interruption to the computer, the computer will power-on to determine what state it should be in (on or off). If the computer was powered-off before the AC power interruption, it will power-off when power is restored. If the computer was powered-on before the AC power interruption, it will power-on when power is restored.

  Note

  If the Power Enable button is not on and the AC is interrupted, the system will not power-on and check to see if it should be on until the next time the Power Enable button is pressed.

The white power-on button is used to power-on or -off the computer. You must press and hold this button for about two seconds on some models.

Starting the RAID Configuration Program

If you have not yet created the SCSI-2 Fast/Wide PCI-Bus Adapter Configuration Option Diskette (RAID controller diskette), see the ServerGuide CD documentation.

To start the RAID configuration program:

Insert the IBM RAID controller diskette into the primary drive and power-on the server.
If the server is already on, press **Ctrl**+**Alt**+**Del**.
If you have more than one RAID adapter, you will get an adapter selection screen. Otherwise, the Main Menu appears.

RAID Program Keys

Key	Program Response
F1	Selects **Help** from any menu

Key	Program Response
Esc	Returns to the previous screen or to the previous work area of a screen
Up (↑) and Down (↓) Arrows	Highlights the item to be selected
Enter	Selects the highlighted item

Main Menu Selections

> **Note**
>
> Whenever you make changes to the disk-array configuration and select **Exit**, the Confirm pop-up window will appear. You must select **Yes** to save and activate the changes.

Selection	Program Response
Help	Provides additional information.
View configuration:	Displays the existing disk array configuration.
Create/delete array:	Selects the drives, defines a hot-spare drive for an array you want to create, or deletes an existing array. This selection also has choices for defining a logical drive and formatting a drive.
Initialize/synchronize array:	Select this choice after creating an array to: • Set the drive to a predetermined value. • For proper operation of RAID levels 1 and 5. **Note:** Any data existing on the drive is overwritten with zeros, and the corresponding parity information is initialized to the correct value. • Initialize more than one logical drive at a time. • Interrupt the initialization process at any time by pressing **Esc**. • Restart the initialization process by pressing **Enter**. • End the process by pressing **Esc** again.

Selection	Program Response
Synchronize logical drive:	Recomputes and rewrites the parity data on the drive. You can select this choice to recompute parity data for RAID levels 1 and 5. This selection does not alter data on the drive. The synchronization process can be done on multiple logical drives.
Rebuild device:	Rebuilds logical drives. The rebuild operation is supported only for RAID levels 1 and 5.
Advanced functions:	Changes the write policy (the way data is written to the drive), saves your configuration information to a diskette, restores it from a diskette, or changes RAID parameters. This choice also allows you to do a low-level format.
Drive information:	Displays information about the SCSI devices (hard disk, CD-ROM, tape, and so on) connected to the RAID adapter.
Exit:	Leaves the Main Menu.

Undetermined Failing Processor Diagnostics

If the diagnostics identified a processor failure on a multiprocessor computer but could not identify which processor is failing (the FRU replacement is **any processor** in the "Symptom-to-FRU Index"), do the following:

1. Power-off the computer and remove all of the installed processors.
2. Reinstall one of the processors and run the diagnostics.
3. If the processor is good, remove the good processor and follow this procedure for each processor previously removed from the computer, until you locate the defective processor.
4. When you locate the defective processor, replace it and reinstall the remaining processors you removed from the computer.

Viewing the RAID Configuration

Before creating or changing a disk array, you can look at the current configuration by selecting **View Configuration** from the Main Menu of the RAID configuration program.

To view the disk-array configuration:

1. Start the RAID configuration program. See "Starting the RAID Configuration Program" on page 366.
2. Select **View configuration**. The current disk-array configuration information appears on the screen.
3. Press **Enter** to see the stripe order in the Bays Occupied (Ch:Bay) field.
4. Press any key to continue.
5. Press **Esc** to return to the Main Menu.

Locations

Bays

Connectors (Rear View)

- SCSI 2 Connector either/or
- Expansion Slots
- Serial Connectors
- Display Connector
- Parallel Connector
- Mouse Connector
- Keyboard Connector
- Power Connector
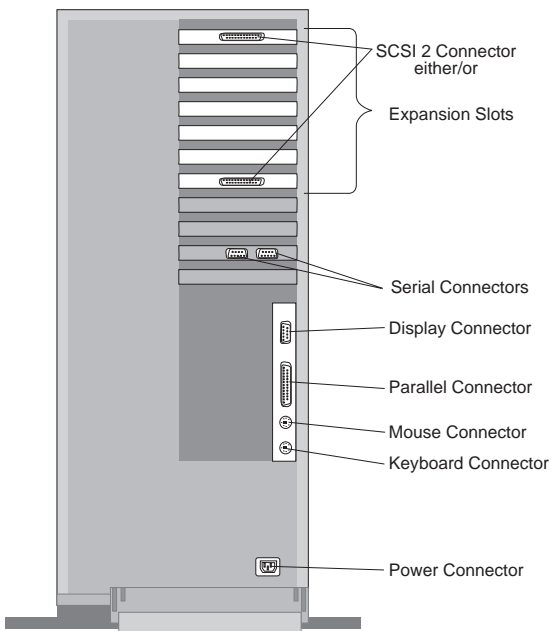
Controls/Indicators (Front View)

Power OK Indicator
Power Enable Indicator
All Subsystems Good Indicator
Hard Disk Drive Activity Indicator
DASD Error Indicator
Processor Complex Error Indicator
Information Panel

Keypad (4 Menu Buttons)
Enter Button
Power On/Off Button
Power Enable Switch
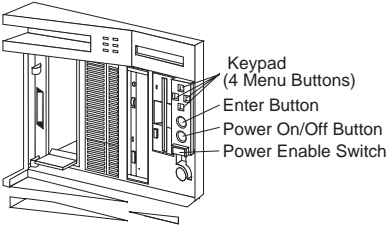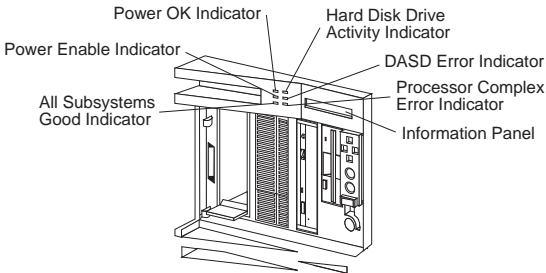
Hot-Swap Backplane: Front View
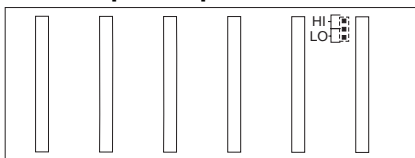
SCSI ID Jumper: If two backplanes are connected to the same adapter, one backplane must be set to high and the other one to low.

SCSI ROM Address ID Jumper Setting	Description
HI = High	Assigns SCSI IDs 8 to D to the backplane
LO = Low	Assigns SCSI IDs 0 to 5 to the backplane

Rear View

Address Jumper

ROM Address Jumper Setting

Notes

- The following settings are for PC Server 720 computers only.
- If more than one backplane is installed in the computer, each backplane must have a different ROM address setting.
- **Do not** install a ROM address jumper on backplanes installed in PC Server 320 computers.

Jumper Position	Description
C	Address for a backplane installed in Bank C (location shown on page 370)
D	Address for a backplane installed in Bank D (location shown on page 370)
E	Address for a backplane installed in Bank E (location shown on page 370)

Termination (Hot-Swap Back Plane): The hot-swap back plane is automatically terminated. Drives connected to the hot-swap back plane should not be terminated.

SCSI-2 Fast/Wide RAID Adapter/A
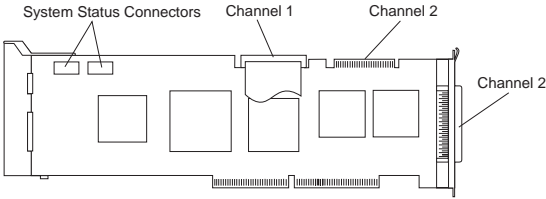
SCSI Fast/Wide Adaptec Adapter
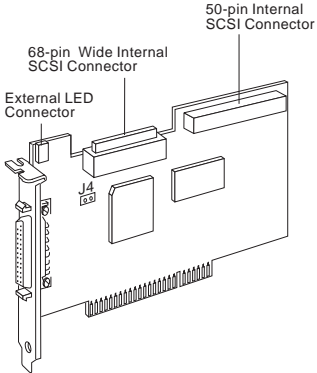
System Board

1. PCI/Micro Channel connectors
2. PCI-speed-select jumper (J24, CE use only)
3. Power-on-features jumper (JMP4)
4. Serial connector
5. Video port
6. Password-write-enable jumper (JMP2)
7. Parallel port
8. Pointing-device port
9. Keyboard port
10. 3.3V power connector
11. Remote-update jumper (J25, CE use only)
12. Power connector
13. 5V power connector
14. Bank-select jumper (JMP5)
15. Processor board slots
16. Power-on-password jumper (JMP1)
17. Memory/processor slot
18. Fan connector
19. Memory card slot
20. Bus slots
21. Bridge card slot
22. Diskette-drive cable connector
23. Bad-CMOS jumper (J42)
24. Operator-panel cable connector
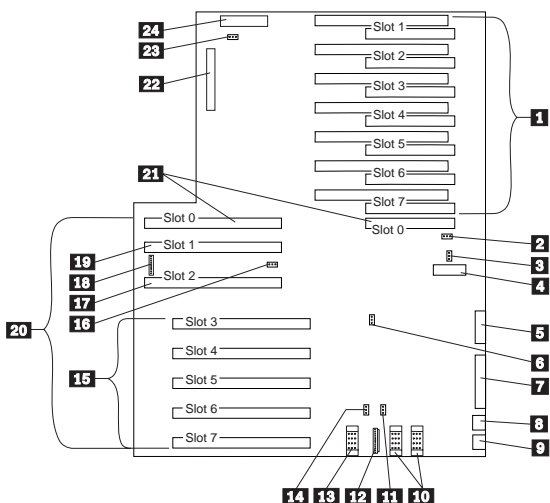
- **Note**

For default settings, refer to the label located inside the system.

Symptom-to-FRU Index

The information in this index should be used with the "Symptom-to-FRU Index (Micro Channel)" on page 26 in the *PS/2 Hardware Maintenance Manual*.

This index contains the following information:

- Corollary error codes (CP, EP, TP, IP, FP and HALT), pages 376 through 384.
- "Micro Channel Error Symptoms/Codes" on page 384. (See also the additional error symptoms and codes for the Symptom-to-FRU Index (Micro Channel) in the *PS/2 Hardware Maintenance Manual*.)
- SCSI/non-SCSI error codes ("SCSI/Non-SCSI Error Code Format" on page 388)
- PCI error codes/messages ("PCI Error Format and Error Codes/Messages" on page 395)
- "Testing PCI Adapter Cards" on page 398
- "Accessing/Checking the PCI Device List" on page 398

Always start with "General Checkout (Micro Channel)" on page 19 in the *PS/2 Hardware Maintenance Manual*.

The Symptom-to-FRU Index lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this index to help you decide which FRUs to have available when servicing the computer.

In the following error codes, *X* can be any number or letter. See *Symptom-to-FRU Index (Micro Channel)* on page 19 in the *PS/2 Hardware Maintenance Manual* for additional error codes.

Note

For IBM devices not supported by this supplement or the *PS/2 Hardware Maintenance Manual*, refer to the manual for that device.

Corollary Error Codes

Corollary error codes can be displayed on the information panel during early portions of the Power-On Self-Test (POST) code. If the system hangs with one of these checkpoints displayed, a Halt code may also be displayed, see "Halt Indications (HALT)" on page 383. FRU replacement is listed with the first FRU being the first item replaced and so on.

The types of Corollary Error Codes are:

- "Checkpoint Codes (CP)" on page 377
- "Test Error Indication (EP)" on page 379
- "Test Point Codes (TP)" on page 380
- "Multiprocessor Error Indication (IP and FP Codes)" on page 382

- "Halt Indications (HALT)" on page 383

Checkpoint Codes (CP): The following checkpoints can be displayed on the information panel during early portions of the Power-On Self-Test (POST) code. If the system hangs with one of these checkpoints displayed, the FRU replacement should be as listed with the first FRU being the first item and so on.

The checkpoint code information is displayed on the information panel in the following format:

CP: **1XX**

1XX   Checkpoint values as described below.

> **Notes**
>
> 1. The checkpoint code will only be displayed by the default (**lowest slot number**) processor card. Therefore, only the default processor card is being tested during this time.
> 2. If a 2 digit checkpoint code (CP: XX) is displayed **without** a beep symptom, go to "No Beep Symptoms" on page 384 and diagnose the no beep symptom.
> 3. If a 2 digit checkpoint code (CP: XX) is displayed **with** a beep symptom, go to "Beep Symptoms" on page 385 and diagnose the beep symptom.

CP Code	FRU
141 Start of COM 1 Test	1. **System Board** 2. Bridge Card 3. *Default* Processor Card
142 Start of SRAM Test	1. **Memory Card** 2. Bridge Card 3. *Default* Processor Card 4. System Board
143 SRAM Test	1. **Memory Card** 2. *Default* Processor Card 3. System Board
144 SRAM Test	1. **Memory Card** 2. *Default* Processor Card 3. System Board
145 SRAM Test	1. **Memory Card** 2. *Default* Processor Card 3. System Board
146 Transition to Protected Mode	1. **_Default_ Processor Card** 2. Bridge Card 3. System Board

CP Code	FRU
147 Port Initialization	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
148 Jump to 32-Bit Assembly Code	1. *Default* **Processor Card** 2. Bridge Card 3. Memory Card 4. System Board
149 Execution of 32-Bit Protected Mode	1. *Default* **Processor Card** 2. Bridge Card 3. Memory Card 4. System Board
14A Transition to 'C' Code	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
14C Default Processor Card Setup Routines	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
14D Additional Default Processor Card Setup Routines	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
14E Additional Default Processor Card Setup Routines	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
14F Additional Default Processor Card Setup Routines	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
150 ROM Checksum	1. **System Board** 2. Bridge Card 3. *Default* Processor Card
151 L2 Cache Flush on Default Processor Card	1. *Default* **Processor Card** 2. Bridge Card 3. Memory Card 4. System Board
152 Default Processor Card Configuration	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
153 Default Processor Card and Bridge Card Initialization	1. *Default* **Processor Card** 2. Bridge Card 3. System Board

CP Code	FRU
154 Bridge DMA Initialization	1. **Bridge Card** 2. System Board 3. *Default* Processor Card 4. Memory Card
155 Enable Fault/Error Detection and Enable Interrupts	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
156 Enable Default Processor Card Parity and L1 Cache	1. *Default* **Processor Card** 2. Bridge Card 3. System Board 4. Memory Card
157 Start of Test Cases	1. *Default* **Processor Card** 2. Bridge Card 3. System Board
158 Video Initialization	1. *Default* **Processor Card** 2. System Board 3. Bridge Card
159 Keyboard Initialization	1. **Keyboard** 2. System Board
15A Global Initialization. Try removing the wrap plug from the serial port.	1. **System Board** 2. *Default* Processor Card

Test Error Indication (EP): In some cases, the early POST code will detect errors during the running of the test cases and display corresponding test errors to the information panel. The information is displayed in the following format:

   EP: **1XXS**

1XX   Error values as described below.

S   Slot number of the card/board issuing the error.

EP Code	FRU
1043 (104X) Memory Error (First reseat the memory adapter.)	1. **Memory Adapter**
106s Processor Card Error	1. **Processor Card**

Test Point Codes (TP): The following list contains
test points that can be displayed on the information panel
during early portions of the POST code. If the system
hangs with one of these test points displayed, replace the
FRU(s) in the order listed.

Test point information is displayed on the information panel
as follows:

TP: **1XXS**

1XX   Test point values as described below.

S   Slot number of the card/board issuing the
                 error.

TP Code	FRU
101s Reset All	1. *Current* **Processor Card** 2. Bridge Card 3. System Board
102s Interrupt Initialization	1. *Current* **Processor Card** 2. Bridge Card 3. System Board
103s Cache Flush	1. *Next* **Processor Card** 2. Bridge Card 3. System Board
104s Memory Sizing	1. **Memory Card** 2. Bridge Card 3. *Current* Processor Card 4. System Board
105s Memory Testing	1. **Memory Card** 2. Bridge Card 3. *Current* Processor Card 4. System Board
106s Memory Testing	1. **Memory Card** 2. Bridge Card 3. *Current* Processor Card 4. System Board
107s Multiprocessor Cache Test. See "Undetermined Failing Processor Diagnostics" on page 369.	1. *Any* **Processor Card** 2. System Board 3. Memory Card 4. Bridge Card
108s Memory Testing	1. **Memory Card** 2. Bridge Card 3. *Current* Processor Card 4. System Board

TP Code	FRU
109s LED Blink Test	1. **System Board** 2. *Current* Processor Card 3. Bridge Card
10As Interrupt Testing. See "Undetermined Failing Processor Diagnostics" on page 369.	1. ***Current* Processor Card** 2. Bridge Card 3. System Board 4. *Any* Processor Card
10Bs Bridge Interrupt Testing	1. **Bridge Card** 2. *Current* Processor Card 3. System Board
10Cs Multiprocessor Test. See "Undetermined Failing Processor Diagnostics" on page 369.	1. ***Any* Processor Card** 2. System Board 3. Bridge Card
10Ds Multiprocessor Memory Test. See "Undetermined Failing Processor Diagnostics" on page 369.	1. **Memory Card** 2. *Any* Processor Card 3. System Board 4. Bridge Card
10Es Multiprocessor Memory Test	1. **Memory Card** 2. *Any* Processor Card 3. System Board 4. Bridge Card
10Fs Multiprocessor Memory Test. See "Undetermined Failing Processor Diagnostics" on page 369.	1. **Memory Card** 2. *Any* Processor Card 3. System Board 4. Bridge Card
110s Multiprocessor Memory Test. See "Undetermined Failing Processor Diagnostics" on page 369.	1. **Memory Card** 2. *Any* Processor Card 3. System Board 4. Bridge Card
111s Multiprocessor Memory Test. See "Undetermined Failing Processor Diagnostics" on page 369.	1. **Memory Card** 2. *Any* Processor Card 3. System Board 4. Bridge Card

Multiprocessor Error Indication (IP and FP

Codes): During the early POST code, various multiprocessor bus errors might occur; if they do, the early POST code will display error information to the information panel in one of the following formats:

IP: 1xx **D S** xx
FP: 1xx **D S** xx

D   Character denoting the type of board/card issuing the error as follows.
          C for Processor Card
          M for Memory Card
          B for Bridge Card

S   Slot number of the board/card issuing the error.

If you receive an IP or FP error, do the following.

1. Replace the board/card issuing the error.
2. If replacing a FRU does not correct the problem, reinstall the FRU you removed from the computer; then, continue with the next step.
3. Remove all cards/boards of the same type identified by the error code one at a time until you locate the failing card/board. (Example, if the error code identified a memory card and replacing the memory card in the slot identified by the error code does not correct the problem, remove all memory cards one at a time until you locate the failing board)

   If the problem remains, replace the FRUs in the following order.
   a. Memory Card
   b. Processor Card
   c. Bridge Card
   d. System Board

Halt Indications (HALT): If during the early POST code, a fatal error is detected, the system will display a "halting" message with a corresponding error code to indicate the reason for the halt condition. The message will be displayed on the information panel in the following format:

   HALT: **XXX**xxx

Where "**XXX**" is the following code number, replace the FRU(s) in the order listed. If present, ignore the last three digits (xxx).

> ─── **Note** ───
>
> The exceptions to the above three or six digit error code format are the following error codes.
>
> - HALT: 02
> - HALT: 107C

Halt Code	FRU
02 COM 1 failure	1. **System Board** 2. Bridge Card
101 COM 1 failure	1. **System Board** 2. Bridge Card 3. *Default* Processor Card
102 Memory failure	1. **Memory Card** 2. System Board 3. *Default* Processor Card
103 Bridge failure	1. **Bridge Card** 2. *Default* Processor Card 3. System Board
104 Processor card failure. See "Undetermined Failing Processor Diagnostics" on page 369.	1. *Any* **Processor Card** 2. System Board 3. Bridge Card
105 Memory failure	1. **Memory Card** 2. System Board 3. *Default* Processor Card
106 Unknown POST path. **Note:** This is a software error and the system should be re-flashed with the latest level of the POST code. If the error persists, a faulty processor card may be the cause.	1. **Processor Card** 2. System Board

Halt Code	FRU
107 Unexpected interrupt or trap. See "Undetermined Failing Processor Diagnostics" on page 369.	1. **Bridge Card** 2. System Board 3. *Any* Processor Card 4. Memory Card
107C NMI error	1. **Processor Card** 2. Bridge Card 3. *Any* remaining Processor Cards 4. System Board
108 Not enough memory found	1. **Memory Card** 2. *Default* Processor Card 3. System Board
109 Memory error	1. **Memory Card** 2. System Board 3. *Default* Processor Card
1FF Miscellaneous fatal error. See "Undetermined Failing Processor Diagnostics" on page 369.	1. **Memory Card** 2. *Any* Processor Card 3. Bridge Card 4. System Board

Micro Channel Error Symptoms/Codes

No Beep Symptoms

No Beep Symptom	FRU/Action
The computer hangs while loading the operating system, the CD-ROM doesn't install during the Adaptec BIOS routines, or the CD-ROM is not available to the operating system.	1. **CD-ROM Drive** 2. SCSI Cable
Blank display, otherwise computer operates normally. (Run the Display Self Test)	1. **Display Adapter** 2. Video Memory (if used) 3. System Board
Memory count hangs during POST.	1. **System Board Memory** 2. Memory Option (if installed) 3. System Board 4. Processor 5. Bridge Card
No beep, fan runs, power-on indicator is on, and computer hangs during POST **without** message on the display. See "Undetermined Problems" on page 552.	1. **System Board** 2. Processor Card 3. Bridge Card 4. Memory Card

No Beep Symptom	FRU/Action
No beep, fan runs, power-on indicator is on, and computer hangs during POST **with** a message on the display. See "Undetermined Problems" on page 552.	1. **System Board** 2. Processor Card 3. Bridge Card 4. Power Supply
System slows down	1. **Check the processors** 2. System Board

Beep Symptoms

Beep/Symptom	FRU/Action
One beep and the computer hangs. See "Undetermined Problems" on page 552.	1. **Any Device or Adapter**
One beep and the displayed memory size is incorrect.	1. **Memory Card**
Continuous beep and a blank display. (Run the Display Self Test)	1. **Display Adapter** 2. Video Memory (if used) 3. System Board
One long and three short beeps. (Run the Display Self Test)	1. **Display Adapter** 2. Video Memory (if used) 3. System Board

Error Codes: The following codes might appear on the display and/or the information panel.

Error Code	FRU/Action
000**95**XX (System complex failure)	1. **Memory Card** 2. Bridge Card 3. Processor Card 4. System Board
000**113**XX (The first memory card is missing or not operational.)	1. **Memory Card**
000**114**XX	1. **Any Adapter** 2. **System Board**
000**164**00 (Memory size changed)	1. **Memory Card**
000**217**00 (Multi-bit ECC error)	1. **Memory Card**
000**240**00 000**297**XX	1. **Memory Card**
00**9503**XX 00**9505**XX 00**9506**XX	1. **System Board** 2. Processor Card 3. Bridge Card 4. Memory Card
01**290050**, 01**290051** 01**290052**, 01**290053** 01**290054**, 01**290055** 01**290056**	1. **System Board** 2. Bridge Card 3. Processor Card 4. Memory Card 5. Any PCI Card
01**296000** (Processor not supported)	1. **Replace the Processor Card**
01**299910**X (Adapter in slot X has an invalid serial number)	1. **Replace the adapter in the slot indicated**
01**30010**XX (I2C failed to respond)	1. **System Board**
01**300A**XX (Slot LED problem)	1. **System Board**
01**300B**XX (Display panel problem)	1. **Display Panel** 2. Power Switch Panel 3. System Board
0**210**XXXX (Internal bus, size unknown) 0**210**XX**1** (External bus, size unknown)	1. **SCSI Hard Disk Drive** 2. SCSI Adapter or the SCSI controller built into the system board. 3. SCSI Cable 4. SCSI ID Switch (on some models)
0**26109**XX (Display problem)	1. **Display**
0**26111**XX (Video adapter problem)	1. **Video Adapter**

Error Code	FRU/Action
0**2790X**XX, 0**2791X**XX 0**2792X**XX, 0**2793X**XX 0**27906**XX, 0**27907**XX (Ethernet adapter POST error)	1. **Check power and reseat adapter.** 2. Ethernet PeerMaster Server Adapter
0**2799X**XX (Communications to the Ethernet PeerMaster Server Adapter failed or the adapter failed.)	1. **Run Setup and verify the Ethernet PeerMaster Server Adapter configuration.** 2. Ethernet PeerMaster Server Adapter
0**279XX**XX	1. **Fast/Wide Streaming RAID Adapter/A (FRU No. 06H3059)** 2. System Board 3. Signal Pass Through Card (if installed)
0**28309**XX (Display problem)	1. **Display**
0**28310**XX (System board video problem)	1. **System Board**
0**28331**XX (System board video)	1. **System Board**

Error Messages

Error Message	FRU/Action
Drive in channel X bay X does not respond. Installation stopped. See "Undetermined Problems" on page 552.	1. **Replace the drive in the bay indicated.** 2. Any PCI Adapter 3. System Board
Controller does not respond to commands; no logical drive installed.	1. **RAID Adapter** 2. System Board

SCSI/Non-SCSI Error Code Format

This section contains an explanation of the encoded SCSI and non-SCSI POST error codes and detailed information about each code.

Error messages are displayed on the screen as three, four, five, eight, twelve, or thirteen digits. An "X" in an error message can be any number. The shorter POST errors are highlighted in the Symptom-to-FRU Index. Some digits will represent different information for SCSI errors versus non-SCSI errors.

The following figure shows which digits display the shorter POST errors. The figure also defines additional SCSI information.

```
RDDDPLSCB QEET
                │└─ Test state
                └── Error code Extension
               ──── Qualifier

         ──── Bus (0=internal  1=external)
        ───── Capacity of the device
       ────── Slot number of the device
      ─────── LUN (usually 0)
     ──────── PUN (SCSI ID #)

  ─────────── Device Number
 ──────────── Reserved Digit (usually 0)
```

Notes

1. Non-IBM device error codes and documentation supersede this list.
2. Duplicate SCSI ID settings will cause misleading error symptoms or messages.

For example, SCSI error code **0210501A0** decodes as follows:

Digit	Information
0	Reserved digit (usually 0)
210	Device number 210 indicates hard disk
5	SCSI ID assigned is 5
0	Logical Unit Number (not used, usually 0)
1	The adapter is installed in slot 1
A	The device capacity is 60MB (A = 60MB)
0	The device is connected to the internal bus

RDDD Codes for Adapters

RDDD	Device Type or Information
0**037**	SCSI on the system board
0**096**	SCSI adapter with cache

RDDD	Device Type or Information
0**112**	SCSI adapter without cache
0**206**	SCSI-2 adapter

RDDD Codes for Devices

RDDD	Device Type or Information
0**208**	Unknown device type
0**209**	Direct access - removable media, and/or other than 512 byte blocks
0**210**	Direct access - hard disk, 512 byte blocks
0**211**	Sequential access (tape)
0**212**	Printer
0**213**	Processor
0**214**	Write Once, Read Multiple (W.O.R.M.)
0**215**	Read only (CD-ROM)
0**216**	Scanner
0**217**	Optical memory (read/write optical disk)
0**218**	Changer (multiple tray CD-ROM)
0**219**	Communications

B Codes

B	Device Type or Information
0	Dual SCSI adapter (internal bus)
1	Dual SCSI adapter (external bus)

QEET 0000 Codes

Refer to this list if the "DDD" indicates an adapter, followed by a **QEET** of 0000. For example, 0**1120100 0000**.

PLSC	QEET	Information
0100	**0000**	On systems with NVRAM, SCSI setup data not located, or the checksum did not verify. On systems without NVRAM (Model 50 for example), setup data must be on the 1st hard disk.
0200	**0000**	Configuration error. No hard disk found at PUN 6, LUN 0 for 161,162,165 system error path. Might be an unsupported configuration.
0300	**0000**	No space available in extended BIOS data area for SCSI data table (possibly too many adapters installed).
0400	**0000**	ROM modules not found on adapter (IML-based systems only). Running setup might correct it.

PLSC	QEET	Information
0500	0000	ROM checksum error on second 16K portion of 32K ROM
0600	0000	ROM access control port error

QEET Errors (other than 0000)

These are specific "QEET" error codes (preceded by a "DDD" indicating an adapter).

Note: A number in slot "S" indicates an error on the adapter, (or device attached to the adapter) in slot "S." If "S" is 0, suspect the system board.

QEET	Information
001x	8032/80188/80C186 ROM test failure
002x	Local RAM test failure
003x	Bad fuse, or bad termination, or local RAM address failure on SCSI adapter if "RDDD" is 0112
004x	Internal peripheral test failure
005x	Buffer control chip test failure, or LTB failed, (or system-board SCSI failed if "RDDD" is 0037)
006x	Undefined error condition, or buffer RAM test failure on SCSI adapter if "RDDD" is 0096
007x	System interface control chip test failure
008x	SCSI internal interface test failed
00Ax	SCSI external interface test failed
107x	Adapter hardware failure
10Cx	Command failed
10Ex	Command error (invalid command or parameter)
10Fx	Sequencing error
110x	Adapter internal error log contains entries. (Reported if no other errors on adapter exist.)
180x	Time out
181x	Adapter busy error
182x	Unexpected interrupt presented by adapter
183x	Adapter register test failure
184x	Adapter reset failure
185x	Adapter buffer test failure (on cached adapters)
186x	Adapter reset count expired
187x	Adapter registers not cleared on reset
188x	Card ID in adapter microcode did not match ID in POS registers
190x	Expected device did not respond
19Yx	DMA arbitration level conflict (Y = assigned arbitration level)
220x	Adapter hardware error

QEET	Information
221x	Global timeout on adapter (device did not respond)
222x	Adapter DMA error
223x	Adapter buffer defective
224x	Command aborted by adapter
301x	Invalid parameter in SCB
303x	Command not supported
304x	Command aborted by system
305x	Command rejected (buffer not disabled)
306x	Command rejected (Adapter diagnostic failure)
307x	Format rejected
308x	Assign rejected (command in progress)
309x	Assign rejected (device already assigned)
30Ax	Command rejected (device not assigned)
30Bx	Command rejected (maximum logical block address, LBA, exceeded)
30Cx	Command rejected (16-bit card slot address range exceeded)
313x	Invalid device for command
3FFx	Status not returned by adapter
401x	Recovered error (not an error condition)
402x	Device not ready
403x	Device medium error
404x	Device hardware error
405x	Illegal request for device
406x	Device unit attention would not clear
407x	Device data protect error
409x	Device vendor unique error
40Ax	Copy operation aborted by device
40Bx	Device command aborted
40Cx	Device search data command satisfied
40Dx	Device volume overview (residual data remains in buffer)
40Ex	Device mismatch (source data did not match medium data)
500x	Check condition on device, no sense data returned
501x	No index or sector
502x	Seek incomplete
503x	Write fault
504x	Drive not ready
505x	Drive not selected
506x	No track zero found

QEET	Information
507x	Multiple drives selected
508x	Logical unit communication failure
509x	Head positioning error (track following error)
510x	CRC or ECC error on ID field
511x	Unrecoverable read error
512x	No address mark (ID field)
513x	No address mark (data field)
514x	Record not found
515x	Seek error
516x	Data synchronization error
517x	Recoverable read (without ECC) error
518x	ECC recovered read error
519x	Defect list error
51Ax	Parameter overrun
51Bx	Synchronous transfer error
51Cx	Primary defect list not found
51Dx	Compare error
520x	Invalid command
521x	Illegal logical block address (LBA)
522x	Illegal function for device type
524x	Illegal command block field
525x	Invalid LUN
526x	Illegal field in parameter list
528x	Media changed
529x	Power-on or bus device reset occurred (not an error)
52Ax	Mode select parameters changed (not an error)
531x	Medium format corrupted
532x	Defect spare location unavailable
540x	Device RAM failure
541x	Data path diagnostic failure
542x	Power-on diagnostic failure
543x	Message rejected
544x	Internal controller error
545x	Device was unable to reconnect
547x	Interface parity error
548x	Initiator detected error
549x	Illegal command or command out of sequence error
5F0x	Format in progress (not an error)
5F1x	Spinup in progress
601x	SCSI bus reset occurred

QEET	Information
602x	SCSI interface fault
610x	Selection timeout error (device not available)
611x	Unexpected bus free
612x	Mandatory SCSI message rejected
613x	Invalid SCSI phase sequence
620x	Short length record error
702x	Device not ready (removable media devices)
704x	Device not ready (non-removable media devices)
728x	Media changed error would not clear
731x	Medium format corrupted (format unit interrupted - format must be issued again)
7F0x	Format in progress (prior format unit issued being completed)
7F1x	Spinup in progress

Q Codes

All error codes with "Q" = 1 are developed using information returned by either an adapter or device. The "Q" value defines the origin of the "EE" code that is reported. Error codes (EE) with "Q" = 4 or 5 might be reported that are not listed here or can actually have a definition other than that given, depending on the device.

"Q"	Information
2	Command error field of command complete status block returned by the adapter
3	SCSI Status field of the command complete status block or command error field values indicating software problems (< 20H)
4	Sense key value returned by a device
5	Additional sense byte (byte 12) of sense information from device
6	Device error code field of command complete status block
7	Device errors not normally considered an error, but considered an error based on when the code was returned (medium corrupted error on device with non-removable media)

Test Status Codes

"T"	Information
O	Not applicable for error code
A	Adapter initialization error)
B	Adapter reset
C	Adapter register test
D	Adapter buffer test phase 1 (on cached adapters)
E	Adapter buffer test phase 2 (on cached adapters)
F	Adapter buffer test phase 3 (on cached adapters)
G	Adapter buffer test phase 4 (on cached adapters)
H	Adapter (buffer enable, buffer size, retry, enable)
I	Device assignment sequence
J	Device not ready (initial unit attention clearing)
K	Device reset
L	Device starting phase
M	Device in process of starting
N	Device block size determination
O	Device self-test
P	Device single block read (LBA)
Q	Device double block read (LBA)
S	Error occurred after device testing completed

PCI Error Format and Error Codes/Messages

PCI Error Code Format

The following is an explanation of the encoded PCI error codes.

Error codes are displayed on the screen as eight or sixteen digits as follows:

```
DDDD DDS0 VVVVIIII
              │└── PCI Device ID
              └─── PCI Vendor Number
          └─────── Reserved (usually 0)
        └───────── PCI Slot Number (0 = System board)
    └───────────── PCI Device Error
```
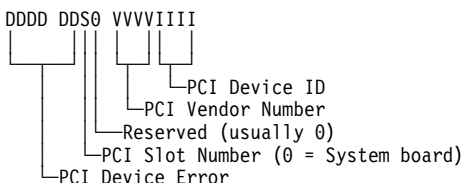
For example, PCI error code **005A0210vvvvviiii** decodes as follows:

Digit(s)	Information
005A 02	PCI device disabled due to Built-in Self Test failure.
1	The device is in PCI slot number one.
0	Reserved.
vvvv	Could be any number (PCI vendor ID).
iiii	Could be any number (PCI device ID).

PCI Error Codes

Error Code	FRU/Action
00**900**100vvvvviiii (System board PCI device does not respond)	1. **System Board**
00**9002**s0vvvvviiii (PCI device Built-in Self Test failure)	1. **If S <> 0, replace the PCI adapter.** Or **If S = 0, replace the system board.**
00**9003**s0vvvvviiii (PCI device resource allocation failure. No resource available for the requested memory, I/O, or C0000-DFFFF ROM address space.)	1. **Run the PCI Utility or the Micro Channel Change Configuration Utility to change system resource allocation.**
00**9004**s0vvvvviiii (PCI device ROM checksum failure)	1. **If S <> 0, replace the PCI adapter.** Or **If S = 0, replace the system board.**

Error Code	FRU/Action
00**9005**s0vvvviiii (Unsupported PCI device)	1. **Remove the unsupported PCI adapter**
00**9010**s0vvvviiii (PCI data parity error)	1. **If S <> 0, replace the PCI adapter.** Or **If S = 0, replace the system board.**
00**9011**s0vvvviiii (PCI data parity error)	1. **If S <> 0, replace the PCI adapter.** Or **If S = 0, replace the system board.**
00**9020**s0vvvviiii (PCI address parity error)	1. **If S <> 0, replace the PCI adapter.** Or **If S = 0, replace the system board.**
00**9030**s0vvvviiii (PCI system error)	1. **If S <> 0, replace the PCI adapter.** Or **If S = 0, replace the system board.**

PCI Error Messages

Error Message	FRU/Action
PCI device(s) removed since last power up: PCI vendor ID=xxxx, device ID=xxxx previously in slot x	1. **One or more PCI add-in devices appears to have been removed since the last execution of POST. This could be due to a catastrophic failure of the PCI device rather than its actual physical removal.**
PCI device(s) added since last power up: PCI vendor ID=xxxx, device ID=xxxx in slot x	1. **One or more PCI add-in devices has been added since the last execution of POST. It may have been moved from another slot. This is not an error. The device was enabled and had resources assigned.**

Error Message	FRU/Action
Unable to assign requested resources: PCI vendor ID=xxxx, device ID=xxxx in slot x	1. **A requested PCI resource (from the PCI Device Configuration Block) could not be assigned as requested due to a conflict with a non-PCI device or to a conflict with another requested PCI resource.**

Testing PCI Adapter Cards

Some, but not all, adapter cards are supplied with diagnostic tests.

If diagnostics are available:

- Run the appropriate diagnostics for the adapter suspected of failing.
- If the test fails, or is unable to locate the adapter, the adapter is defective. Replace the adapter and retest.

If diagnostics are not available:

- Use the customer's reported symptom(s) to locate the failing PCI adapter; then replace it.
- Also see "Accessing/Checking the PCI Device List."

If multiple PCI adapters are failing:

- Remove all PCI adapters.
- Install the adapters one at a time to isolate the failing adapter.

  If isolation to a single adapter is not possible, replace:
  1. Bridge Card
  2. System Board

Note: Failing PCI adapters may cause the system to "hang" when loading the operating system or diagnostics. If this symptom occurs, remove all non-essential PCI adapters and retest the system to diagnose this type of failure.

Accessing/Checking the PCI Device List

To access and check the PCI device list, do the following:

1. Access the list:

   a. Restart the system from the Reference Diskette.
   b. From the Main Menu, select **Set Configuration**.
   c. From the Set Configuration menu, select **View PCI Device Configuration**.

2. Compare the devices listed for each PCI slot with what is physically installed in the system.

   If an installed device does not appear on the list, you may have one of the following conditions:

   a. The missing device may be defective or require an additional diagnostic diskette or service manual.
   b. A defect may have caused the PCI adapter to disappear from the list.

Parts Listing
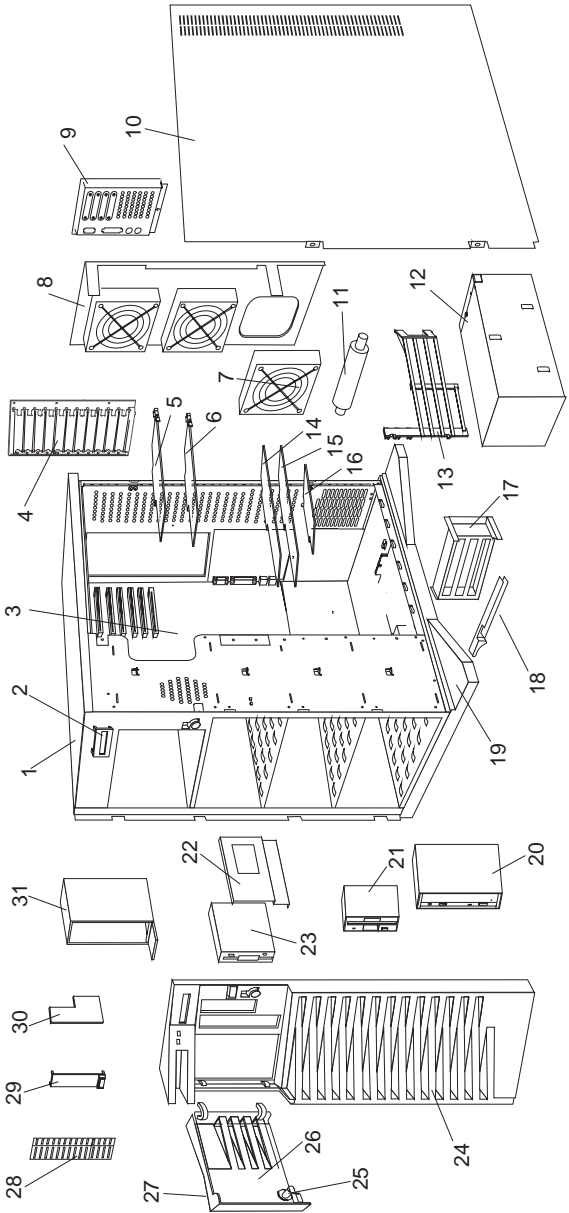
Index	System Unit (Type 8642)	
1	Base Frame (2X CD-ROM)	82G3593
	Base Frame (4X CD-ROM)	06H8685
2	Information Display Assembly (LED)	82G3614
	Display Panel Support	06H7961
3	System Board (without Memory and Processor)	06H1810
	8MB ECC (X36) Memory SIMM	06H7760
4	I/O Panel Die Cast	06H3573
5	SCSI Fast/Wide Adaptec Adapter (0Z0 Only) (AHA-2940W)	06H6431
6	SCSI-2 Fast/Wide RAID Adapter (1Z0, 2ZS and 4ZS)	06H3059
7	Fan	82G3616
8	Fan Mounting Support (without Fans)	82G3618
9	I/O Flex Plate	06H3574
10	Right Side Door	82G3594
	Right Side Door Hinges (with Screws)	82G3600
11	Pedestal Wheel (with Axle)	82G3609
12	470-Watt Power Supply Assembly	06H3589
13	Processor Card Support	06H8683
14	PCI Bridge Card	71G0694
15	512MB Memory Card	71G0696
16	P54C-100/66MHz Processor Card	71G0692
17	3-Cards Guide Support	06H8524
	4-Cards Guide Support	06H8523
18	Card Guide	82G3604
	Adjustable Card Guide Arm	06H8525
19	Pedestal	82G3608
20	Slim-Line CD-ROM Drive (2X)	06H2150
	CD-ROM Drive (4X)	88G4921
21	2.88MB Diskette Drive	82G1888
22	DASD Hot-Swap Tray Assembly (Wide)	06H3956
	DASD Hot-Swap Backplane Assembly	71G8388
	DASD Hot-Swap Cam Spring (Shaft and Knob)	06H5059
	SCSI-Fast/Wide Cable Flex (for 1 drive)	06H6145
	DASD Mounting Plate	82G3602
23	2GB SCSI Hard Disk Drive (2ZS and 4ZS)	06H3372
24	Front Bezel (with Shield - 2X CD-ROM)	06H7874
	Front Bezel (with Shield - 4X CD-ROM)	06H8686
25	Keylock (with Keys)	82G3606
26	DASD Door	82G3596
27	IBM Logo (R)	82G3601
28	5.25-Inch Drive Bezel with Spacer 2X CD-ROM	82G3599
28	5.25-Inch Drive Bezel with Spacer 4X CD-ROM	06H8684
29	Control Panel Bezel	82G3607
	Slim Bezel (4X CD-ROM)	06H8684
30	Control Panel Card	06H7097
	Speaker (with Bracket)	33F8444
	Rubber Dome Switch Pad	06H7873
31	CD Storage Tray	06H5060
	Keyboard (with Cable)	71G4646
	Mouse	06H4595
	Power Cord	62X1045
	Real-Time Clock (with Battery) (See "Battery Notice" on page 461.)	82G3620

Miscellaneous Parts Kit   82G3611
- C2 Spring (1)
- EMI Ground Clips (4)
- EMI Ground Springs (4)
- Lock Pawl (1)
- System Board Mounting Clips (2)
- Screws (4)
- Side Cover Foam Gasket (1)

Cables (Type 8642)
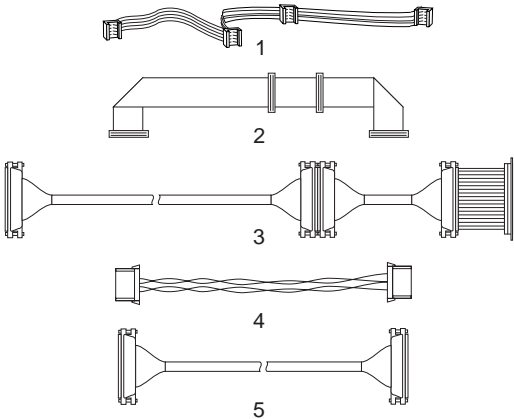
Index	Cables (Type 8642)	
1	System Status Cable (1X4)	82G3617
2	Diskette Drive (3X) Signal Cable (with power)	06H3405
3	SCSI-Fast/Wide Cable (for 3 drives) (1Z0, 2ZS, and 4ZS)	06H6661
	SCSI-Fast/Wide Cable (for 3 drives) (0Z0 Only)	06H6675
4	Hard Disk Drive Power Cable (for 1 drive)	82G3610
	SCSI-Fast/Wide ID Select Cable	06H3957
5	SCSI-Fast/Wide Cable Flex (for 1 drive)	06H6145
	C2 Cable (with Switch)	82G3612
	Fan Cable Assembly	06H7870
	Information Display Cable (2X13)	06H8679
	Dual Serial Cable Assembly	06H7868

Options (Type 8642)	
4mm DAT Autoloader	06H7541
16MB ECC Memory SIMM	06H7761
32MB ECC Memory SIMM	06H7762
220-Watt Power Supply Assembly	06H3237
C2 Cable Cover	71G6290
Cable Cover Thumbscrew	61G3842
DASD Hot-Swap Tray Assembly (Narrow)	71G6292
P54C-100/66MHz Processor Card	71G0692
Eithernet PeerMaster Quad-BT Adapter (with coax cable connector)	06H4220
Eithernet PeerMaster Quad-B2 Adapter (with twisted-pair cable connector)	06H6042
SCSI PCI Option CD-to-Backplane Cable	06H6876
SCSI Backplane to CD-ROM Terminator Cable	06H3751
RAID Controller to Backplane Cable	83G3613

Keyboards (101/102 Key)

Arabic	1391490
Belgium-Dutch	1391414
Belgium-French	1391526
Bulgarian	1399583
Czech	1399570
Danish	1391407
Dutch	1391511
Finnish	1391411
French	1391402
German	1391403
Greek	1399046
Hebrew	1391408
Hungarian	1399581
Iceland	1391495
Italy	1393395
Latvia	1391406
Norwegian	1391409
Polish	1399580
Portuguese	1391410
Romanian	1399582
Russian-Cyrillic	1399579
Serbian-Cyrillic	1399578
Slovak	1399571
Slovenia/Croatia/Bosnia	1393669
South Africa	1396790
Spanish	1391405
Swedish	1391411
Swiss-French	1391412
Swiss-German	1391412
Turkish 179	8125409
Turkish 440	1393286
U.K. English	1391406
U.S. English	06H9743
U.S. English (E/ME/A use only)	1396790

Power Cords

Power Cords

Arabic	14F0033
Belgium	1339520
Bulgaria	1339520
Czech Republic	1339520
Denmark	13F9997
Finland	1339520
France	1339520
Germany	1339520
Hungary	1339520
Israel	14F0087
Italy	14F0069
Latvia	1339520
Netherlands	1339520
Norway	1339520
Poland	1339520
Portugal	1339520
Serbia	1339520
Slovakia	1339520
South Africa	14F0015
Spain	1339520
Switzerland	1339520
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	1339520

SCSI Multi-Storage Enclosure - Type 3517

Features

> **Important**
>
> For additional information about the 3517, refer to the
> _3517 Model 001 SCSI Multi-Storage Enclosure
> Service Guide_, SY32-0400.

Media Bays

Two media bays support 8-bit, 4-mm tape drives.

Hot-Swap Bays

Five hot-swap bays support 1.1 gigabyte (GB), 2.2GB, and
4.5GB single-ended SCSI-2 disk drives mounted on easily
removable carriers.

Hot-Swap Carriers

Each carrier contains the following features, as shown at
the bottom of the illustration on page 412.

- A pushbutton power switch that allows power to be
  removed from and returned to the disk drive.
- A green light to indicate that power is being supplied
  to the disk drive. (The green light will flash if the
  power switch on the carrier is pushed off or if the
  cooling fan is malfunctioning.)
- A yellow light to indicate that the 3517 is connected to
  the system and the disk drive is available.
- A latch to lock the disk drive into the hot-swap bay to
  maintain connection with the bus. (The carrier is
  locked into the bus when the latch is in the horizontal
  position.)

Power Supply

- Non-autoranging (see **Attention** on page 416)
- Low voltage (115 volts setting)

    90–137 V ac
    6.3 Amps
    0.76 kVA
    378 Watts

- High voltage (230 volts setting)

    180–265 V ac

    4.0 Amps

    0.96 kVA

    480 Watts

Servers Supported

The 3517 can be attached to any PC Server that supports
a SCSI-2 adapter.

Diagnostics and Test Information

If a problems occurs with the 3517, see "Symptom-to-FRU Index Supplement" on page 416.

Additional Service Information

The following information is for the SCSI Multi-Storage Enclosure - Type 3517.

- • "Address Settings."
- • "Specifications" on page 411.

Address Settings

Manual-Plug Tape Drive (8-Bit, 4-mm): Two types of manual-plug tape drives (8-bit, 4-mm) can be used in the 3517: type 1 and type 2. They can be identified by the location of the SCSI signal cable connector on the rear of the drive assembly, as shown under "Type 1" on page 408 and "Type 2" on page 409. (When viewing the rear of a type-1 tape drive, the SCSI signal cable connector is located on the top-half of the rear of the drive assembly. When viewing the rear of a type-2 tape drive, the SCSI signal cable connector is located on the bottom-half of the rear of the drive assembly.)

Set the address switches or pins (as applicable) on the manual-plug tape drives before installing the drives in the media bays. See pages 408 and 409.

Type 1

To set the address on a type-1 tape drive:

1. Remove the SCSI bus terminators if they are installed.

2. Move the switches on the switch bank, as illustrated.

SCSI Connector
(50 to 68 Pin Interposer)

Manual-Plug
Tape Drive

Switch Bank

Off
On
8 7 6 5 4 3 2 1

SCSI Bus
Terminators

On On Off <---6 <--- Upper Media Bay Position
On Off On <---5 <--- Lower Media Bay Position
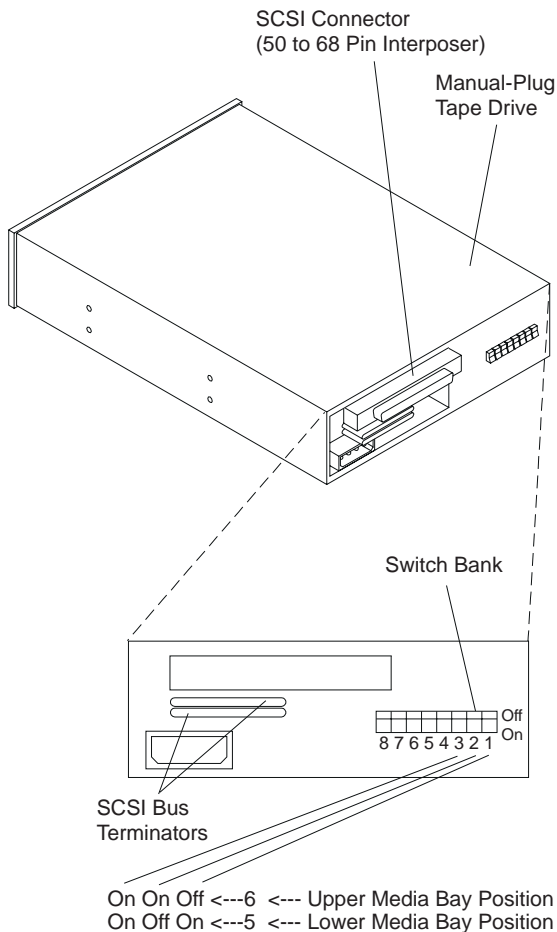
Type 2

To set the address on a type-2 tape drive:

1. Remove the SCSI bus terminator jumpers (pins 6 and 8).

2. Use the address pin jumpers provided with the tape drive to connect the upper and lower pins that correspond to the SCSI ID you want to use, as illustrated.

SCSI ID Jumpers
(Pins 1-3)

Address Pins

Address
6 ········▶ On On Off ◀········ Upper Media
Bay Position

Address Pins

Address
5 ········▶ On Off On ◀········ Lower Media
Bay Position
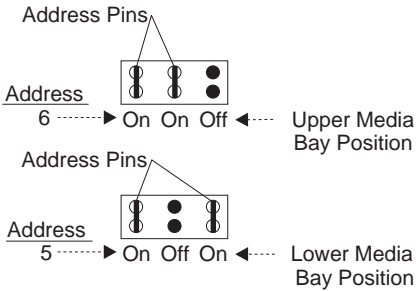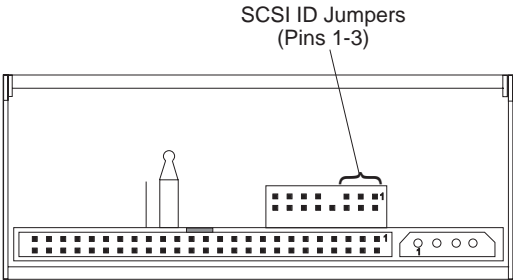
Devices: The following illustration shows the seven device addresses for the 3517 storage unit.

Device Address	
6	⎫
5	⎬ Media Bays
4	⎫
3	
2	⎬ Hot Swap Bays
1	
0	⎭
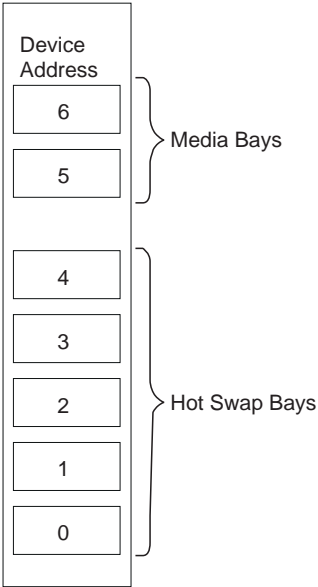
Specifications

> **Note**
>
> If more than one 3517 is installed, you must leave a minimum space of 2.5 cm (1 in.) between them, and 15 cm (6 in.) in the back, to meet cooling requirements.

Size

- Depth: 483 mm (19 in.)
- Height: 407 mm (16 in.)
- Width: 197 mm (7.75 in.)

Weight

- Minimum configuration (2 devices): 20 kg (44 lb.)

  > **Note**
  >
  > The weight of the 3517 is between 18 and 32 kg (39.7 and 70.5 lb.). It takes two persons to safely lift the unit.

Operating Environment

- Air temperature: 16° to 32° C (60.8° to 89.6°F)
- Relative Humidity: 20% to 80%
- Wet Bulb: 23.0° C (73.4°F) maximum
- Voltage: 115/230
- Maximum altitude: 2135 m (7000 ft)

Electrical Input

- Input voltage
    - Low range
        - Minimum: 90 V ac
        - Maximum: 137 V ac
    - High range
        - Minimum: 180 V ac
        - Maximum: 265 V ac
    - Input kilovolt-amperes (kVA) approximately
        - Low range input: 0.76 kVA
        - High range input: 0.96 kVA

Locations

Front View

Top Cover
Green Light
Control Panel
Power Switch
Front Cover

Media Bay 6
Media Bay 5

Lock

Hot Swap Bays
4
3
2
1
0

Latch

Hot Swap Hard Drive

Latch

Handle
Power Switch
Green Light
Yellow Light

Rear View

Voltage Selection Switch

Power Cord

System SCSI Cable

Blank SCSI Panel

Internal View

Chassis

Backplane

Manual-Plug Devices

To Manual-Plug Devices

To Backplane

Cable Tie

Internal SCSI Cable

Screwlock (2X)

Backplane

SCSI Connector

12 V Power Connector

5 V Power Connector

Hot-Swap Drive Connector (5X)

Fan Connector

Backplane

Power Supply

The power supply is mounted at the top back of the 3517.
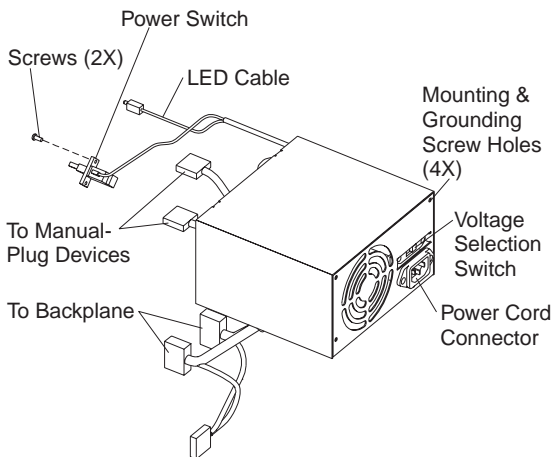
Attention

The Voltage Selection Switch is a two-position switch on the power supply. The switch can be set to 115 V ac (in USA) or 230 V ac (in some other countries). The switch must be set to match the input voltage at the wall outlet before connecting the power cord. If the 3517 is connected to the wrong level of voltage input, the 3517 will not operate and the power supply can be damaged. The power supply is not autoranging.

Symptom-to-FRU Index Supplement

The information in this supplemental index supports the SCSI Multi-Storage Enclosure (Type 3517).

The index lists symptoms and the possible causes. The most likely cause is listed first. Use the index to help you decide which FRUs to have available when servicing this unit.

Important

The information in this manual is intended for service representatives who are trained to repair the IBM 3517 SCSI Multi-Storage Enclosure.

Before servicing an IBM product, be sure to review "Safety Information" on page 456.

For additional information, refer to the *3517 Model 001 SCSI Multi-Storage Enclosure Service Guide*, SY32-0400.

Symptom	FRU/Action
The green light for the power switch is not on, and/or the power supply fan is not running.	1. **Verify that the power cord to the 3517 has continuity.**
	2. Verify that the power source has been wired correctly and has the correct voltage.
	3. Verify that the voltage selection switch is set to match the power source.
	4. Verify that the power cord is plugged into the 3517 and the power source.
	5. Verify that the power switch is on.
	6. If the problem still exists, replace the power supply.
The green light is flashing, and the yellow light is off for all hot-swap hard disk drives.	1. **Press the power switch on the hot-swap hard disk drive in hot-swap bay 0.**
	2. If the green light on the hot-swap hard disk drive continues to flash, replace the cooling fan.
	3. If the green light on the hot-swap hard disk drive is on and not flashing, press the power switch on the remaining hot-swap hard disk drives to turn their green lights on. The green light should not be flashing.

Symptom	FRU/Action
The green light for the power switch is on, and the green light on all hot-swap hard disk drives is not flashing, but no devices are available to the system.	1. **Verify that the system SCSI cable. is correctly connected to the 3517 storage unit and the system.** 2. Verify that the internal SCSI cable and all power cables to the backplane are correctly connected. 3. Send the command from the system to spin-up the drives. Refer to the system publications for more information. Remove the following FRUs; then run the system diagnostics after each FRU is replaced. a. System SCSI Cable. b. Internal SCSI cable. c. Backplane. 4. If there is still a problem after all the FRUs have been replaced, one of the hot-swap hard disk drives may be defective. a. Unseat all of the hot-swap hard disk drives except the one in hot-swap bay 0. b. Disconnect the internal SCSI cable, if installed, from the manual-plug devices. c. Send the command from the system to spin-up the drives. Refer to the system publications for more information. 5. If the command is successful, reseat the next hot-swap hard disk drive and send the command from the system to spin-up the drive. 6. Repeat step 5 on page 418 until the failure symptom returns. Then remove and replace the FRUs in the following order, and run the system diagnostics after each FRU is replaced. a. Hot-swap hard disk drive carrier. b. Hot-swap hard disk drive.

Symptom	FRU/Action

One hot-swap hard disk drive is not available to the system.	1. **Verify that the hot-swap hard disk drive carrier cables are correctly connected.**
	
	2. If the green light on the hot-swap hard disk drive is flashing, press the power switch on the drive.
	
	3. Send the command from the system to spin-up the drive. Refer to the system publications for more information.
	
	4. If the hot-swap hard disk drive is still not available to the system, remove and replace the FRUs in the following order, and run the system diagnostics after each FRU is replaced.
	
	   a. Hot-swap hard disk drive carrier address cable.
	   b. Hot-swap hard disk drive carrier.
	   c. Hot-swap hard disk drive.
	   d. Backplane.

One manual-plug device is not available to the system.	1. **Verify that all cables are properly connected.**
	
	2. Send the command from the system to start the drive.
	
	3. If the manual-plug device is still not available to the system, exchange the FRUs in the following order; then run the system diagnostics after each FRU is replaced.
	
	   a. Interposer on the manual-plug tape drives.
	   b. Manual-plug device.
	   c. Internal SCSI cable.

Parts Listing
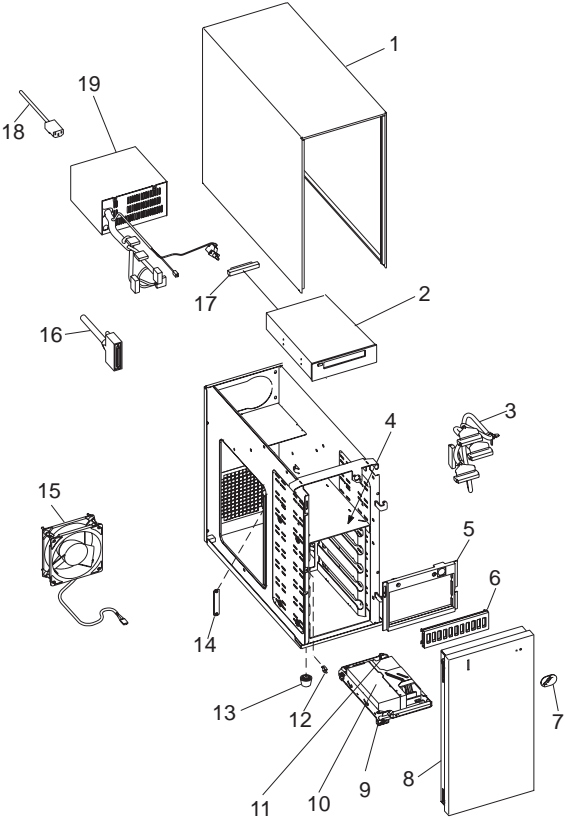
Index	SCSI Multi-Storage Enclosure (Type 3517)	
1	Top Cover Assembly	05H4680
	Screws, Top Cover Assembly (4 each)	27H2338
2	4GB/8GB 4-mm Tape Drive	16G8454
	Screws, 4-mm Tape Drive (4 each)	27H2338
3	SCSI Cable Assembly, Internal	05H4827
	Screw-locks, SCSI Cable (2 each)	27H0863
	Cable Tie	1159519
4	Backplane Assembly (with 5-bay, hot-swap cage)	26H9180
	Screws, Backplane Assembly (8 each)	27H0840
5	Control Panel Assembly	26H9191
6	Blank Media-Bay Panel	06H2187
7	IBM Logo	44H7627
8	Front Cover Assembly	26H9206
9	16-Bit Power Carrier, Hot-Swap Hard Disk Drive	06H8631
	Screws, Hot-Swap Hard Disk Drive to Carrier (4 each)	1147429
10	16-Bit 1.1GB Hot-Swap Hard Disk Drive	06H8560
	16-Bit 2.2GB Hot-Swap Hard Disk Drive	06H8561
	16-Bit 4.5GB Hot-Swap Hard Disk Drive	06H8563
11	Cable, 16-Bit Address, Disk Drive to Carrier	06H8631
12	Latch	26H9207
13	Feet (4 each)	26H9234
	Screws, Feet (4 each)	49G5445
14	Blank SCSI Panel	27H0862
	Screws, Blank SCSI Panel (2 each)	27H2338
15	Fan Assembly, includes Isolators and Finger Guard	27H0922
	Cable Tie	1159519
16	SCSI Fast/Wide 1X Cable	06H3231
	SCSI Wide 1X Cable	70G9857
17	Interposer, 2 x 25 to 68 Pin	92F0324
18	Power Cord (See page 422.)	
19	Power Supply	26H9205
	Screws, Power Supply (4 each)	34H8186
	Screws, Power Switch (2 each)	34H8186
	Cable Tie	1159519
	Media Kit, 4GB/8GB 4-mm Tape Drive	8191149

- 4GB/8GB 4-mm Tape Drive Data Cartridge (8191160)
- 4GB 4-mm Tape Drive Diagnostic Cartridge (8191146)
- 4-mm Tape Drive Cleaning Cartridge (21F8763)

Power Cords

Arabic	14F0033
Belgium	13F9979
Bulgaria	13F9979
Czechoslovakia	13F9979
Denmark	13F9979
Finland	13F9979
France	13F9979
Germany	13F9979
Hungary	13F9979
Israel	14F0087
Italy	14F0069
Latvia	13F9979
Netherlands	13F9979
Norway	13F9979
Poland	13F9979
Portugal	13F9979
Serbia	13F9979
Slovakia	13F9979
South Africa	14F0015
Spain	13F9979
Switzerland	13F9979
Switzerland (French/German)	14F0051
U.S. English	6952301
U.K./Ireland	14F0033
Yugoslavia	13F9979

PC Server Enterprise Expansion Enclosure - Type 3518

Features

Expansion Bays

- 20 drive bays, 18 of which are hot-swap bays

Options Supported

- Up to 18 slim-high or 9 half-high hot-swap hard disk drives (1 GB, 2 GB, and 4 GB)
- Tape autoloader
- 4/10 GB 3.5 Inch DAT tape drive
- CD-ROM drive

Security Features

- Bolt-down capability
- DASD Door lock
- Security cover (optional)

Information Panel

- Two 16-character lines
- LCD display of diagnostic and status information

Integrated Functions

- LED usability support

Power Supply

- 470-watt with automatic range voltage selection (115-230 V ac)
- Built-in overload and surge protection
- Power supply upgrade expansion option
    - 220-watt automatic range voltage selection
    - Built-in overload and surge protection

Diagnostics and Test Information

The following is a list of problems and references for diagnosing the Type 3518 Expansion Enclosure.

Problem	Reference
Error Codes/Error Messages	"Symptom-to-FRU Index" on page 446
Hot Swap Drives	"Hot Swap Tray (FRU No. 06H8631, 07H0774)" on page 441
Hot Swap Tray LED indications	"Hot Swap Tray (FRU No. 06H8631, 07H0774)" on page 441
Power Supply Voltages	See "Power Supplies" on page 428

Additional Service Information

The following information is for the PC Server Enterprise Expansion Enclosure - Type 3518

- "Power-on Self-Test (POST."
- "Power-on Sequence."
- "Power Supplies" on page 428.
- "Specifications" on page 432.
- "Systems Supported" on page 433.

Power-on Self-Test (POST

Each time the expansion enclosure is powered on, it performs a series of tests called the power-on self-test, or POST. If the tests detect a problem, an error/message appears on the information panel. If you suspect a problem or an error/message appears, refer to "Symptom-to-FRU Index" on page 446.

Power-on Sequence

> **Note**
>
> The expansion enclosure can be powered on without connecting it to a server. However, the expansion enclosure must be connected to a server before the drives installed in the enclosure can be used.

To power-on the expansion enclosure, do the following.

1. Locate the keys; then unlock and open the door on the front of the expansion enclosure.
2. If the server is powered-on, power it off.
3. Lift the transparent Power Enable Switch cover on the front panel and press the Power Enable Switch; the Power OK indicator will illuminate.
4. Then, press the Power On/Off switch (located just above the Power Enable Switch). The information panel will display IBM 3518.
5. Power-on the server. The *power-on self-test (POST)* begins.
6. Check the monitor connected to the server. The screen displays the IBM logo and a number that represents the amount of available server memory. The server beeps once to indicate that it is working properly.

Notes

1. If you hear more than one beep or no beep, check the monitor and the information panel.
2. If an error message appears on the information panel or the expansion enclosure stops running during testing or normal operation, see "Symptom-to-FRU Index" on page 446.
3. If an error message appears on the monitor screen, the monitor screen is blank, or the server stops during normal operation, refer to the diagnostic information for the server.

Power Supplies

Attention

Always unplug the power cord and wait two minutes before replacing the power supply to give the power supply capacitors time to discharge.

The expansion tower is shipped with a primary power supply. An additional or optional power supply can be added to the computer. Connectors are used to transfer the primary power supply voltages and signals from the primary power supply to the optional power supply. The following illustrations show how the two power supplies are connected.

Attention

When replacing the primary power supply cover plate, rotate the plate 180°. (This will leave an opening for the primary power supply connector cable that connects to the optional power supply.) Failure to do so will cause the power supply connector cable to be crimped when the plate is replaced.

Note

Tabs are located on the side of each power supply to secure them together.

Power Supply LED and Button: The
power-good LED and button are located on the side of the primary power supply button. The LED (when lit) indicates that the power supply is good. If the LED fails to come on when the computer is powered-on, do the following:

* While observing the LED on the power supply, press the power supply button. If the LED fails to light (while you are holding the button in), you may have a defective power supply. If the LED lights when the button is pressed, go to "Power Supply Shutdowns" on page 431.

Primary Power Supply Voltages:

If the voltages are correct and the power supply fan runs, the power supply is OK.

Connector P1

Key
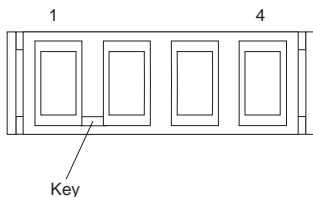
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
4	1	+ 4.8	+ 5.25
4	2	+ 4.8	+ 5.25

Connector P2, P2A

Key
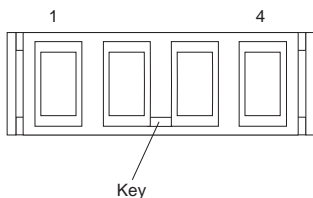
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
4	1	+ 3.3	+ 3.5
4	2	+ 3.3	+ 3.5

Connector P3

−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2	4	+ 11.52	+ 12.6
2	5	+ 11.52	+ 12.6
2	8	- 10.8	- 13.2
2	10	+ 4.8	+ 5.25

Connector P4, P5, P6, P7, P8, P9, P10
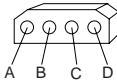
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
B	A	+ 4.8	+ 5.25
B	D	+ 11.52	+12.6

Optional Power Supply Drive Connector

Voltages: If the voltages are correct and the power supply fan runs, the power supply is OK.
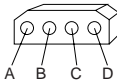
−Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
B	A	+ 4.8	+ 5.25
B	D	+ 11.52	+12.6

Power Supply Shutdowns: If the power supply shuts down, or *appears* to fail at power-on, you might have one of the following problems:

- Too many devices are set to start instantly. See "Setting the Motor-Start Jumper" on page 549.
- There are too many large-capacity devices installed (such as hard disk drives). The nominal operating current of the devices installed collectively exceeds the available current of the power supply. See the "Personal System/2 Installation Planning" guide (form number S41G-2927) for more information.

Also ensure that the fans operate when the machine is powered on.

--- **Note** ---

Verify that the voltage-select switch (if applicable) is set for the correct voltage.

If the voltages are correct and the Symptom-to-FRU index does not solve the problem, go to "Undetermined Problems" on page 552

Specifications

Size

- With pedestal:
  - Depth: 635 mm (25 in.)
    835 mm (32.8 in.) with cable cover
  - Height: 635 mm (25 in.)
  - Width: 247 mm (9.75 in.)

Weight

- Minimum configuration as shipped: 29.1 kg (64 lb)

Environment

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

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour
  - Minimum configuration: 150 BTU (44 watts)
  - Maximum configuration: 3600 BTU (1055 watts)

Electrical Input

- Sine-wave input (50 to 60 Hz is required)
- Input voltage
  - Low range
    - Minimum: 90 V ac
    - Maximum: 137 V ac
  - High range
    - Minimum: 180 V ac
    - Maximum: 265 V ac
  - Input kilovolt-amperes (kVA) approximately
    - Minimum configuration as shipped: 0.16 kVA
    - Maximum configuration: 1.0 kVA

Total Power Available for Drives

- Nominal operating current allowed:
  - +5 V dc line: 7.5 A base; 20.5 A with upgrade
  - +12 V dc line: 4.7 A base; 17.7 A with upgrade

Systems Supported

There are two requirements for system units to support the PC Server Enterprise Expansion Enclosure (Type 3518). The requirements are:

1. Code to support up to 4 or more SCSI adapters
2. Already support 68 pin SCSI-2 adapters

The systems currently supported are:

- Model 85
- Model 95
- Server 300
- Server 320
- Server 500
- Server 520
- Server 720
- Any future servers that meet the above requirements.

Locations

DASD Door
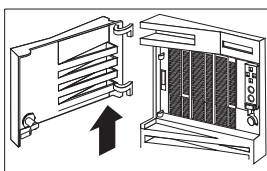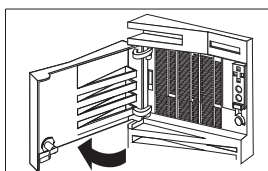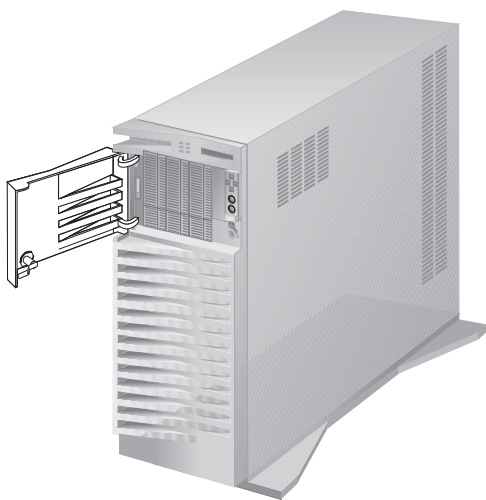
Expansion Bays
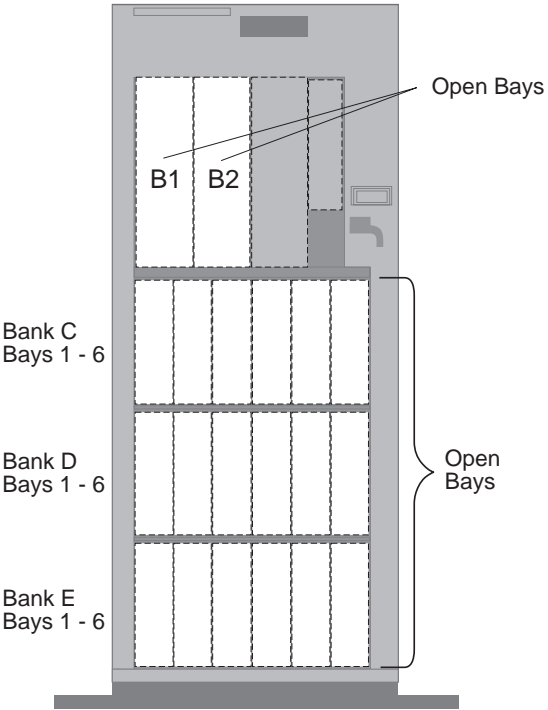
Bays/Banks	Supported Devices
Bays B1 and B2	CD-ROM drives, internal SCSI hard disk drives, or tape drives
Banks C, D, and E	Up to 18 SCA, hot-swap, 3.5-inch hard disk drives

Front Cover

Front Panel Controls

Enter Button
Power On/Off Button
Power Enable Switch

Identification Numbers

Serial Number
Machine Type/Model
Handle

Key Tag
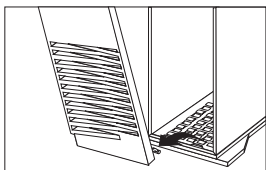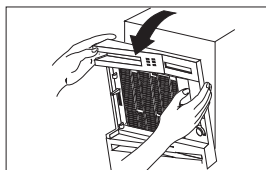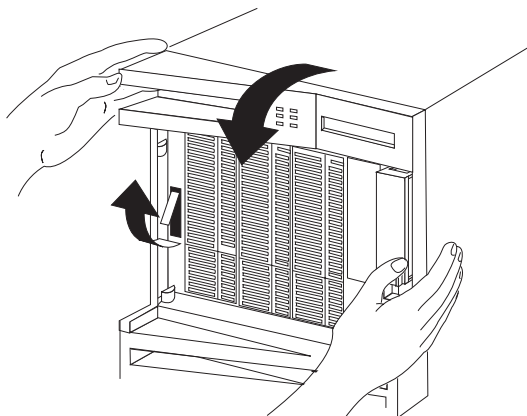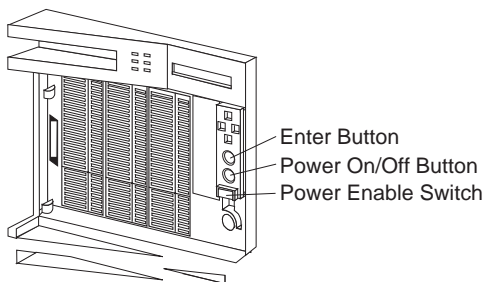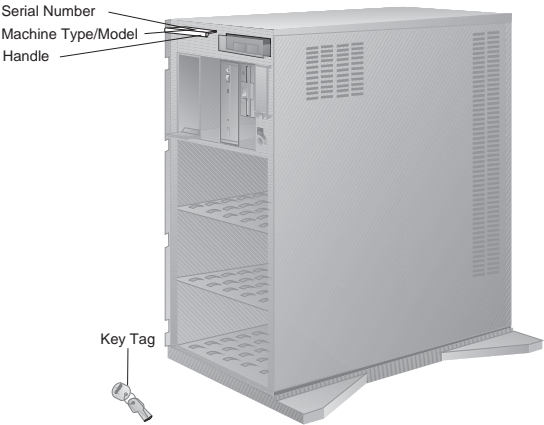
Input/Output Connectors

Note

The following illustration shows the rear view of the Type 3518 Expansion Enclosure.

SCSI Connector
Knockouts

SCSI Connector

Power Connector

Hot Swap Backplane (FRU No. 06H8629)

Chaining
Connector

Hot-Swap Drive
Connectors

System Status
Connector

SCSI-2
Connector

Power Connectors

ID 0   ID 1   ID 2   ID 3   ID 4   ID 5

SCSI ID

SCSI-2 Input
Connector

J1

J9

J2
J12

Power Connectors

SCSI-2 Output
(Daisy-Chain)
Connector
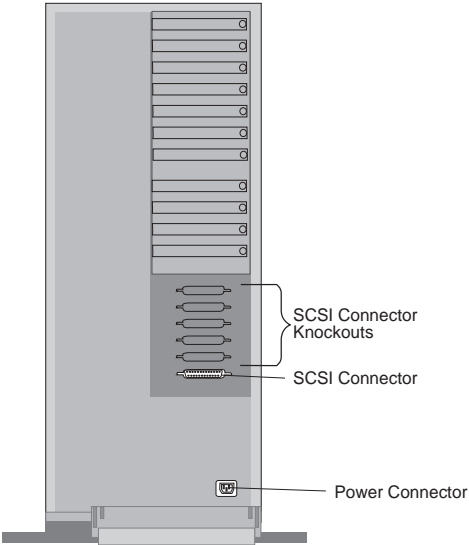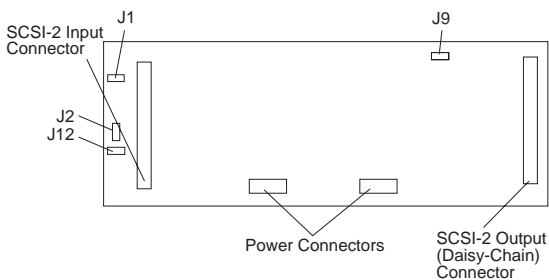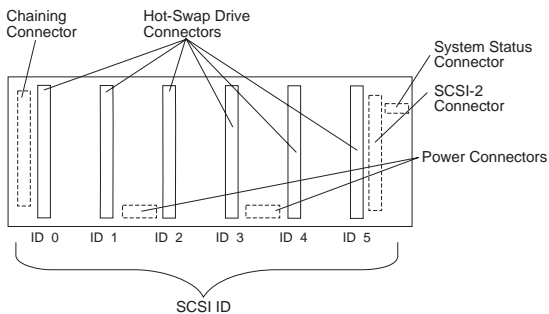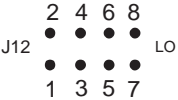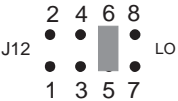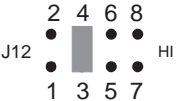
J12 Backplane SCSI ID Jumper Settings:

The Backplane SCSI ID Address Jumper, a pin block with four pairs of pins (J12), is located on the rear of the backplanes in banks C, D, and E. When two backplanes are daisy-chained in the enclosure, the first backplane address jumper (for example, Bank C) must be set to LO, defining the SCSI IDs as 0 through 5. The second backplane (in this example, bank D), must be set to either Reverse, defining the SCSI IDs as 5 through 0, or HI, defining the SCSI IDs as 8 through D. The default, no jumper installed, is to set the addresses to LO.

If the SCSI adapter supports more than eight SCSI devices per SCSI channel, the second backplane can be set either HI or Reverse. However, if the SCSI adapter supports eight or less SCSI devices per channel, the second backplane must be set to Reverse.

The following jumper settings are for SCSI ID jumper J12.

Jumper Position	Description
J12 2 4 6 8 • • • • LO • • • • 1 3 5 7	Sets SCSI IDs to low, starting from 0 (bay 1) to 5 (bay 6)
J12 2 4 6 8 • • ▮ • LO • • ▮ • 1 3 5 7	Sets SCSI IDs to reverse, starting from 5 (bay 1) to 0 (bay 6)
J12 2 4 6 8 • ▮ • • HI • ▮ • • 1 3 5 7	Sets SCSI IDs to high (SCSI IDs 8 to D)

Hot Swap Tray (FRU No. 06H8631, 07H0774)

Notes

1. The following trays are shown with drives installed.
2. Each hot-swap drive installed must have a Hot Swap Drive Tray attached.
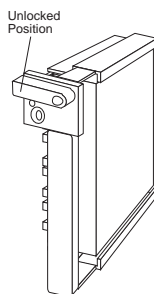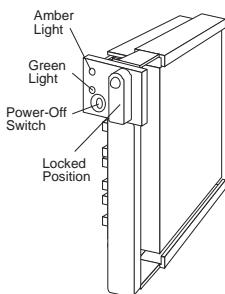
The Hot Swap Drive Tray for the expansion enclosure has a small switch that stops the movement of the disk drive. The tray also provides two LEDs (one green and one amber) to indicate the current state of the drive and tray. The following table summarizes the LED states on the hot-swap tray and their meanings.

Green	Amber	Description
On	Off	The Drive tray is powered on; the hard disk drive is inactive; and the drive should *not* be removed.
Blinking	Off	The hard disk drive is inactive. The hot-swap drive can be removed safely.
On	On or Blinking	The hard disk drive is in use, and should *not* be removed.
Off	Off	The drive is defective, or no power is being supplied to the drive. The hot-swap drive can be removed safely.

Front Panel LED Status Indicators

Power OK Indicator

Power Enable Indicator

All Subsystems
Good Indicator

Processor Complex
Error Indicator

Information Panel
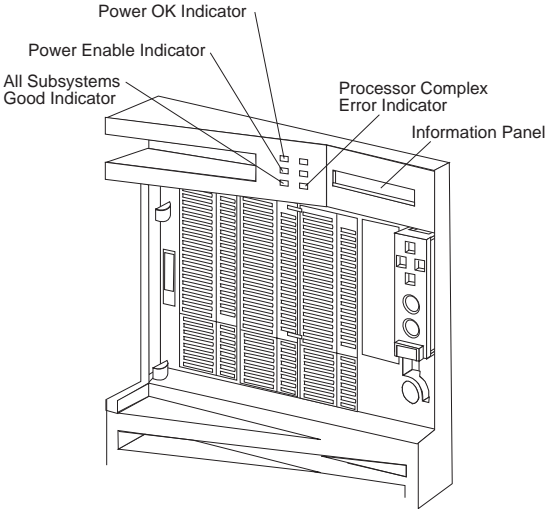
Side Cover
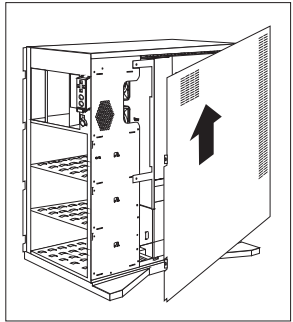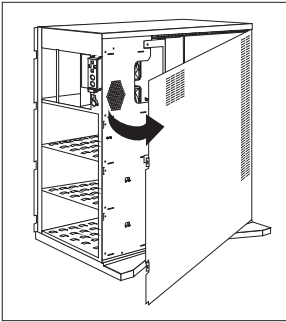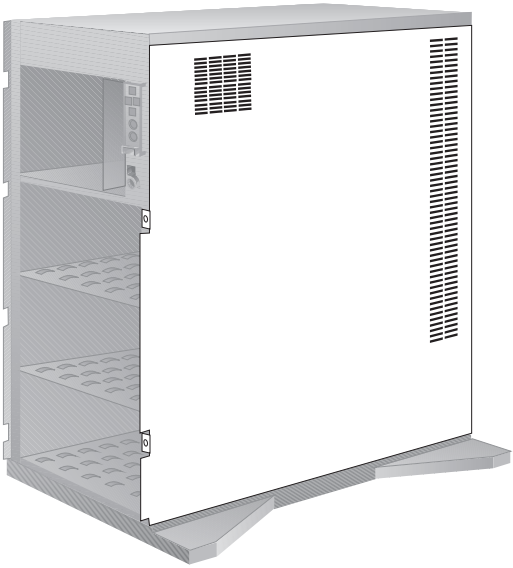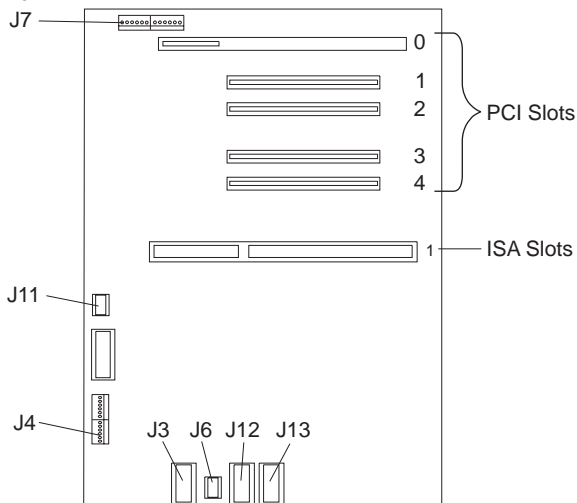
System Board

System Board Connections

Connector	Description	Connect To
J3	Power Supply Connector	P1
J6	Power Supply Connector	P3
J7	Operator Panel Connector	Operator Panel
J12	Power Supply Connector	P2
J13	Power Supply Connector	P2A

Note

The following slots/connectors on the system board are not currently supported.

Slots/Connectors	Description
PCI Slot 0	64 Bit PCI connector
PCI Slots 1 to 4	32 Bit PCI connectors
ISA Slot 1	System Maintenance Adapter for Reporting Trouble (SMART) ISA Card
J11	C2 Security Connector

U-Bolt Security (Optional)
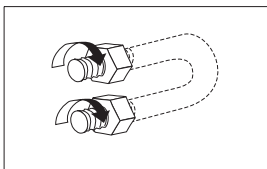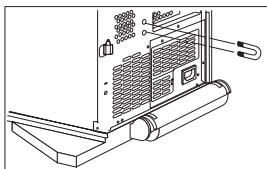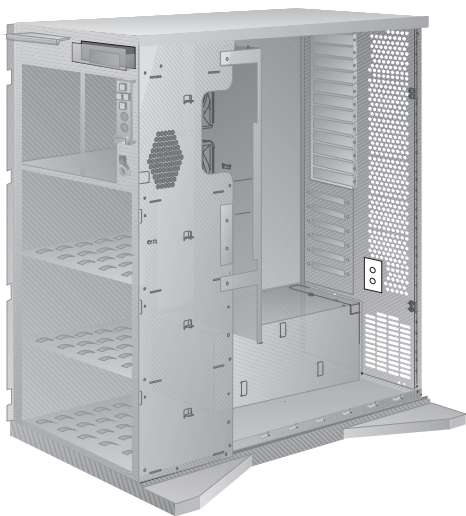
Symptom-to-FRU Index

This index supports the PC Server Enterprise Expansion Enclosure (Type 3518).

The system management subsystem consists of a main processor that acts as the controller. The controller monitors the system temperature, the power supply, the fan rotation, and the system voltages. If a non-fatal error is detected, an error code or error message is displayed on the information panel. Fatal errors are logged to the system EEPROM and displayed at the next power-on.

Use this Symptom-to-FRU Index to help you decide which FRUs to have available when servicing the expansion enclosure.

For information on:	Go to:
Power supply problems	"Power Supplies" on page 428

Error Code/Symptom	FRU/Action
E700 AC Failure (Power lost while the enclosure was running. The error is displayed the next power-on.)	1. **Power Cord** 2. Power Supply
E701 Power Supply (Redundant power supply indicates a bad condition. Error is non-fatal and can be cleared by pressing the front panel Enter button.)	1. **Power Supply**
E702 5V Failure (Enclosure 5V input is low or too high. If too low, non-fatal error is written to the information panel. If to high, enclosure is shutdown and the error is displayed the next power-on.)	1. **Power Supply** 2. System Board (Planar)
703 12V Failure (Enclosure 12V input is low or too high. If too low, non-fatal error is written to the information panel. If to high, enclosure is shutdowns and the error is displayed the next power-on.)	1. **Power Supply** 2. System Board (Planar)

Error Code/Symptom	FRU/Action
E704 Fan Failure (In a non-fatal situation , a fan has failed. If multiple fans fail, the enclosure is shutdown and the enclosure will not run until the failure is corrected.)	1. **Fan** 2. System Board (Planar)
E705 Overheat (Power supply overheated and the enclosure was shutdown.)	1. **Power Supply** 2. Fan 3. System Board (Planar)
Blank information panel (If the Power OK indicator is on and the fans are running, operation will probably not be affected. However, no diagnostic errors/messages will be displayed.)	1. **Information Display Cable** 2. Information Display Assembly 3. System Board (Planar)
No power (Be sure the power cords and cables are properly plugged in, the expansion enclosure is properly enabled and powered on, and the electrical power source is active.)	1. **Power Cord** 2. Power Supply

Parts Listings
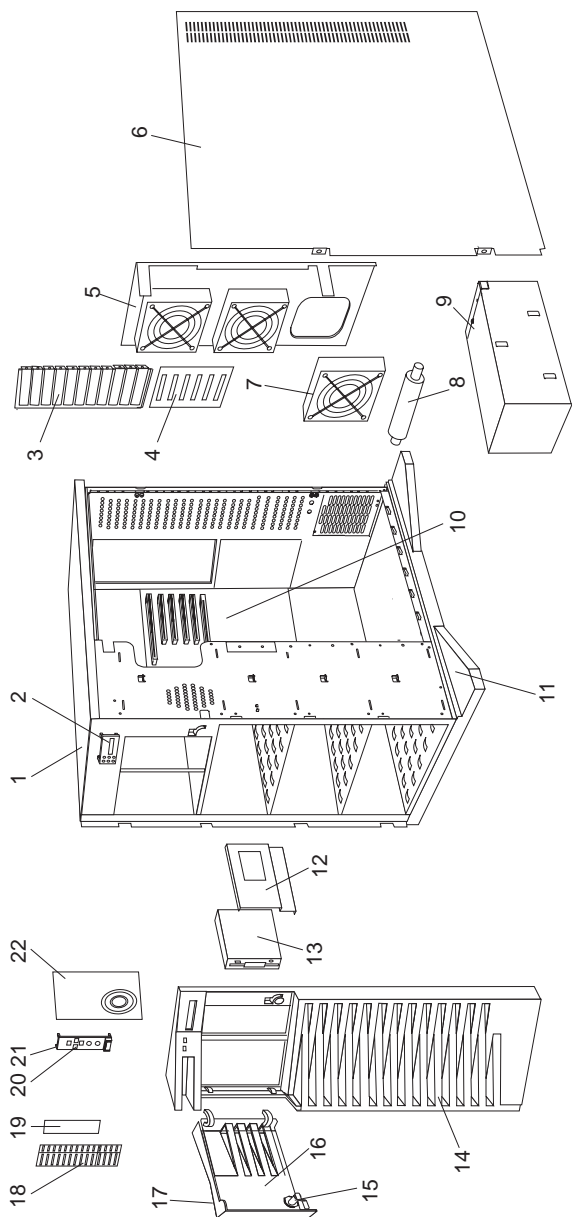
Index	System Unit (Type 3518)	
1	Base Frame (4X CD-ROM)	06H8685
2	Information Display Assembly	82G3614
	Display Panel Support	06H7961
3	I/O Panel Die Cast	06H8657
	(Additional Micro Channel Blanks)	
4	I/O Flex Plate	06H8627
5	Fan Mounting Support	82G3618
6	Right Side Door	82G3594
7	Fan Assembly	82G3616
8	Pedestal Wheel	82G3609
9	470 Watt Power Supply	06H3589
	220 Watt Power Supply Upgrade	06H3237
10	System Board (Planar)	06H8625
11	Pedestal	82G3608
12	DASD Tray - Hot Swap (Wide)	06H8631
12	DASD Tray - Hot Swap (Narrow) - Optional	07H0744
	(for Option 70G8492)	
13	Hard Disk Drive - Optional	
14	Front Bezel with Shield (4X CD-ROM)	06H9379
15	Keylock with Keys	82G3606
16	DASD Door	82G3596
17	IBM Logo (Restricted)	82G3601
18	5.25-Inch Blank Bezel (4X CD-ROM)	06H8684
19	Diskette Drive Bezel	06H8670
20	Rubber Dome Switch Pad	06H7873
21	Control Panel Bezel	82G3607
22	Control Panel Card Assembly	75H7652
	4 mm DAT Autoloader - Optional	06H7514
	Control Panel Cable Jumper	06H8663
	DASD Mounting Plate	82G3602
	Hinges with Screws	82G3600
	Hot Swap Back Plane Assembly	06H8629
	Hot Swap Cam Spring, Shaft/Knob	07H0498
	Miscellaneous Parts Kit	82G3611

- Screws (4 each)
- Lock Pawl (1 each)
- EMI Ground Clip (4 each)
- System Board Mounting Clip (2 each)
- C2 Spring (1 each)

	Miscellaneous Parts Kit (Blackplane)	07H0745

- Jumpers (4 each)
- Screws (4 each)
- Standoff (4 each)

Power Cord (see "Power Cords" on page 451)

Cables (Type 3518)
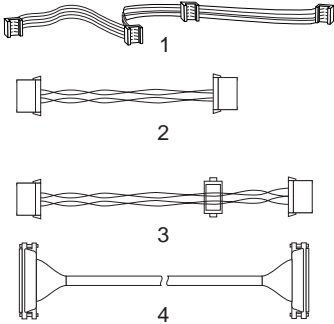
Index Cables (Type 3518)

1	System Status Cable 1X4	82G3617
	(with 4 connectors)	
2	Hard Disk Drive Power Cable 2X	06H8640
	(with 2 connector)	
3	Hard Disk Drive Power Cable 2X Short	06H8641
	(with 2 connectors)	
4	SCSI-Fast/Wide Cable 1X Short	06H7957
	(with 1 connector)	
	C2 Cable with Switch	82G3612
	Fan Cable Assembly	06H7870
	Information Display Cable	06H8679
	Hot Swap Back Plane Chaining - Optional	06H8644
	DASD ID Cable - Optional	07H1696
	(for Option No. 96G3055, 94G3057, 94G3052)	
	DASD ID Cable	06H8664
	(for Option No. 71G9743)	
	4X Non-Hot Swap SCSI Cable - Optional	06H8647

Power Cords

Power Cords	
Arabic	14F0033
Belgium	13F9979
Bulgaria	13F9979
Czech Republic	13F9979
Denmark	13F9997
Finland	13F9979
France	13F9979
Germany	13F9979
Hungary	13F9979
Israel	14F0087
Italy	14F0069
Latvia	13F9979
Netherlands	13F9979
Norway	13F9979
Poland	13F9979
Portugal	13F9979
Serbia	13F9979
Slovakia	13F9979
South Africa	14F0015
Spain	13F9979
Switzerland	13F9979
Switzerland (French/German)	14F0051
U.S. English	62X1045
U.K./Ireland	14F0033
Yugoslavia	13F9979

Related Service Information

Important

The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that are familiar with the computers, functions, terminology, and service information provided in this supplement and the PS/2 Hardware Maintenance Manual (part number 83G8990, form number S52G-9971-02).

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Safety Information

The following section contains the safety information that you need to be familiar with before servicing an IBM mobile computer.

General Safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
    1. Ensure you can stand safely without slipping.
    2. Distribute the weight of the object equally between your feet.
    3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
    4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 16 kg (35 lb) or objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

    Remember: Metal objects are good electrical conductors.

- Wear safety glasses when you are: hammering, drilling soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.

Electrical Safety

Observe the following rules when working on electrical equipment.

> **Important**
>
> Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.
>
> Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing main units
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the off position.
- If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.

    Remember: Another person must be there to switch off the power, if necessary.
  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

    Remember: There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.
  - When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
  - Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

  Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered-off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts *with the power on* when they are removed from their normal operating places in a machine:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generators

  and similar units. (This practice ensures correct grounding of the units.)
- If an electrical accident occurs:
  - **Use caution; do not become a victim yourself.**
  - **Switch off power.**
  - **Send another person to get medical aid.**

Safety Inspection Guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of non-IBM features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock).
- Explosive hazards, such as a damaged CRT face or bulging capacitor
- Mechanical hazards, such as loose or missing hardware

The guide consists of a series of steps presented in a checklist. Begin the checks with the power off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord.
3. Check the power cord for:
    a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
    b. The power cord should be the appropriate type as specified in the parts listings.
    c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling Electrostatic Discharge-Sensitive Devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). 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.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.

2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

   Note: The use of a grounding system is desirable but not required to protect against ESD damage.

   - Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
   - Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
   - Use the round ground-prong of the AC plug on AC-operated computers.

Grounding Requirements

Electrical grounding of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Battery Notice

```
─ CAUTION ─
```

Pour éviter tout risque d'explosion, remplacez la pile
selon les instructions du fabricant qui en définit les
équivalences. Ne cherchez pas à la démonter ou à la
recharger. Ne l'exposez ni au feu, ni à l'eau. Ne la
mettez pas en court-circuit. Pour le reyclage ou la
mise au rebut des piles usagées, conformez-vous à la
réglementation en vigueur.

Die Batterie kann bei unsachgemäßem Austauschen
explodieren. Eine verbrauchte Batterie nur durch eine
gleichwertige, vom Hersteller empfohlene Batterie
ersetzen. Die Batterie nicht zerlegen, wiederaufladen
oder kurzschließen. Die Batterie vor Feuer und Nässe
schützen. Bei der Entsorgung der aufladbaren
Batterie die örtlichen Richtlinien für Sondermüll sowie
die allgemeinen Sicherheitsbestimmungen beachten.

Se la batteria è sostituita in modo non corretto
potrebbe esserci pericolo di esplosione. Si
raccomanda di sostituirla con una batteria dello stesso
tipo o equivalente. Non smontarla, ricaricarla, gettarla
nell'acqua o nel fuoco, o cortocircuitarla. Smaltire la
batteria secondo la normativa in vigore (DPR 915/82,
successive disposizioni e disposizioni locali).

Hay peligro de explosión si la batería se sustituye
incorrectamente. No la desmonte, recargue, eche al
fuego o al agua, ni la cortocircuite. Deseche la batería
tal y como disponga la normativa local.

Danger of explosion if battery is incorrectly replaced.
Replace only with the same or equivalent type
recommended by the manufacturer's instructions. Do
not disassemble it, recharge it, throw it into fire or
water, or short-circuit it. Dispose of the battery as
required by local ordinances or regulations.

Disk Array Configuration

The following information contains step-by-step procedures
to perform the tasks necessary to configure, add, change,
or delete one or more disk arrays. The hard disk drive in
disk-array model comes configured as one logical drive.

- To view the disk-array configuration, go to "Viewing
  the RAID Configuration" on page 468.
- To create a disk array, go to "Creating a Disk Array"
  on page 469.
- To backup the disk-array configuration, see "Backing
  Up the Disk-Array Configuration" on page 483.

Device Drivers

The RAID adapter requires the installation of device drivers. See the README file on the SCSI-2 Fast/Wide PCI-Bus Adapter Configuration Option Diskette for detailed instructions.

If you install an operating system from the ServerGuide CD, the device drivers will be installed automatically. If, however, you install an operating system from diskettes, you will need to install the device drivers. See the README file on the RAID Adapter Option Diskette for installation instructions.

Administration Monitoring Utilities

The RAID Adapter Option Diskette contains RAID monitoring utility programs for several operating systems that the disk-array system supports. The monitoring programs are:

- OS/2 RAID Controller Administration and Monitor
- OS/2 RAID NetFinity Alert Manager
- OS/2 RAID Controller Administration for Novell NetWare
- IBM RAID Controller Administration for Banyan VINES

These programs include many of the functions contained in the IBM RAID configuration program, but unlike that program, they reside on top of the operating system and do not require you to start the program from a startable diskette or from a startable compact disc. You can start these programs from the active operating system desktop.

Each of these monitoring programs allows you to view the RAID configuration, reconfigure the array when replacing a defunct drive, and perform tuning tasks such as changing the write policy.

To monitor the drive status with OS/2, NetWare, Microsoft Windows, and VINES, you must be running the administration programs. The RAID Adapter Option Diskette contains files that you must install when you run OS/2, NetWare, or VINES.

See the README file on the RAID Adapter Option Diskette for installation and use instructions for these monitoring utilities. For OS/2 RAID NetFinity Alert Manager, also see the ServerGuide CD documentation supplied with the server.

RAID Technology: RAID is the technology of grouping several hard disk drives in a server into an *array* that can be defined as a single logical drive. This *logical* drive then appears to the operating system as a single *physical* drive. This grouping technique greatly enhances logical-drive capacity and performance. In addition, if one

of the hard-disk drives fails (becomes defunct) the system continues to run, with no operator intervention required, at reduced performance.

Hard Disk Drive Capacities: With a server, it is important to understand the implications of hard disk drive capacities and how they influence the way you create disk arrays. Different capacity drives are treated as if they all have the capacity of the smallest disk drive. Therefore, if you have four drives of 1GB, 1GB, 1GB, and 2GB grouped in one disk array, the total capacity of the array is 1GB times 4, or 4GB (instead of the 5GB physically available).

Note

The total capacity of the array without protection would be 4GB. With RAID level 5, the usable data capacity would be 3GB.

Additional Storage Capacity: When hard disk drives are added to the server, you must configure a new disk array before the drives can be used. Either reconfigure the existing disk array to include the capacity offered with the added drives, or group the added drives into their own array (see "Creating a Disk Array" on page 469). You also can create an array with only one drive.

The RAID Configuration Program Screens:

When you configure or view the disk array you will be using the IBM RAID configuration program on the SCSI-2 Fast/Wide PCI-Bus Adapter Configuration Option Diskette (also called the IBM RAID Adapter Option Diskette). The following figure is a compilation of many of the IBM RAID Controller Disk Array Configuration (also called the IBM RAID configuration program) screens followed by an explanations of the numbered areas of the figure.

```
                IBM RAID Controller Disk Array Configuration Ver. 3.00
                           Adapter in Slot 4 (1.98)
  ┌Enter Size┐
  │of Logical│   ┌──────── Create/Delete Array ─────────┐      ┌─ Ch 1 ─┐   ┌─ Ch 2 ─┐
  │Drive.(MB)│   │                                       │      │        │   │        │
  │          │   │ 1. Help                               │      │ ┌Array┐ │   │ ┌Array┐ │
  │:    3840 │   │ 2. Define hot-spare drive             │      │ ┌Bay─┐ │   │ ┌Bay─┐ │
  │          │   │ 3. Delete disk array                  │      │1 └ONL┘ A│   │1 └ONL┘ B│
  └──────────┘   │ 4. Create disk array                  │      │         │   │         │
                 │ 5. Define Logical drive               │      │2 └ONL┘ A│   │2 └ONL┘ C│
                 │ 6. Exit                               │      │         │   │         │
  ┌Arr Array┐    │                                       │      │3 └ONL┘ A│   │3 └ONL┘ C│
  │ID Size(MB)│  │ Log Size RAID  Date                   │      │         │   │         │
  │A   5760  │   │ Drv (MB) Level Created Status          │      │4 └ONL┘ B│   │4 └ONL┘ D│
  │B   5760  │   │ A0  1500 RAID-5 03/24/94 Good    WT    │      │         │   │         │
  │C   3840  │   │ A1  1500 RAID-0 03/24/94 Good    WT    │      │5 └ONL┘ B│   │5 └ONL┘ D│
  │D   5760  │   │ A2  1005 RAID-1 03/24/94 Good    WT    │      │         │   │         │
  │          │   │ B0  1500 RAID-5 03/24/94 Good    WT    │      │6        │   │6 └ONL┘ D│
  │          │   │ B1  3510 RAID-0 03/24/94 Good    WT    │      │         │   │         │
  │          │   │ C0  1500 RAID-0 03/24/94 Good    WB    │      │7        │   │7 └HSP┘  │
  │          │   │ C1  1170 RAID-1 03/24/94 Good    WT    │      └────────┘   └────────┘
  └──────────┘   └───────────────────────────────────────┘
  Enter a value greater than 2 and less than the default value shown or 32*1024
  whichever is lesser, and press Enter, Esc to quit form.
```

1. This pop-up allows you to select the RAID level you
   want to assign to the logical drive you are defining,
   and it allows you to select the logical drive size. You
   can enter the size, in megabytes, or you can accept
   the default value shown.

   When you need to confirm an action, the Confirm
   pop-up appears in this area.

2. You can select any of the choices that appear on the
   menus.

3. The Bay/Array selection list shows each bay in the
   server (for each channel) numbered 1 through 7. The
   abbreviation in the bay indicates the status of the
   drive installed in the bay. Selections are made from
   this list to determine which bays (hard disk drives) are
   in the arrays. The letter to the right of the bay
   identifies the array in which the hard disk drive in that
   bay is grouped.

   ┌─ **Note** ─────────────────────────────────────┐

   The Channel/Bay/Array area on the screen does
   not reflect the physical configuration of the
   server. The hot-swappable hard disk drives are
   numbered 1 through 6 (from top to bottom).

   └──┘

4. The Array list indicates the array ID and the size (in
   megabytes) of the array. When a drive is being
   rebuilt, this area, along with the Logical Drive list
   area, shows the progression of the rebuilding
   process.

5. The Logical Drive list identifies the logical drive (for
   example, A1), the size of the logical drive, the RAID
   level assigned to the logical drive, the date it was
   created, and the write policy.

   The status of the logical drive is also shown.

Good means that all is well with the drive.
Critical means that you must replace the drive or do a rebuild operation. (You will have received a message telling you the drive is in a **Critical** state.)
Offline means that the logical drive is unrecoverable; the data in that drive is lost.

When a drive is being rebuilt, this area, along with the Array list area, shows the progression of the rebuilding process.

During an initialization process, the Write Policy area displays the percent initialized; during a synchronization process, it displays the percent synchronized.

6. The information area tells you the action you can perform on this screen or pop-up.

Starting the RAID Configuration Program

To start the RAID configuration program, insert the IBM RAID Adapter Option Diskette into the primary diskette drive and power-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**. From the PC DOS start-up menu, select **Start RAID Configuration Program**, then press **Enter**.

If you have more than one RAID adapter installed, you will get an adapter selection screen similar to the following; otherwise, the Main Menu appears.

```
  Notes

  1.  The version numbers and slot numbers on the
      screens might be different.
  2.  The primary diskette drive is the first diskette
      drive that the system tries to start from.
```

```
Vendor ID     : IBM
Model         : DFHSS2W 17170014
Version       : 6728
Capacity      : 2150 MB
Soft Error    : 229
Hard Error    : 62
Misc          : 91
```

You can select **Help** from any menu. To return to the previous screen or to the previous work area of a screen, press **Esc**. To select a menu item, press the number of the item or use the Up Arrow (↑) key or Down Arrow (↓) key to highlight the item, then press **Enter**.

```
                IBM PC ServeRaid Adapter Disk Array Configuration Ver. 1.XX
                    Adapter Bus: 0  Host: 2 ID ─ Null Configuration

   ┌────────────────────────────────────┐
   │Select Configuration Source         │
   ├────────────────────────────────────┤
   │1. Flash EEprom as Source           │
   │2. NVRAM as Source                  │
   │3. NVRAM+POCL as Source             │
   │4. Hard Disk Drive-HDD as Source    │
   │5. HDD as Source with Rearrange     │
   │6. Specific HDD as Source           │
   │7. Exit                             │
   └────────────────────────────────────┘




   Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter.
   Press escape to return to previous menu.
```

The Main Menu contains the following choices:

- **Help:** Select this choice when you need additional information.
- **View configuration:** Select this choice to see the existing disk array configuration.
- **Create/delete array:** Select this choice to define a hot-spare drive, to select the drives for an array you want to create, or to delete an existing array. The Create/delete array screen also has choices for defining a logical drive and formatting a drive.

    Whenever you make changes to the disk-array configuration and select **Exit**, the Confirm pop-up window will appear. You must select **Yes** to save and activate the changes.

- **Initialize/synchronize array:** Select this choice after creating an array to:
  - Set the drive to a predetermined value. For proper operation of RAID levels 1 and 5, you *must* select Initialize/synchronize array. Any data existing on the drive is overwritten with zeros, and the corresponding parity information is initialized to the correct value.

    You can choose to initialize more than one logical drive at a time. Also, you can interrupt the initialization process at any time by pressing **Esc**. Then, you can either restart the initialization process by pressing **Enter**, or you can end the process by pressing **Esc** again.
  - **Synchronize logical drive**: Select this choice to recompute and rewrite the parity data on the drive for RAID levels 1 and 5. This selection does not alter data on the drive. The synchronization process can be done on multiple logical drives.
- **Rebuild device:** Select this choice to rebuild logical drives. The rebuild operation is supported only for RAID levels 1 and 5.
- **Advanced functions:** Select this choice to change the write policy (the way data is written to the drive), to save the configuration information to a diskette, to restore it from a diskette, or to change RAID parameters. This choice also allows you to do a low-level format.
- **Drive information:** Select this choice to view information about the SCSI devices (hard disk, CD-ROM, tape, and so on) connected to the RAID adapter.
- **Exit:** Select this choice to leave the Main Menu.

Viewing the RAID Configuration

Before creating or changing a disk array, you can look at the current configuration by selecting **View Configuration** from the Main Menu of the RAID configuration program.

To view the disk-array configuration:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and powering-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu; the Main Menu appears.
3. Select **View configuration**. The current disk-array configuration information appears on the screen.
4. Press **Enter** to see the stripe order in the Bays Occupied (Ch:Bay) field. In the following example, data for the B array is striped across Channel 1 bay 4, Channel 1 bay 5, and Channel 2 bay 1.

```
             IBM RAID Controller Disk Array Configuration Ver. 3.00
                          Adapter in Slot 4 (1.98)

                    ┌──────────────────────────────┐
                    │     View Configuration       │          ┌─ Ch 1 ─┐   ┌─ Ch 2 ─┐
                    └──────────────────────────────┘            Array┐      Array┐
                    ┌──────────────────────────────┐          ┌Bay          ┌Bay
                    │     Bays Occupied (Ch:Bay)    │         1 └─ONL─┘ A   1 └─ONL─┘ B
                    │         1:4, 1:5, 2:1         │
                    └──────────────────────────────┘         2 └─ONL─┘ A   2 └─ONL─┘ C

 Arr  Array   Log  Size  RAID   Date                         3 └─ONL─┘ A   3 └─ONL─┘ C
 ID  Size(MB) Drv  (MB)  Level  Created  Status
 A    5760     A0  1500  RAID-5 03/24/94 Good                4 └─ONL─┘ B   4 └─ONL─┘ D
 B    5760     A1  1500  RAID-0 03/24/94 Good
 C    3840     A2  1005  RAID-1 03/24/94 Good                5 └─ONL─┘ B   5 └─ONL─┘ D
 D    5760     B0  1500  RAID-5 03/24/94 Good
               B1  3510  RAID-0 03/24/94 Good                6 └────┘      6 └─ONL─┘ D
               C0  1500  RAID-0 03/24/94 Good
               C1  1170  RAID-1 03/24/94 Good                7 └────┘      7 └─HSP─┘
               D0  3840  RAID-5 03/24/94 Good

 Press any key to continue.
```

5. Press any key to return to the View Configuration screen.
6. Press **Esc** to return to the Main Menu.

Performing Common Tasks

The Create/Delete Array menu of the RAID configuration program contains the more common tasks for configuring disk arrays. The procedures to complete these tasks are.

- "Creating a Disk Array"
- "Defining Logical Drives" on page 470
- "Defining a Hot-Spare Drive" on page 474
- "Deleting a Disk Array" on page 476
- "Redefining Space in an Array" on page 477

Creating a Disk Array: You can create disk arrays from the existing drives. Later, storage capacity can be added to the server without disturbing existing data by installing additional hard disk drives and creating additional arrays.

To create a disk array:

1. Insert the IBM RAID Adapter Option Diskette into the primary diskette drive and power-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu; the Main Menu appears.

   > **Note**
   >
   > To create an array using hard disks in an existing array, refer to "Redefining Space in an Array" on page 477.

3. Select **Create/delete array** from the Main Menu.
4. Select **Create disk array** from the Create/Delete Array menu.

   The cursor will be active in the Bay/Array selection list.

```
        IBM RAID Controller Disk Array Configuration Ver. 3.00
                     Adapter in Slot 4 (1.98)

          ┌──────────────────────────┐
          │   Create/Delete Array    │      ┌─ Ch 1 ─┐    ┌─ Ch 2 ─┐
          │                          │       Array        Array
          │ 1. Help                  │      ┌Bay ┐       ┌Bay ┐
          │ 2. Define hot-spare drive│      1 └ONL┘ A    1 └ONL┘ B
          │ 3. Delete disk array     │
          │ 4. Create disk array     │      2 └ONL┘ A    2 └ONL┘ C
          │ 5. Define Logical drive  │
          │ 6. Exit                  │      3 └ONL┘ A    3 └ONL┘ C
          │                          │
          └──────────────────────────┘      4 └ONL┘ B    4 └RDY┘

                                            5 └ONL┘ B    5 └RDY┘

                                            6 └   ┘      6 └RDY┘

                                            7 └   ┘      7 └HSP┘

  Select a RDY drive and Enter to add to array. Esc to make array.
```

5. Select each drive you want in the array by using the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the drive and then pressing **Enter**. As you

select each drive, the status will change from **RDY** (Ready) to **ONL** (Online).

If you change your mind after selecting the drives for an array, you can delete the array (by selecting **Delete disk array** from the Create/Delete Array menu) and then begin again.

6. When you have selected all the drives you want to include in the array, press **Esc**. The cursor will become active in the menu.

7. If you have drives you did not use in this array and you want to create another array, you can do one of the following:

   - Define the logical drive or drives for this array; then create another array and its logical drives. See "Defining Logical Drives."
   - Create another array now by repeating steps 2 through 5 in this procedure; then define logical drives for both arrays.
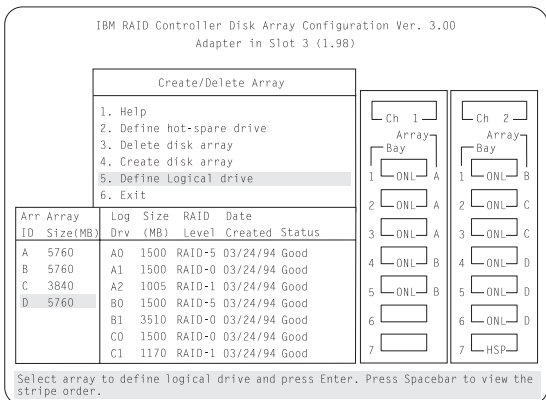
   --- **Note** ---

   You must define at least one logical drive for each created array before you can exit from the configuration program.

Defining Logical Drives: After you have created an array, you must define a logical drive. (You cannot leave the RAID configuration program until you define the logical drives for any created arrays.)

To define a logical drive:

1. Select **Define Logical drive** from the Create/Delete Array menu. The following screen appears; the cursor is active in the Array list.

```
          IBM RAID Controller Disk Array Configuration Ver. 3.00
                      Adapter in Slot 3 (1.98)

              ┌─────────────────────────────┐   ┌─ Ch 1 ─┐   ┌─ Ch 2 ─┐
              │    Create/Delete Array       │   ┌ Array ┐   ┌ Array ┐
              │ 1. Help                      │   ┌ Bay ┐     ┌ Bay ┐
              │ 2. Define hot-spare drive    │  1 └─ONL─┘ A  1 └─ONL─┘ B
              │ 3. Delete disk array         │  2 └─ONL─┘ A  2 └─ONL─┘ C
              │ 4. Create disk array         │  3 └─ONL─┘ A  3 └─ONL─┘ C
              │ 5. Define Logical drive      │  4 └─ONL─┘ B  4 └─ONL─┘ D
              │ 6. Exit                      │  5 └─ONL─┘ B  5 └─ONL─┘ D
  Arr Array   Log  Size  RAID   Date          6              6 └─ONL─┘ D
  ID  Size(MB) Drv  (MB)  Level Created Status 7              7 └─HSP─┘
  A   5760     A0   1500  RAID-5 03/24/94 Good
  B   5760     A1   1500  RAID-0 03/24/94 Good
  C   3840     A2   1005  RAID-1 03/24/94 Good
  D   5760     B0   1500  RAID-5 03/24/94 Good
               B1   3510  RAID-0 03/24/94 Good
               C0   1500  RAID-0 03/24/94 Good
               C1   1170  RAID-1 03/24/94 Good

  Select array to define logical drive and press Enter. Press Spacebar to view the
  stripe order.
```

2. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the array you want to define; then press

Enter. The Select RAID Level pop-up window appears, and the cursor is active in the window.

Note

The system automatically assigns RAID level 0 to any logical drives defined in an array containing only one hard disk drive. When this is the case, the Select RAID Level pop-up window will not appear.

If you have only two hard disk drives in the array, the Select RAID Level pop-up window appears, but RAID level 5 is not selectable because you need at least three hard disk drives in an array to assign RAID level 5 to one of the logical drives. You can define more than one logical drive for the array. The only restriction is that the maximum number of logical drives you can define is eight.

3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the RAID level you want to assign to these logical drives; then press **Enter**.

```
              IBM RAID Controller Disk Array Configuration Ver. 3.00
                          Adapter in Slot 3 (1.98)
   Select
 RAID Level          Create/Delete Array
 1. RAID-5
 2. RAID-0    1. Help                                ┌ Ch  1 ┐    ┌ Ch  2 ┐
 3. RAID-1    2. Define hot-spare drive              └───────┘    └───────┘
              3. Delete disk array                   ┌Array┐      ┌Array┐
              4. Create disk array                   ┌Bay┐        ┌Bay┐
              5. Define Logical drive              1 └ONL┘ A     1 └ONL┘ B
              6. Exit
                                                   2 └ONL┘ A     2 └ONL┘ C
 Arr Array   Log  Size  RAID   Date
 ID  Size(MB) Drv  (MB)  Level Created Status       3 └ONL┘ A     3 └ONL┘ C
 A   5760     A0   1500  RAID-5 03/24/94 Good        4 └ONL┘ B     4 └ONL┘ D
 B   5760     A1   1500  RAID-0 03/24/94 Good
 C   3840     A2   1005  RAID-1 03/24/94 Good        5 └ONL┘ B     5 └ONL┘ D
 D   5760     B0   1500  RAID-5 03/24/94 Good
              B1   3510  RAID-0 03/24/94 Good        6 ┌───┐       6 └ONL┘ D
              C0   1500  RAID-0 03/24/94 Good
              C1   1170  RAID-1 03/24/94 Good        7 ┌───┐       7 └HSP┘
 Select a RAID LEVEL.
```

Note

Because the level you assign can influence the space needed for the drive, you must assign a RAID level before you enter the size of the logical drive.

The Logical Drive list contains the logical drive ID, the size of each logical drive, the RAID level you assigned to that logical drive, and the date that the logical drive was created.

The status of the logical drive also is shown. **Good** means that all is well with the drive. **Critical** means that you must replace the hard disk drive or do a rebuild operation. (You will have received a message telling you what has happened to the drive.) **Offline**

means that the logical drive is unrecoverable; the data on that drive is lost.

The Logical Drive Size pop-up window shows the space in the array that is available for logical drives.

```
              IBM RAID Controller Disk Array Configuration Ver. 3.00
                          Adapter in Slot 3 (1.98)
 ┌─────────┐
 │Enter Size│  ┌──────────────────────────────────┐
 │of Logical│  │        Create/Delete Array       │
 │Drive.(MB)│  │                                  │      ┌─ Ch 1 ─┐    ┌─ Ch 2 ─┐
 │:   3840  │  │ 1. Help                          │      ┌─Array─┐    ┌─Array─┐
 └─────────┘  │ 2. Define hot-spare drive        │      │ Bay   │    │ Bay   │
              │ 3. Delete disk array             │    1 └─ONL─┘ A   1 └─ONL─┘ B
              │ 4. Create disk array             │    2 └─ONL─┘ A   2 └─ONL─┘ C
              │ 5. Define Logical drive          │    3 └─ONL─┘ A   3 └─ONL─┘ C
 ┌─────────┐  │ 6. Exit                          │    4 └─ONL─┘ B   4 └─ONL─┘ D
 │Arr Array│  └──────────────────────────────────┘    5 └─ONL─┘ B   5 └─ONL─┘ D
 │ID Size(MB)│ Log  Size  RAID   Date
 │          │ Drv  (MB)  Level Created Status          6 └─────┘     6 └─ONL─┘ D
 │A  5760   │ A0   1500  RAID-5 03/24/94 Good          7 └─────┘     7 └─HSP─┘
 │B  5760   │ A1   1500  RAID-0 03/24/94 Good
 │C  3840   │ A2   1005  RAID-1 03/24/94 Good
 │D  5760   │ B0   1500  RAID-5 03/24/94 Good
              B1   3510  RAID-0 03/24/94 Good
              C0   1500  RAID-0 03/24/94 Good
              C1   1170  RAID-1 03/24/94 Good
 ┌──────────────────────────────────────────────────────────────────────────┐
 │Enter a value greater than 2 and less than the default value shown or 32*1024│
 │whichever is lesser, and press Enter. Esc to quit form.                      │
 └──────────────────────────────────────────────────────────────────────────┘
```

4. Type the size, in megabytes, that you want for the logical drive; then press **Enter**. A pop-up window appears asking you to confirm your action.

   Information about the new logical drive appears in the Logical Drive list.

   > **Note**
   >
   > The size appearing in the Logical Drive list might be different from the size you typed. The size of a logical drive is determined by a number of factors, but basically the size must be divisible by the number of drives in the array.

   Consider the following scenarios:

   Scenario 1:
   The array consists of three 1GB drives. You assign RAID level 0 (which uses all the drives in the array with no parity storage), and type 1000MB. The number in the Size (MB) field will be 999, which is the number closest to and lower than 1000 that is divisible by 3.

   Scenario 2:
   The array consists of three 1GB drives, and you assign RAID level 5. Data is striped across all three drives in the array, but the space equivalent to that of one drive is used for parity storage. Therefore, if you type 1000MB, the number in the Size (MB) field remains 1000 because it is divisible by 2 (drives), which is the space available for data.

   If you do not use the entire array for this logical drive, you can create another by assigning either the same

or a different RAID level for an additional logical drive. You can have as many as eight logical drives among four disk arrays.

5. To return to the Create/Delete Array menu, press **Esc**. To define more logical drives, repeat steps 1 through 5 of this procedure.

6. To leave this screen, select **Exit** or press **Esc**. A pop-up window appears asking you to confirm your action.

7. To save the changes, select **Yes**. To maintain the disk-array configuration that was in place before you made changes, select **No**.

8. If you are using RAID level 1 or RAID level 5, *you must select* **Initialize logical drive** *for proper operation*. This sets the drive to a predetermined state. Any data existing on the drive is overwritten with zeros, and corresponding parity is initialized to the correct value.

   a. Select **Initialize/synchronize array** from the Main Menu; then select **Initialize logical drive**.

   b. Select the logical drives you want to initialize from the Logical Drive list by pressing the Spacebar (the selected drives will appear highlighted). To start the initialization, press **Enter**. A pop-up window appears asking you to confirm your action.

   > **Attention**
   >
   > If you select **Yes** in the Confirm pop-up window, information in the logical drive will be overwritten with zeros.

   c. Select **Yes** to confirm that you want to initialize this logical drive.

   The initialization process begins, and you can see its progress in the **Pct. Int.** (Percent Initialized) column of the Logical Drive list.

   d. To stop the initialization at any time, press **Esc**. Then press **Esc** again to return to the menu, or press **Enter** to continue initializing the drive.

9. To back up the disk-array configuration to diskette, you will need a 3.5-inch formatted diskette. To back up the disk-array configuration:

   a. Select **Advanced functions** from the Main Menu.

   b. Select **Backup config. to diskette**.

   Follow the instructions on the screen. A pop-up window shows the default file name of CONFIG. You can change the file name by typing over the default. The Backup program will assign a file-name extension of *.dmc*.

Defining a Hot-Spare Drive: To define a drive as a hot-spare drive:
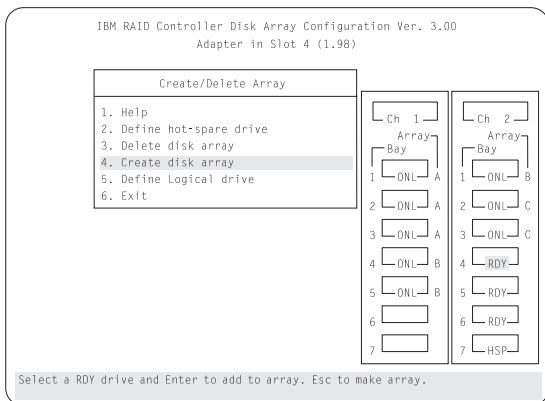
1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and powering-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu; the Main Menu appears.
3. Select **Create/delete array** from the Main Menu. The following screen appears.

```
        IBM RAID Controller Disk Array Configuration Ver. 3.00
                     Adapter in Slot 4 (1.98)


          Create/Delete Array

   1. Help                              ┌─ Ch  1 ─┐     ┌─ Ch  2 ─┐
   2. Define hot-spare drive             ┌Array┐        ┌Array┐
   3. Delete disk array                  │ Bay │        │ Bay │
   4. Create disk array                 1 └─ONL─┘ A     1 └─ONL─┘ B
   5. Define Logical drive
   6. Exit                              2 └─ONL─┘ A     2 └─ONL─┘ C

                                        3 └─ONL─┘ A     3 └─ONL─┘ C

                                        4 └─ONL─┘ B     4 └─RDY─┘

                                        5 └─ONL─┘ B     5 └─RDY─┘

                                        6 └─────┘       6 └─RDY─┘

                                        7 └─────┘       7 └─RDY─┘


Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter.
Press escape to return to previous menu.
```

4. Select **Define hot-spare drive**. The cursor will become active in the Bay/Array selection list.

```
                IBM RAID Controller Disk Array Configuration Ver. 3.00
                            Adapter in Slot 3 (1.98)


                  Create/Delete Array
                                              ┌─ Ch 1 ─┐   ┌─ Ch 2 ─┐
    1. Help                                      Array        Array
    2. Define hot-spare drive                  ┌─Bay─┐     ┌─Bay─┐
    3. Delete disk array                     1 └─ONL─┘ A   1 └─ONL─┘ B
    4. Create disk array
    5. Define Logical drive                  2 └─ONL─┘ A   2 └─ONL─┘ C
    6. Exit
                                             3 └─ONL─┘ A   3 └─ONL─┘ C

                                             4 └─ONL─┘ B   4 └─RDY─┘

                                             5 └─ONL─┘ B   5 └─RDY─┘

                                             6 └─────┘     6 └─RDY─┘

                                             7 └─────┘     7 └─HSP─┘

  Select a HSP or RDY drive and Enter to change state.
```

> **Note**
>
> Only SCSI hard disk drives are shown as RDY, ONL, DDD, OFL, or HSP state. SCSI tape and CD-ROM drives are not shown. They appear when you select drive information. Refer to "Bay/Array Selection List" on page 480 for the drive status meanings.

The numbers shown on the left in the Bay/Array selection list area in the previous figure are the bay IDs.

5. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **RDY** (ready) drive you want to define as the hot spare; then press **Enter.** The **RDY** changes to **HSP** (hot spare). You can press **Enter** again to toggle between **HSP** and **RDY**.
6. Press **Esc** when you have finished. The cursor will become active in the Create/Delete Array menu.

7. If you want to create a disk array, go to "Creating a Disk Array" on page 469.
8. If you are finished:
   a. Select **Exit** or press **Esc**. A pop-up window will appear asking you to confirm your change.

      ⎯ **Note** ⎯

      The changes you make are not saved until you confirm them by selecting **Yes** in the Confirm pop-up window.

   b. Select **No** if you do not want the drive you selected to be a hot spare; select **Yes** to define it as a hot-spare drive.
   c. Back up the disk-array configuration information to diskette. Refer to "Backing Up the Disk-Array Configuration" on page 483 for instructions.

Deleting a Disk Array: The last array created must be the first deleted.

⎯ **Attention** ⎯

All the data and programs in the array are lost during this procedure. Before proceeding, back up any data and programs that you want to save.

To delete a disk array:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and turning on the system. If the system already is turned on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration program** from the PC DOS start-up menu; the Main Menu appears.
3. Select **Create/delete array** from the Main Menu.
4. Select **Delete disk array** from the Create/Delete Array menu. The cursor will be active in the Array list.
5. Review the Date Created column in the Logical Drive list; then press the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the most recently defined array.

   ⎯ **Attention** ⎯

   All the data and programs in the array will be lost during this procedure.

6. Press **Del**. The Confirm pop-up window appears.

```
                    IBM RAID Controller Disk Array Configuration Ver. 3.00
                               Adapter in Slot 4 (1.98)

                         Create/Delete Array
                                                          ┌ Ch  1 ┐    ┌ Ch  2 ┐
                   1. Help                                ┌Array┐      ┌Array┐
                   2. Define hot-spare drive              Bay          Bay
                   3. Delete disk array                  1 └ONL┘ A    1 └ONL┘ B
                   4. Create disk array
                   5. Define Logical drive               2 └ONL┘ A    2 └ONL┘ C
 Arr Array     Log  Size  RAID   Date                    3 └ONL┘ A    3 └ONL┘ C
 ID  Size(MB)  Drv  (MB)  Level  Created  Status
                                                         4 └ONL┘ B    4 └ONL┘ D
 A   5760      A0   1500  RAID-5 03/24/94  Good
 B   5760      A1   1500  RAID-0 03/24/94  Good          5 └ONL┘ B    5 └ONL┘ D
 C   3840      A2   1005  RAID-1 03/24/94  Good
 D   5760      B0   1500  RAID-5 03/24/94  Good          6              6 └ONL┘ D
               B1   3510  RAID-0 03/24/94  Good
               C0   1500  RAID-0 03/24/94  Good          7              7 └HSP┘
               C1   1170  RAID-1 03/24/94  Good
               D0   3840  RAID-5 03/24/94  Good

 Select array to delete an press Del to delete the array. Press Spacebar to view
 the stripe order.
```

7. If you do not want to delete the array, select **No**. To delete the array, select **Yes**.

> **Note**
>
> To use hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array.

If a defunct drive is still in a bay, the status shows a blank bay, as though there is no drive in that bay. When you replace the drive, the status will show **RDY** after you reconfigure and select **Yes** in the Confirm pop-up window.

> **Note**
>
> In some operating systems, deleting an array and associated logical drives might change the drive letters assigned to the existing drives.

Redefining Space in an Array: You can redefine space in a disk array in a number of ways. For example, you can combine a number of small logical drives to create a larger one, or you can redefine the existing logical drive into several smaller drives. Also, you can install additional hard disk drives and create a larger logical drive than was possible with the existing storage capacity.

One method to redefine space in an array is to change the RAID level assigned to a logical drive. For example, if you assigned RAID level 1 to a logical drive and then decided you needed the capacity offered with RAID level 5, you can use this procedure to replace the existing logical drive with a logical drive assigned the new RAID level.

To redefine the space in a disk array, first you must delete the array. The last disk array defined must be the first deleted. In all cases, when you delete an array, all the data and programs in the array are lost.

If you have data and programs that you want to save, they must be backed up and then restored. You might want to use a high-speed backup device, such as a tape drive, to backup large amounts of data.

To redefine the space in an array:

1. Back up all data and programs in the array.
2. If needed, install additional hard disk drives.

   Refer to the *User's Reference* for information about selecting drive sizes.

   > **Attention**
   >
   > In all cases, when you delete an array, all the data and programs in the array are lost.

3. Insert the IBM RAID Adapter Option Diskette into the primary diskette drive; then press **Ctrl**+**Alt**+**Del** to start the RAID configuration program.
4. Select **Start RAID Configuration Program** from the PC DOS start-up menu; the Main Menu appears.
5. Delete the existing array:
   a. Select **Create/delete array** from the Main Menu. The Create/Delete Array menu will disappear.
   b. Select **Delete disk array**. The cursor will be active in the Bay/Array list.
   c. Review the Logical Drive List Date Created column; then press the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the most recently defined array.

      > **Note**
      >
      > You must delete disk arrays in descending order; the last one created must be the first one deleted.

   d. Press **Del**. The Confirm pop-up window appears.

      > **Attention**
      >
      > All the data in the array will be lost during this procedure. Be sure to back up all data and programs that you want to save.

   e. If you do not want to delete the array, select **No**. To delete the array, select **Yes**.

      > **Note**
      >
      > To use the hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array. After you make your selection, the Confirm pop-up window will disappear, and the cursor will be active in the menu.

6. If you want to define a hot spare drive, refer to "Defining a Hot-Spare Drive" on page 474 for step-by-step instructions.

7. Create a new disk array and define logical drives.

   See "Creating a Disk Array" on page 469 for instructions on creating a disk array and defining logical drives.

8. After you have established the new array and logical drive or drives, select **Initialize/synchronize array** from the Main Menu; then select **Initialize logical drive** to prepare the drives in the array to receive data. This sets the drive to a predetermined state. Any data existing in the drive is overwritten with zeros, and corresponding parity is initialized to the proper value.

9. Insert a 3.5-inch formatted diskette in the primary diskette drive, select **Advanced functions** from the Main Menu; then select **Backup config. to diskette**. Follow the instructions on the screen.

10. Exit the RAID configuration program by pressing **Esc** or selecting **Exit** from the Main Menu. A pop-up window will appear asking you to confirm your action.

11. Reinstall the operating system and device drivers, then restore the data and programs.

Drive Maintenance

Drive maintenance consists of the following.

- How to obtain drive status information
- Results of a hard disk drive failure
- Procedure for replacing defunct drives
- Procedure for redefining the space in an array by replacing logical drives

Obtaining Drive Status: To see the ID, capacity, and other information about each of the hard disk drives attached to the RAID adapter:

1. Start the RAID configuration program by inserting the IBM RAID option diskette into the primary diskette drive and turning on the system. If the system already is turned on, press **Ctrl**+**Alt**+**Del**.

2. Select **Start RAID Configuration Program** from the PC DOS start-up menu; then press **Enter**.

3. Select **Drive information** from the Main Menu.

```
            IBM RAID Controller Disk Array Configuration Ver. 3.00
                        Adapter in Slot 3 (1.98)

                      Drive Information
                                                ┌─ Ch 1 ─┐    ┌─ Ch 2 ─┐
                                                  ┌Array┐       ┌Array┐
                                                  ┌Bay┐          ┌Bay┐
                                                1 └─ONL─┘ A    1 └─ONL─┘ B

                                                2 └─ONL─┘ A    2 └─ONL─┘ C

                                                3 └─ONL─┘ A    3 └─ONL─┘ C

                                                4 └─ONL─┘ B    4 └─ONL─┘ D

 Drive ID      : IBM    0664N1H     !M 4 40    5 └─ONL─┘ B    5 └─ONL─┘ D
 Drive Capacity : 1920 MB
 Soft Error    : 0                             6 └─TAP─┘      6 └─ONL─┘ D
 Hard Error    : 0
 Misc Error    : 0                             7 └─CDR─┘      7 └─HSP─┘

 Select drive using the Up Arrow (↑) and Down Arrow (↓) keys. press Enter to return
 to the previous menu.
```

4. Use the Up Arrow (↑) key or the Down Arrow (↓) key
   to highlight each of the drives shown in the Bay/Array
   selection list. As a drive is highlighted, the
   information for that drive appears at the bottom of the
   screen.
5. Press **Esc** to return to the Main Menu.

Note

The status of the hard disk drive determines the status
of the logical drives in the array in which the hard disk
is grouped.

Bay/Array Selection List: The status of the drives
in the Bay/Array selection list is defined as follows:

Status   **Meaning**

CDR   CD-ROM drive installed.

DDD   Defunct. The drive is an online or hot-spare
               drive that does not respond to commands. (If
               a **RDY** drive is defunct or powered down, it
               shows as an empty bay (a blank status), not a
               DDD status).

FMT   Format. The drive is being reformatted.

HSP   Hot spare. The drive will replace a similar
               drive that becomes defunct in real time. At
               that time, its status changes to **ONL**, and its
               array association appears.

OFL   Offline. The drive is a good drive that has
               replaced a defunct drive in a RAID level 1 or
               level 5 array. It is associated with an array,
               but does not contain any valid data. The drive
               state remains OFL during the rebuild phase.

ONL   Online. The drive is part of an array. If this
               drive fails, logical drives defined in the array in
               which this drive is grouped will have a status
               of Offline (if the logical drive is assigned RAID
               level 0 with a good status) or Critical (if the

logical drive is assigned RAID level 1 or level 5 with a good status).

RDY   Ready. The drive is recognized by the adapter and is available for definition.

TAP   Tape drive installed.

UFM   Unformatted. The drive requires a low-level format before it can be used in an array.

Blank Status: Any of the following circumstances can cause the status area to be blank:

- No hard disk drive is installed in that bay.
- The bay contains a hard disk drive, but the drive is not inserted correctly.
- An array was deleted and a defunct drive is still in the bay.
- A new drive was installed and the configuration program has not been restarted. (The status will change to **RDY** when the RAID configuration program is restarted.)

Results of a Hard Disk Drive Failure:

Depending on the circumstances, there can be several possible results from a drive failure.

Scenario 1:

- Only one hard disk drive fails.
- A hot-spare drive is defined that is the same size as the failed drive.
- The logical drives in the array are assigned RAID level 1, level 5, or a combination of these two levels.

The hot spare will take over immediately.

> **Note**
>
> Hot-spare drive capability does not apply to logical drives assigned RAID level 0. Data for logical drives assigned RAID levels 1 and 5 is not lost, even though the drives function with reduced performance.

Scenario 2:

- Only one hard disk drive fails.
- A hot-spare drive is not defined or is a different size from the failed drive.
- The logical drives in the array are assigned RAID levels 1, 5, or a combination of these two levels.

No data will be lost, but the system will operate at reduced performance until the defunct drive is replaced and rebuilt.

Scenario 3:

If more than one drive in an array fails, all the data is lost in all of the logical drives of the array. For this reason, it is important that you replace and rebuild a defunct drive as soon as possible.

Logical and Hard Disk Drive Status Indications:

The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.

- A single hard disk drive failure (indicated by a **DDD** status in the Bay/Array selection list) causes logical drives in that array that are assigned levels 1 and 5 to have a **Critical** status. Data remains in logical drives with a **Critical** status, but you must replace the one defunct hard disk drive promptly, because if two hard disk drives were to fail, all of the data in the array would be lost.

  After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **OFL** if there is a **Critical** logical drive. After the Rebuild process, the hard disk drive status changes from **OFL** to **ONL**.

- A single or multiple hard disk drive failure causes logical drives in that array that are assigned level 0 to have an Offline status. Data in logical drives with an Offline status is lost. However, with a *multiple* disk drive failure, when the defunct drives are part of the same array, logical drives in that array will have an Offline status. This means that data is lost in all the logical drives in that array, regardless of which RAID level is assigned.

Replacing a Faulty Drive:
To replace a faulty drive:

- **Note**

  The hard disk drive indicator light blinks when the drive has failed and needs to be replaced (**DDD** status only).

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and powering-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu.

   If the drive failed while the system was powered down, a screen appears the next time the system is powered on showing you which drive is defunct.
3. If the drive is not damaged (for example, it is not inserted correctly):

a. Power-off the system.

b. Correct the problem.

Make sure that the cables to the power supply and the SCSI-2 controller are connected correctly. Check the SCSI-2 controller, and the SCSI-2 connector on the RAID Adapter.

c. Restart the system.

4. If the drive is defunct:

a. Press **Y** (Yes) to reconfigure the system.

b. Press **Ctrl**+**Alt**+**Del** when instructed to restart the system. The Main Menu appears.

At this point, the drive status indicates **DDD**.

> **Attention**
>
> Removing the wrong hard disk drive can cause loss of all data in the array.

c. Replace the defunct drive.

d. After you have replaced the drive, press **Enter**. The system will be reconfigured to include the drive, and the drive's status will change to **OFL**.

e. When you see the configuration completion message, select **Rebuild drive**.

f. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **OFL** (offline) drive you want to rebuild; then press **Enter**.

Information and status messages about each stage of the rebuilding process appears on the screen.

g. When the rebuilding process is completed, press **Esc** to return to the Main Menu. The new configuration will be saved automatically.

h. Backup the new configuration (see "Backing Up the Disk-Array Configuration").

i. Select **Exit** to end the RAID configuration program.

j. Remove the diskette and press **Ctrl**+**Alt**+**Del** to restart the system.

Advanced Functions

You can select several utility programs from the Advanced Functions menu. These include:

- Back up configuration to diskette
- Restore configuration to diskette
- Change the write policy
- Change the RAID parameters
- Format a drive

Backing Up the Disk-Array Configuration:

The RAID adapter maintains a record of the disk-array configuration information in its electronically erasable programmable read-only memory (EEPROM) module. The

disk-array configuration is *vital information.* To protect this information, back up the information to diskette as soon as you have completed the tasks. You need a blank, formatted, 3.5-inch diskette.

To back up the disk-array configuration information to diskette:

1. Label a blank diskette "Disk Array Configuration Backup," and date it.
2. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and powering-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**.
3. Select **Start RAID Configuration Program** from the PC DOS start-up menu and press **Enter**.
4. Select **Advanced functions** from the Main Menu.
5. Select **Backup config. to diskette**.
6. Remove the RAID Adapter Option Diskette from the drive and insert the blank diskette.
7. Follow the instructions on the screen.

Restoring the Disk-Array Configuration: To restore the disk-array configuration information in the RAID adapter EEPROM module, use the RAID Adapter Option Diskette and an up-to-date Disk Array Configuration Backup diskette.

Note

Because dynamic changes in the configuration of the disk array occur due to hot-spare drive replacement or other drive maintenance activity, the configuration backup information on the diskette might be different from that in the adapter. It is important that you back up the disk-array configuration information frequently, to keep the backup information on the diskette current.

To restore the RAID configuration information:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and powering-on the system. If the system already is powered-on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu and press **Enter**.
3. Select **Advanced functions** from the Main Menu.
4. Select **Restore config. from diskette**.
5. Follow the instructions on the screen.

Using the Advanced Functions: This section gives the procedures for using the advanced functions, such as changing the write policy, changing the RAID parameters, and formatting a drive.

Warnings appear throughout this section to alert you to potential loss of data. Read these warnings carefully before answering yes to the confirmations requested by the RAID configuration program.

Changing the Write Policy

When you configure a logical drive, the RAID adapter automatically sets the write policy to *write-through* (WT) mode, where the completion status is sent *after* the data is written to the hard disk drive. To improve performance, you can change this write policy to *write-back* (WB) mode, where the completion status is sent *after* the data is copied to cache memory, but *before* the data is actually written to the storage device.

Although you gain performance with write-back mode, it creates a greater risk of losing data due to a power failure. This is because the system gets a completion status message when the data reaches cache memory, but *before* data is actually written to the storage device.

Attention

If you change the write policy to write-back, wait at least 10 seconds after the last operation before you power-off the server. It takes that long for the system to move the data from the cache memory to the storage device. Failure to follow this practice can result in lost data.

To change the write policy:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and turning on the system. If the system already is turned on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu and press **Enter**.
3. Select **Advanced functions** from the Main Menu.
4. Select **Change write policy** from the Advanced Functions menu. The cursor will be active in the Logical Drive list.
5. Select the logical drive whose write policy you want to change. A screen similar to the following appears:

```
                IBM RAID Controller Disk Array Configuration Ver. 3.00
                            Adapter in Slot 3 (1.98)

                        Advanced Functions
                1. Help                                   ┌─ Ch  1 ─┐    ┌─ Ch  2 ─┐
                2. Back-up config. to diskette             ┌─Array─┐      ┌─Array─┐
                3. Restore config. from diskette           ┌ Bay ┐        ┌ Bay ┐
                4. Change write policy                    1 └─ONL─┘ A    1 └─ONL─┘ B
                5. Format drive
Arr Array   Log  Size  RAID   Date           Wrt         2 └─ONL─┘ A    2 └─ONL─┘ C
ID  Size(MB) Drv (MB)  Level  Created Status  pol
A   5760    A0  1500  RAID-5 03/24/94 Good    WB         3 └─ONL─┘ A    3 └─ONL─┘ C
B   5760    A1  1500  RAID-0 03/24/94 Good    WT
C   3840    A2  1005  RAID-1 03/24/94 Good    WT         4 └─ONL─┘ B    4 └─ONL─┘ D
D   5760    B0  1500  RAID-5 03/24/94 Good    WT
            B1  3510  RAID-0 03/24/94 Good    WT         5 └─ONL─┘ B    5 └─ONL─┘ D
            C0  1500  RAID-0 03/24/94 Good    WT
            C1  1170  RAID-1 03/24/94 Good    WT         6 └─────┘      6 └─ONL─┘ D
            D0  3840  RAID-5 03/24/94 Good    WT
                                                         7 └─────┘      7 └─HSP─┘
Select logical drive and press Enter to toggle the write policy.
```

Note

The information might be different from that
shown in this screen.

The Logical Drive list contains the logical drive ID, the
size in megabytes of each logical drive, the RAID
level you assigned to that logical drive, and the date
you created it.

The status of the logical drive is also shown. **Good**
means that all is well with the drive; **Critical** means
that you must replace the hard disk drive and rebuild
the logical drive. (You will have received a message
telling you what has happened to the drive.) **Offline**
means that the logical drive is unrecoverable; the
data in that drive is lost.

6. Locate the **Wrt pol** (Write Policy) field in the Logical
   Drive list.

   The write policy is shown as either **WT** (write-through,
   which is the default setting) or **WB** (write-back).

7. Use the Up Arrow (↑) key or the Down Arrow (↓) key
   to select the logical drive whose write policy you want
   to change.

Attention

If you change the write policy to write-back, wait
at least 10 seconds after the last operation
before you power-off the server. It takes that
long for the system to move the data from the
cache memory to the storage device. Failure to
follow this practice can result in lost data.

---

8. Press **Enter** to change the write policy.

   Notice that **WT** changes to **WB**. You can press **Enter**
   to alternate between **WT** and **WB**.

9. When you have made your choice, press **Esc** to
   return to the Advanced Functions menu.

10. Select **Exit**. The Confirm pop-up window appears asking you to confirm your action.
11. To return the setting to its original state, select **No**. To save the changes, select **Yes**.
12. Back up the disk-array configuration information to diskette. Refer to "Backing Up the Disk-Array Configuration" on page 483 for more information.

Formatting Drives

You can perform a low-level format on drives with **RDY** (ready), **OFL** (offline), or **UNF** (unformatted) status.

Note

The **Format drive** choice on the Advanced Functions menu provides a low-level format. If you install a new hard disk drive that requires a standard format, use the Format command provided by the operating system.

The Format program is provided in the IBM RAID configuration program so that you can perform a low-level format on a drive controlled by the RAID adapter.

To perform a low-level format:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and powering-on the system. If the system already is turned on, press **Ctrl**+**Alt**+**Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu; the Main Menu appears.
3. Select **Advanced functions** from the Main Menu.

Note

A low-level format erases all data and programs from the hard disk drive. Before proceeding, back up any data and programs that you want to save.

4. Select **Format drive**. The low-level format program starts.
5. Follow the instructions on the screen.

You can perform a low-level format on more than one drive at a time.

Changing the RAID Parameters

You can change the RAID parameters using the advanced functions by selecting **Change RAID parameters**.

```
              IBM RAID Controller Disk Array Configuration Ver. 3.00
                         Adapter in Slot 3 (1.98)

                   Advanced Functions
             ┌──────────────────────────────┐         ┌─ Ch 1 ─┐   ┌─ Ch 2 ─┐
             │ 1. Help                       │         ┌─Array─┐    ┌─Array─┐
             │ 2. Back-up config. to diskette│         │ Bay   │    │ Bay   │
             │ 3. Restore config. from diskette       1 └─ONL─┘ A  1 └─ONL─┘ B
             │ 4. Change write policy        │
             │ 5. Format drive               │         2 └─ONL─┘ A  2 └─ONL─┘ C
  ┌───────────────────────────────────────────────┐
  │ Arr Array  Log  Size RAID   Date        Wrt    3 └─ONL─┘ A  3 └─ONL─┘ C
  │ ID  Size(MB) Drv  (MB)  Level Created Status pol│
  │ A   5760   A0  1500 RAID-5 03/24/94 Good    WB  4 └─ONL─┘ B  4 └─ONL─┘ D
  │ B   5760   A1  1500 RAID-0 03/24/94 Good    WT
  │ C   3840   A2  1005 RAID-1 03/24/94 Good    WT  5 └─ONL─┘ B  5 └─ONL─┘ D
  │ D   5760   B0  1500 RAID-5 03/24/94 Good    WT
  │           B1  3510 RAID-0 03/24/94 Good    WT  6 └──────┘    6 └─ONL─┘ D
  │           C0  1500 RAID-0 03/24/94 Good    WT
  │           C1  1170 RAID-1 03/24/94 Good    WT  7 └──────┘    7 └─HSP─┘
  │           D0  3840 RAID-5 03/24/94 Good    WT
  └───────────────────────────────────────────────┘
  Select logical drive and press Enter to toggle the write policy.
```

The default settings are:

- Stripe unit size — 8K

  > **Attention**
  >
  > Once the stripe unit is chosen and data is stored in the logical drives, the stripe unit cannot be changed without destroying data in the logical drives.

  The stripe unit size is the amount of data written on a given disk before writing on the next disk. To maximize the overall performance, choose the stripe unit such that the stripe-unit size is close to the size of the system I/O request. The default is set to 8K data bytes.

- Rebuild priority — Equal

  Rebuild priority can be set to equal, high, or low. When the rebuild request is set to equal, the rebuild I/O request and system I/O request get equal priority in the execution order.

  When the rebuild request is set to high, the rebuild I/O request will get a higher priority than a system I/O request. In a heavily loaded system (with a high rate of system I/O requests), the high-priority rebuild can significantly reduce the disk rebuild time at the expense of degraded handling of I/O requests.

  When the rebuild priority is set to low, the rebuild I/O requests can execute only if no pending system I/O requests are pending. In a moderate to heavily loaded system, low rebuild priority will increase the disk rebuild time significantly and provide better system performance.

> **Note**
>
> Rebuild priority can be changed without affecting data in the logical drives.

- Parity placement — RA

  > **Attention**
  >
  > Once a parity placement scheme is chosen and data stored, it cannot be changed without destroying data.

  Parity placement defines how parity is placed in the disk array with respect to data. The following illustration shows both the Left Symmetric (LS) and Right Asymmetric (RA) parity placement in a four-drive disk array. Here AAA, BBB, and CCC are the data stripe units, and PP0 is the corresponding parity. Similarly DDD, EEE, and FFF are the data stripe units, and PP1 is the corresponding parity.

```
 Right Asymmetric (RA)      Left Symmetric (LS)

 Disk  Disk  Disk  Disk     Disk  Disk  Disk  Disk
  1     2     3     4         1     2     3     4
 PP0   AAA   BBB   CCC       AAA   BBB   CCC   PP0
 DDD   PP1   EEE   FFF       EEE   FFF   PP1   DDD
 GGG   HHH   PP2   III       III   PP2   GGG   HHH
 JJJ   KKK   LLL   PP3       PP3   JJJ   KKK   LLL
```

  In some situations you may want to try LS parity placement to improve performance. The default parity placement is RA.

- Read ahead — On

  Normally the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter transfers data from disk to its local cache in steps of stripe-unit size. This provides excellent overall performance when workloads tend to be sequential. However, if the workload is random and system I/O requests are smaller than stripe-unit size, reading ahead to the end of the stripe unit will result in a wasted SCSI bus bandwidth and wasted disk utilization. When read-ahead is set to Off, the size of data transfer from the disk to local cache is equal to the system I/O request size, and no read-ahead to the end of the stripe unit is performed.

> **Notes**
>
> 1. The read-ahead setting can be changed without destroying data in a logical drive.
> 2. When the configuration is saved on a diskette, the RAID parameters are saved also.

Display

If the screen is rolling, replace the display assembly. If that does not correct the problem, replace the system board.

If the screen is not rolling, do the following to run the display self-test:

1. Power-off the computer and display.
2. Disconnect the display signal cable.
3. Power-on the display.
4. Turn the brightness and contrast controls clockwise to their maximum setting.
5. Check for the following conditions:
   - You should be able to vary the screen intensity by adjusting the contrast and brightness controls.
   - The screen should be white or light gray, with a black margin (test margin) on the screen.

   Note

   The location of the test margin varies with the type of display. The test margin might be on the top, bottom, or one or both sides.

If you do not see any test margin on the screen, replace the display. If there is a test margin on the screen, replace the system board.

   Note

   During the first two or three seconds after the display is powered on, the following might occur while the display synchronizes with the computer.

   - Unusual patterns or characters
   - Static, crackling, or clicking sounds
   - A "power-on hum" on larger displays

   A noticeable odor might occur on new displays or displays recently removed from storage.

   These sounds, display patterns, and odors are normal; do not replace any parts.

If you are unable to correct the problem, go to "Undetermined Problems" on page 552.

Ethernet Quad-BT and -B2 PeerMaster Micro Channel Adapters

The following service information supports the IBM Eithernet Quad-BT (10Base-T) and -B2 (10Base2) PeerMaster Micro Channel adapters.

> **Warning**
>
> Do not install a PeerMaster adapter in slot 4 of an IBM PS/2 Model 85 or 95 server. Pressure resulting from contact with foam mounted to the side panel might result in damage to the adapter or computer.

Features

The IBM Quad-BT or -B2 PeerMaster Micro Channel Adapters provide the ability to connect your PS/2 Micro Channel server to four separate 10Mbps Ethernet LAN segments. Quad-BT refers to a 10Base-T adapter; Quad-B2 refers to a 10Base2 adapter.

These adapters:

- Perform high performance data transfers between the host PC and adapter
- Provide high performance data transfers among ports on an adapter
- Provide high performance data transfers among ports across multiple adapters with no host processor intervention
- Provide a cost efficient, high performance means to forward cross-segment traffic without impacting server performance
- Perform 64-bit data transfers across the Micro Channel at burst rates of 640Mbps, which equals the total bandwidth of 64 Ethernet ports

Supported Systems

These adapters are type 5 Micro Channel adapters. You can install them only in type 5 adapter system-bus slots. (You can install type 5 adapters in IBM PS/2 Models 85 and 95 and later-version PS/2 Micro Channel servers.)

Network Operating System Requirements

Use one of the following network operating systems:

- OS/2 LAN Server 2.x or 3.x
- Novell NetWare 3.1x or 4.0x

IBM PeerMaster Server Adapter Option Diskette

The PeerMaster Server Adapter Option Diskette is shipped with the PeerMaster Server Adapter options. The diskette contains the following:

- Device drivers
- Setup programs
- NetFinity enablers
- Diagnostic programs

Operation Modes

Mode	Description
Traditional Adapter	Used when you expect little or no cross-subnetwork traffic.
VNET Switch	Used when you need to build subnets to provide cross-segment traffic.

Traditional Adapter Mode: When the adapter is operating in this mode, the drivers for the adapter register each individual LAN segment with the network operating system (NOS) as a unique subnet. The NOS views the adapter as four separate adapters. Each network segment must be configured with a unique network number.

Notes

- Do not externally join (using bridges, switches, or concentrators) ports of adapters.
- You can configure as many nodes as you need; the adapter places no limit on the number of nodes per port.
- Ensure that each port is bound to the protocol with a unique network number.

VNET Switch Mode

Notes

- Do not externally join (using bridges, switches, or concentrators) ports of adapters that comprise a VNET.
- Nodes can be configured as needed; the adapter places no limit on the number of nodes per port.
- Ensure that all ports in a VNET are bound to the protocol (by way of VNET) with a common network number.

When the adapter is operating in this mode, multiple LAN segments are registered with the NOS as a single subnet, called a *VNET*. VNETs are multisegment virtual subnets.

VNETs are made possible by a layer of virtual network software that binds to multiple instances of the adapter LAN driver and registers them with the NOS as a single subnet. Multiple PeerMaster adapters may be configured to interoperate in various ways, such as:

- Traditional subnets
- One large VNET
- Multiple independent VNETs
- Any combination of VNETs and traditional subnets

All physical segments within a VNET are configured to the same network number. Cross-segment traffic within a VNET is switched by the adapter instead of by the server, allowing the server to be more productive.

External internetworking devices are not required to provide communication between segments with a VNET.

Configuration Examples

Configuration Examples	Description(s)
Traditional Adapter mode	An 8-port network with two PeerMaster adapters configured in the Traditional Adapter mode, **see "Traditional Adapter Mode" on page 495.**
VNET Switch mode	An 8-port network with two PeerMaster adapters configured in the VNET Switch mode, **see "VNET Switch Mode: Single VNET" on page 496.**
	An 8-port network with two PeerMaster adapters each configured as an independent VNET, **see "VNET Switch Mode: Multiple VNETs" on page 498.**
	An 8-port network with two PeerMaster adapters, one configured in the VNET Switch mode and the other in the Traditional Adapter mode, **see "VNET Switch Mode: Combined VNETs and Traditional Nets" on page 499.**

You can use PeerMaster adapters to create a variety of network configurations. The following examples illustrate some basic network configurations that you can create. Use these examples as guidelines to determine the best configuration for your needs.

Traditional Adapter Mode

This illustration shows:

- A server with two Quad-BT PeerMaster adapters configured in the Traditional Adapter mode.

  The network protocol views each LAN segment as a separate subnet with its own network number. Clients on all ports have direct access to the server.

  > **Note**
  >
  > The same principles apply to Quad-B2 configurations; however, concentrator hubs are not required for 10Base2 operation.

- A configuration of eight separate network numbers.
- Curved arrows illustrating the basic flow of cross-subnet traffic.

  The server-based router accepts and forwards all frames that require routing between subnets.

- Software layers illustrated above the adapters indicating software that is required to route traffic internally, running on the server.

Cross-subnet traffic, such as traffic from Net 1 to Net 2, must be forwarded by a router. The router can be internal to the server or an external stand-alone device.

The advantage of the Traditional Adapter mode is that a router restricts cross-subnet traffic to only those data packets that are uniquely addressed to the target network. The disadvantage of this mode is that server responsiveness might be heavily impaired due to the burden of packet routing. This mode should be used only when little or no cross-subnet traffic is expected.

VNET Switch Mode Configurations: The following information describes three configurations using the VNET switch mode.

VNET Switch Mode: Single VNET

This illustration above shows two Quad-BT PeerMaster adapters (Card 1 and Card 2) forming a single VNET.

The adapter provides the functions of a high-performance network adapter combined with the power of an Ethernet switching hub.

Note

The same principles apply to Quad-B2 configurations; however, concentrator hubs are not required for 10Base2 operation.

- All segments configured as Network number 1 (Net 1).
- Curved arrows indicating the flow of data across ports connected by the VNET switch.

The VNET switch performs all cross-segment traffic and, therefore, server responsiveness is not impaired by heavy cross-segment traffic. The adapters perform two types of frame switching: port-to-port and peer-to-peer.

Port-to-port   Occurs when the source and destination ports both reside on the same adapter. (The adapter forwards data packets between ports 1 and 2 of adapter 1 (Card 1)).

> **Note**
>
> Port-to-port switching is completely transparent to the server microprocessor.

Peer-to-peer   Occurs when the source and destination ports reside on separate adapters. Peer-to-peer switching is accomplished through peer data transfers across the Micro Channel bus. (The adapters forward data packets between port 1 of adapter 1 (Card 1) and port 1 of adapter 2 (Card 2)).

VNET Switch Mode: Multiple VNETs

This illustration above shows:

- A configuration of two network numbers (Net 1 and Net 2).
- An 8-port network with two Quad-BT PeerMaster adapters (Card 1 and Card 2), each configured as an independent VNET (two VNETs).

  Note: The same principles apply to Quad-B2 configurations; however, concentrator hubs are not required for 10Base2 operation.

- The curved arrow that passes through the LAN drivers, protocol stacks, and router in the server represents the connection between the two subnets (Net 1 and Net 2). Cross-subnet traffic, such as traffic from Net 1 to Net 2, must be forwarded by a router. The router can be internal to the server or an external stand-alone device.

Each VNET may represent a separate department or workgroup. The four switched ports within each VNET provide a multisegment workgroup environment. Isolating the two VNETs by way of the server-based router allows you to create a separation between the two departments. You can configure the router to permit restricted traffic to pass between the departments.

VNET Switch Mode: Combined VNETs and Traditional Nets

> **Note**
>
> Use this configuration only when you expect little or no cross-VNET traffic.

This illustration above shows:

- A five-subnet network (Net 1, Net 2, Net 3, Net 4, and Net 5) configured as one four-segment VNET (VNET1) on Card 1 and four traditional networks on Card 2.
- A network using PeerMaster adapters.

  Note: The same principles apply to Quad-B2 configurations; however, hubs are not required for 10Base2 operation.

- Cross-subnet traffic, such as traffic from Net 1 to Net 2, must be forwarded by a router. The router can be internal to the server or an external stand-alone device.

This VNET may represent a large department while the traditional networks may represent small workgroups. You can configure the router to restrict traffic between departments.

Locations
10Base-T Adapter

10Base2 Adapter

Cabling for 10Base-T Networks

Two types of network cables may be connected to the
Quad-BT PeerMaster adapter: straight-through and
crossover.

Note

Use straight-through cables when connecting your
adapter to an external 10Base-T concentrator hub.

Straight-Through

Use crossover cables to directly connect your adapter to
another 10Base-T device, such as a workstation, server, or
another adapter. Crossover cables create *dedicated
segments*. A dedicated segment is two point-to-point
devices connected to a dedicated link.

Crossover

Attention

Ensure that you do not externally join ports of
adapters (using bridges, switches, or concentrators).

Cabling for 10Base2 Networks

To connect any port of the Quad-B2 PeerMaster adapter to a 10Base2 *thin Ethernet cable segment*. (A thin Ethernet cable segment is the length of the cable between the repeaters.), do the following.

Notes

1. Avoid severe bending of the cable.
2. Do not exceed 185 meters (600 feet) of interconnection without using a signal repeater to attach another network segment.
3. Do not attach more than one Quad-B2 PeerMaster 10Base2 port to the same 10Base2 network segment.

---

1. Attach a bayonet connector (BNC) T-connector to the BNC network port at the rear of the computer.
2. Attach the end of the coaxial cable to an open end of the T-connector.
3. Attach the other end of the cable to an open end of the T-connector at the rear of the next workstation in which a 10Base2 is installed; then, continue making connections to the rest of the workstations.
4. Attach a 50-ohm cable terminator at each end of every segment.

Symptom-to-FRU Index

The Symptom-to-FRU index contains the following diagnostic information:

- LED Indications
- Error Codes
- NetWare load-time error messages
- NetWare run-time messages

LED Indications

Notes

The PeerMaster adapter LED is normally off prior to adapter download, and is normally on after successful download.

LED Indication	FRU/Action
.5 seconds ON then .5 seconds OFF. Repeats continuously. DRAM Failure. DRAM memory stick may be missing or loose.	Insert or reseat memory and try again.
.5 seconds ON then .5 seconds OFF. LED flashes 3 times, then stays off. POST Failure	Run the adapter diagnostics to get the exact error and recommended action.

LED Indication	FRU/Action
.5 second ON then .5 second OFF. Flashes 5 times, then stays off. Flash Checksum Failure	Replace Flash with programmed part.

Error Codes

Error Code	FRU/Action
0**27601S**0, 0**27602S**0, 0**27603S**0, 0**27604S**0 POST Flash Main Sector Checksum Failure	1. **10Base-T Adapter**
0**27605S**0, 0**27606S**0, 0**27607S**0, 0**27608S**0, 0**27609S**0, 0**27610S**0, 0**27611S**0, 0**27612S**0 Verify proper seating of the DRAM SIMM on the adapter.	1. **10Base-T Adapter**
0**27613S**0, 0**27614S**0, 0**27615S**0, 0**27616S**0, 0**27617S**0, 0**27618S**0, 0**27619S**0, 0**27620S**0 POST SRAM failure	1. **10Base-T Adapter**
0**27621S**0, 0**27622S**0, 0**27623S**0, 0**27624S**0, 0**27625S**0	1. **10Base-T Adapter**
0**27626S**0 POST Ethernet Port 1 External Loopback Failure	1. **Verify correct cabling of Port 1.** 2. 10Base-T Adapter
0**27627S**0 POST Ethernet Port 2 External Loopback Failure	1. **Verify correct cabling of Port 2.** 2. 10Base-T Adapter
0**27628S**0 POST Ethernet Port 3 External Loopback Failure	1. **Verify correct cabling of Port 3.** 2. 10Base-T Adapter
0**27629S**0 POST Ethernet Port 4 External Loopback Failure	1. **Verify correct cabling of Port 4.** 2. 10Base-T Adapter
0**27630S**0, 0**27631S**0, 0**27632S**0, 0**27633S**0	1. **10Base-T Adapter**
0**27691S**0, 0**27692S**0, 0**27693S**0, 0**27699S**0	1. **Run Setup and verify the adapter configuration.** 2. 10Base-T Adapter
0**27701S**0, 0**27702S**0, 0**27703S**0, 0**27704S**0 POST Flash Main Sector Checksum Failure	1. **10Base2 Adapter**

Error Code	FRU/Action
0**27705S**0, 0**27706S**0, 0**27707S**0, 0**27708S**0, 0**27709S**0, 0**27710S**0, 0**27711S**0, 0**27712S**0 Verify proper seating of the DRAM SIMM on the adapter.	1. **10Base2 Adapter**
0**27713S**0, 0**27714S**0, 0**27715S**0, 0**27716S**0, 0**27717S**0, 0**27718S**0, 0**27719S**0, 0**27720S**0 POST SRAM failure	1. **10Base2 Adapter**
0**27721S**0, 0**27722S**0, 0**27723S**0, 0**27724S**0, 0**27725S**0	1. **10Base2 Adapter**
0**27726S**0 POST Ethernet Port 1 External Loopback Failure	1. **Verify correct cabling of Port 1.** 2. 10Base2 Adapter
0**27727S**0 POST Ethernet Port 2 External Loopback Failure	1. **Verify correct cabling of Port 2.** 2. 10Base2 Adapter
0**27728S**0 POST Ethernet Port 3 External Loopback Failure	1. **Verify correct cabling of Port 3.** 2. 10Base2 Adapter
0**27729S**0 POST Ethernet Port 4 External Loopback Failure	1. **Verify correct cabling of Port 4.** 2. 10Base2 Adapter
0**27730S**0, 0**27731S**0, 0**27732S**0, 0**27733S**0	1. **10Base2 Adapter**
0**27791S**0, 0**27792S**0, 0**27793S**0, 0**27799S**0	1. **Run Setup and verify the adapter configuration.** 2. 10Base2 Adapter

NetWare Load-Time Error Messages

Error Message	FRU/Action
050: The board cannot be found The driver assumes that the adapter has not been installed.	1. **Verify that the adapter is properly installed.** 2. 10Base-T or 10Base2 Adapter
058: The board does not respond, **070: The board has failed** The driver cannot communicate with the adapter.	1. **Restart the computer or run your system configuration program to check for possible system conflicts.** 2. 10Base-T or 10Base2 Adapter

Error Message	FRU/Action
073: Unable to allocate memory The driver was not able to allocate sufficient memory to perform its functions.	1. **Unload the driver and unnecessary NLMs and try again.** 2. Reload the server and try again. 3. Install additional memory into the server.
110: Unable to download the firmware The driver is not able to communicate with the adapter.	1. **Restart your computer or run the system configuration program to check for possible system conflicts.** 2. 10Base-T or 10Base2 Adapter
203: Board diags failed to complete The driver is not able to communicate with the adapter.	1. **Restart your computer or run the system configuration program to check for possible system conflicts.** 2. 10Base-T or 10Base2 Adapter
301: POST Flash Main Sector Checksum Failure, **302: POST was not performed - board 303: POST Test Sequencer Internal Failure 304: POST Flash Boot Sector Checksum**	1. **10Base-T or 10Base2 Adapter**
305: POST DRAM Size Detection Failure The power unit is down.	1. **Verify proper seating of the DRAM SIMM on the adapter.** 2. 10Base-T or 10Base2 Adapter
306: POST DRAM Byte (8-bit) Wide Failure 307: POST DRAM Short (16-bit) Wide Failure 308: POST DRAM Word (32-bit) Wide Failure 309: POST DRAM Long (64-bit) Wide Failure 310: POST DRAM Trip (96-bit) Wide Failure 311: POST DRAM Quad (128-bit) Wide Failure 312: POST DRAM Addressability Failure The power unit is down.	1. **Verify proper seating of the DRAM SIMM on the adapter.** 2. 10Base-T or 10Base2 Adapter

Error Message	FRU/Action
313: SRAM Size Detection Failure, **314: SRAM Byte (8-bit) Wide Failure**, **315: SRAM Short (16 bit) Wide Failure**, **316: SRAM Word (32-bit) Wide Failure**, **317: SRAM Long (64 bit) Wide Failure**, **318: SRAM Trip (96-bit) Wide Failure**, **319: SRAM Quad (128-bit) Wide Failure**, **320: SRAM Addressability Failure**, **321: Timer Failure**, **322: Port 1 Internal Loopback Failure**, **323: Port 2 Internal Loopback Failure**, **324: Port 3 Internal Loopback Failure**, **325: Port 4 Internal Loopback Failure**	1. **10Base-T or 10Base2 Adapter**
326: Ethernet Port 1 External Loopback Failure, **327: POST Ethernet Port 2 External Loopback Failure**, **328: POST Ethernet Port 3 External Loopback Failure**, **329: POST Ethernet Port 4 External Loopback Failure**	1. **Verify correct cabling of the port.** 2. 10Base-T or 10Base2 Adapter
330: Port 1 Device Verification Failure, **331: Port 2 Device Verification Failure**, **332: Port 3 Device Verification Failure**, **333: Port 4 Device Verification Failure**	1. **10Base-T or 10Base2 Adapter**

NetWare Run-Time Messages: It is possible that an Unrecoverable, or recoverable, error might occur during normal operation of the adapter. The following table describes the run-time errors that might be displayed.

Recoverable Errors and Warnings

Error Message	FRU/Action
58: The board does not respond, **110: Unable to download the firmware**, **111: Invalid Pipe Command**, **112: The board watchdog failed**, **113: Adapter resetting... please wait** These messages indicate that errors have occurred during the recovery process. The driver will attempt to recover control of the adapter at periodic intervals.	1. **If the driver is not able to recover from any of these errors after several minutes, replace the 10Base-T or 10Base2 adapter.**
229: The adapter alert condition has been corrected This message indicates the successful recovery from one of the above run-time error conditions.	1. **N/A**
388: Ethernet Media Port 1 Tx Carrier Sense Errors, check your cable, **389: Ethernet Media Port 2 Tx Carrier Sense Errors, check your cable**, **390: Ethernet Media Port 3 Tx Carrier Sense Errors, check your cable**, **391: Ethernet Media Port 4 Tx Carrier Sense Errors, check your cable**	1. **Check cables, adapter cables, or concentrator.**
395: Ethernet Media Port 1 Tx Carrier Sense Errors corrected, **396: Ethernet Media Port 2 Tx Carrier Sense Errors corrected**, **397: Ethernet Media Port 3 Tx Carrier Sense Errors corrected**, **398: Ethernet Media Port 4 Tx Carrier Sense Errors corrected** Problem is solved.	1. **N/A**

Unrecoverable Errors

If you receive an error that is not described in the preceding error-message lists, you might have an Unrecoverable (fatal) error. The error message indicates that the adapter has experienced an Unrecoverable run-time error.

To make the adapter functional, unload the drivers, then reload them. If unloading and reloading the drivers does not make the adapter functional, restart the computer and try again.

If the above procedures do not correct the problem, replace the 10Base-T or 10Base2 adapter.

Parts Listing

Quad-BT (10Base-T) PeerMaster Micro Channel Adapter	06H4220
Quad-B2 (10Base2) PeerMaster Micro Channel Adapter	06H6042
Quad-BT and Quad-B2 Option Diskette	06H6380

External SCSI Devices

> **Note**
>
> You cannot use both internal connectors on the SCSI-2 adapter and also use the external connector. For disk-array models with the SCSI-2 Fast/Wide PCI-Bus Adapter, you cannot use the internal channel 1 connector and the external connector at the same time. If you intend to use the external connector, connect internal SCSI-2 devices to the internal channel 2 connector. See the following figure.
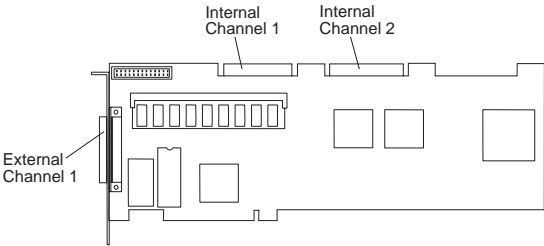
Termination Requirements

The requirements for terminating external SCSI devices are:

- If you attach both internal and external SCSI devices, you must terminate the last internal device and the last external device. For non-disk-array models, you must also change the termination setting of the

SCSI-2 adapter in the SCSISelect utility program, as described in "SCSISelect Utility Program" on page 547, so that the SCSI-2 adapter is no longer terminated.

- If you attach only external devices to the SCSI-2 adapter, you must terminate the last device on the cable. If you install only one external device, it must be terminated. Since the SCSI-2 adapter is already terminated, do not change the termination setting.

Cabling Requirements

Before you install external SCSI devices, you must have the correct external SCSI cables. See Table 4 on page 510 for information on cable lengths. The cables must have the proper connector for the SCSI-2 adapter on one end, and the proper connector for the first external device on the other end.

The SCSI-2 Fast/Wide PCI-Bus adapter can support a total of 15 devices and the SCSI-2 PCI-Bus RAID adapter can support a total of 14 devices, provided that you do not exceed the maximum cable lengths listed in Table 4 on page 510.

If you are using a SCSI data transfer rate greater than 5MB per second, the maximum length of the SCSI bus (cable) must not exceed 3 meters (9.8 feet). If you are using a SCSI data transfer rate of 5MB per second or slower, the maximum length of the SCSI bus cable must not exceed 6 meters (19.7 feet). These lengths apply to the combined lengths of the internal and external cables. Adhering to these standards ensures that the server operates properly.

The following table shows the maximum cable lengths for connecting SCSI devices, based on data-transmission rates.

Note

The maximum cable length for an external cable is determined by subtracting the length of the internal cable being used from the maximum length of SCSI cable that can be used based on the speed of the data transfer.

5MB Per Second or Slower Data Transmission Rates

Note

Maximum cable length – internal cable length = external cable length.

- **Maximum Length of SCSI cable = 6 meters (19.7 ft.)**

  Length of 4-drop, SCSI narrow cable = 1 meter (3.3 ft.)

  Length of 7-drop, SCSI Fast/Wide cable = 1.5 meters (4.9 ft.)
- **When a narrow internal cable is used, the maximum length of the SCSI external cable = 5 meters (16.4 ft.)**

  6 meters – 1 meter = 5 meters, or

  19.7 ft. – 3.3 ft. = 16.4 ft.
- **When a Fast/Wide internal cable is used, the maximum length of the SCSI external cable = 4.5 meters (14.8 ft.)**

  6 meters – 1.5 meter = 4.5 meters, or

  19.7 ft. – 4.9 ft. = 14.8 ft.

Greater Than 5MB Per Second Data Transmission Rate

Note

Maximum cable length – internal cable length = external cable length.

- **Maximum Length of SCSI cable = 3 meters (9.8 ft.)**

  Length of 4-drop, SCSI narrow cable = 1 meter (3.3 ft.)

  Length of 7-drop, SCSI Fast/Wide cable = 1.5 meters (4.9 ft.)
- **When a narrow internal cable is used, the maximum length of the SCSI external cable = 2 meters (6.5 ft.)**

  3 meters – 1 meter = 2 meters, or

  9.8 ft. – 3.3 ft. = 6.5 ft.
- **When a Fast/Wide internal cable is used, the maximum length of the SCSI external cable = 1.5 meters (4.9 ft.)**

  3 meters – 1.5 meter = 1.5 meters, or

  9.8 ft. – 4.9 ft. = 4.9 ft.

Table 4. Maximum External SCSI Cable Lengths

Setting SCSI IDs for External Devices

The internal channel connector (you can only use one of the two internal channel connectors) and the external channel connector on the SCSI-2 Fast/Wide PCI-Bus Adapter accept SCSI IDs from 0 through 7. Each device attached to the external channel connector must have a unique SCSI ID and each device attached to the internal channel connector must have a unique SCSI ID.

For example, you can have a SCSI ID of 0 on a device attached to the channel 1 connector and a SCSI ID of 0 on a device attached to the channel 2 connector of the same SCSI-2 Fast/Wide PCI-Bus Adapter. However, you cannot have a SCSI ID of 0 on two devices attached to the same channel connector.

Note

Read the README file on the SCSI-2 Fast/Wide PCI-Bus Adapter Configuration Option Diskette for updated information. Select **Option Diskette** from the first menu screen.

The following table shows an example of using one internal and one external channel on the RAID adapter. Channel 2 is connected to bank A and Channel 1 is attached to an external DASD storage enclosure. Refer to the documentation supplied with the storage enclosure for physical locations.

Displayed Channel Number	Displayed Bay Number	Bank and Bay Physical Location	SCSI ID
1	1	External	0
1	2	External	1
1	3	External	2
1	4	External	3
1	5	External	4
1	6	External	5
2	1	A1	0
2	2	A2	1
2	3	A3	2
2	4	A4	3
2	5	A5	4
2	6	A6	5
2	7	(CD-ROM)	6

Table 5. One Internal and One External Channel Mapping

You must set a unique SCSI ID for each external SCSI device connected to the SCSI-2 Fast/Wide PCI Adapter. Therefore, do not set the SCSI IDs for external devices to the values that you use for internal devices. Refer to the instructions supplied with the SCSI devices for more information about setting a SCSI ID. The default ID for the SCSI-2 adapter is 7. The ID for the preinstalled CD-ROM drive is 3 on non-disk-array models, and 6 on disk-array models. If the disk-array server was supplied with a preinstalled hard disk drive in bay 1, the ID is 0.

- **Note**

  If you install a second SCSI-2 adapter, you can use the same SCSI IDs that you use for the preinstalled SCSI-2 adapter.

Hot-Swap Backplane (FRU No. 06H8388)

Front View
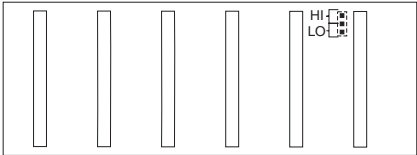
SCSI ID Jumper

If two backplanes are connected to the same adapter, one backplane must be set to high and the other one to low.

SCSI ROM Address ID Jumper Setting	Description
HI = High	Assigns SCSI IDs 8 to D to the backplane
LO = Low	Assigns SCSI IDs 0 to 5 to the backplane

Rear View

Address Jumper

ROM Address Jumper Setting

Notes

- If more than one backplane is installed in the computer, each backplane must have a different ROM address setting.
- **Do not** install a ROM address jumper on backplanes installed in PC Server 320 computers.
- To identify the location for the backplane jumper, see "Hot-Swap Backplane (FRU No. 06H8388)" on page 512.

Jumper Position	Description
C	Address for a backplane installed in Bank C.
D	Address for a backplane installed in Bank D.
E	Address for a backplane installed in Bank E

Termination (Hot-Swap Back Plane)

The hot-swap back plane is automatically terminated. Drives connected to the hot-swap back plane should not be terminated.

IDE Controllers

Note

This information applies to non-Micro Channel computers.

Related Service Information   **513**

Some severs have an IDE controller on the system board.
You can connect two drives to the IDE controller on
non-disk-array models, and one drive to the IDE controller
on disk-array models. If you plan to do this, you must
purchase an IDE cable.

The IDE controller is for low-speed devices, such as tape
drives, but you can connect hard disk drives.

When you connect two drives to the IDE controller, one
drive is the primary (master), and the other is the
secondary or alternate (subordinate). To set the jumpers
to the secondary mode, follow the instructions in the
documentation supplied with the drives.

Installing an Uninterruptible Power Supply

A 9-pin, serial-port cable is supplied with the server. You
can use this cable to attach an American Power
Conversion (APC) uninterruptible power supply (UPS).

After the UPS is installed, the software support must be
loaded on the server. To do this refer to the ServerGuide
CD documentation.

Keyboard

> **Note**
>
> If a mouse or other pointing device is attached,
> remove it to see if the error symptom goes away. If
> the symptom goes away, the mouse or pointing device
> is defective.

001

– Power-off the computer.
– Disconnect the keyboard cable from the system unit.
– Power-on the computer and check the keyboard cable
  connector on the system unit for the voltages shown.
  All voltages are ± 5%.

Pin	Voltage (Vdc)
1	+5.0
2	Not Used
3	Ground
4	+5.0
5	+5.0
6	Not Used
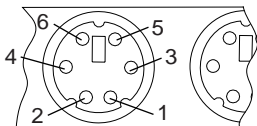
ARE THE VOLTAGES CORRECT?

Yes No

> **002**
>
> Replace the system board.

003

On keyboards with a detachable cable, replace the cable.
If the problem remains or if the cable is permanently
attached to the keyboard, replace the keyboard. If the
problem remains, replace the system board.

Multiple Fixed Disk Drive Replacement (RAID Array)

Use the following procedure for fixed disk replacement
under 8641 ECA002, which provides for the replacement
of specific 2.25 GB fixed disk drives. Refer to RETAIN
record # H13646 for important additional information. This
process may also be used any time multiple fixed disks are
being replaced in a RAID Array.

> **Important**
>
> 1. Keeping track of which drives are located in which bays.
> 2. Have a backup copy of the current RAID configuration.
> 3. The drives might have been swapped multiple times. Always inspect the connectors for damage.
> 4. If the fixed disks are being replaced due to suspected STICTION problems (the drive head is bound to the drive disk), **the main Idea is not to power-off the server**. If the IBM F/W Streaming RAID Adapter Option Diskette is at version 2.3, it is strongly recommended that version 2.22. be obtained and used during this procedure. Version 2.3 turns off all the fixed disks the array during the rebuild process. This will expose the remaining drives to possible stiction. Use version 2.3 after all drives have been replaced.

1. Make a Chart of Bays 1 through 6 and write in each bay the original disk drive Serial Number and the New disk drive serial number for that particular bay.
2. While still installed in the system, place stickers on the drives indicating what bays they are in. Do the same to the new drives once they are installed.
3. Insert the IBM F/W Streaming RAID Adapter Option Diskette Version 2.22 into the default diskette drive (Do not use Version 2.3)
4. Press **Ctrl+Alt+Del** to soft boot the system; then, select "Advanced Options."
5. Select "Backup Configuration to Diskette" from this menu.
6. Insert a blank diskette into drive A and put in a filename for this backup. The default filename is "config." If you use the same backup diskette for more than one system, be sure to give each system a different filename and keep track of the specific filenames.
7. Exit the "Advanced Options" menu; then, select "View Configuration" from the "Main Menu."
8. If applicable, identify which bay contains the hot spare drive.
9. Pull the Hot Spare drive out of its bay; then, exit out of "View Configuration" and the "Main Menu."
10. Press **Ctrl+Alt+Del** When prompted, press **Y** to update the configuration with the HSP bay as "DDD."
11. You are now ready to pull out the first drive to be replaced. The first drive to replace should be the drive suspected of having the highest probability of stiction. If there is not a SUSPECT drive, then choose an order you would like to replace them in,

such as Bays 1, 2, 3, 4,etc. Just remember the replacement order. Check off the bays on your chart after each drive has been successfully replaced.

> **Note**
>
> Remember, the hot spare drive is pulled out first and is left out during replacement/rebuilding of the other drives. It then becomes the last drive replaced and its status turns to HSP. The hot spare doesn't require rebuilding (it's a spare).

12. In the order you have chosen, do the following for each drive being replaced.
    a. Pull out the drive and reboot the RAID Support Diskette. "Press **Y** to update configuration as DDD.
    b. Press **Ctrl+Alt+Del** to reboot the system.
    c. Install the new drive into the bay.
    d. Select "Rebuild Drive" from the "Main Menu"; then, select "Replace Drive."
    e. Highlight the correct DDD Drive in the bay you are replacing. The system will start the drive. After starting successfully, the drive status will change from DDD to OFL.
    f. Select "Rebuild Drive" from the "Rebuild Menu" (The "Rebuild Menu" is a selection on the "Main Menu.")
    g. Highlight the correct OFL Drive in the bay you are rebuilding. The system will rebuild the drive from 0 to 100%. After the system has successfully rebuilt the drive it will change the drive from OFL to ONL and save the configuration.
13. If a fatal error occurs during the above procedure, replace only the original drive back into the system that has not been rebuilt successfully yet. Then, do the following to restore the configuration from diskette.
    a. Insert the Option Diskette into the default diskette drive; then, press **Ctrl+Alt+Del**
    b. Select "Restore Configuration" from diskette on the "Advanced Options Menu" from the "Main Menu."
    c. Remove the "Option Diskette" and insert the diskette with the backup configuration into the default diskette drive and type in the file name for that particular system. Then, proceed replacing and rebuilding drives wherever you left off.
14. If during the restoring from diskette an "Adapter Is Not Responding To Controller Commands" message appears, do the following:
    a. Press **Ctrl+Alt+Del** and restore the configuration from the backup copy of the "RAID Support

Diskette" again until it comes back and says restoration completed successfully.

15. After all drives are replaced and rebuilt successfully, power-off, then power-on the server.

Network Adapters Supported (Dual Processor Servers)

If you are having trouble with the installation or operation of a network adapter using OS/2 for SMP 2.11 and OS/2 LAN Server 4.0, ensure that the network adapter device driver supports dual processors.

The following list of network adapters and device drivers, which support dual processors, have been verified to work with IBM PC Servers with dual processors, OS/2 for SMP 2.11, and OS/2 LAN Server 4.0.

Important

The architecture of the adapter and the architecture of the slot the adapter is installed in must be the same. (Examples: An EISA adapter must be installed in a EISA slot, and a Micro Channel adapter must be installed in a Micro Channel slot.

Network Adapter	Device Driver	LAN Server 4.0 MPTS
3Com Token-Link III EISA	IBMTOKMP.OS2	IBM SMP Token-Ring Network Adapter
3Com EtherLink II 3C503-16 ISA	ELNKII.OS2	3Com 3C503 EtherLink II Adapter
3Com EtherLink III EISA	ELNK3.OS2	3Com Etherlink III Family OS/2
3Com EtherLink III ISA	ELNK3.OS2	3Com Etherlink III Family OS/2
IBM Token-Ring Network 16/4 ISA	IBMTOKMP.OS2	IBM SMP Token-Ring Network Adapter
IBM Token-Ring 16/4 ISA-16	IBMTOKMP.OS2	IBM SMP Token-Ring Network Adapter
IBM LAN Adapter for Ethernet ISA	IBMENI.OS2	IBM LAN Adapter for Ethernet
Intel TokenExpress 16S ISA	OLITOK16.OS2	Use the NDIS driver on the adapter diskette
Intel EtherExpress 16C ISA	EXP16.OS2	Intel EtherExpress 16 Family
SMC EtherCard Elite 16 Ultra ISA	SMC8000.OS2	Use the NDIS driver on the adapter diskette

If OS/2 LAN Server provides a device driver for the network adapter, use the table above to determine the

appropriate device driver to select during the installation
process. If OS/2 LAN Server does not provide the device
driver, use the NDIS device driver located on the diskettes
supplied with the adapter. (Check the adapter
documentation for installation instructions.)

OS/2 Trap Errors

The following information will be helpful in diagnosing trap
errors.

Error Code	Information
0000 0001	See note 7 (Application software error, contact the software vendor's support).
0002	See notes 4, 6, 8, and 9. Install CSDs, run CHKDSK. Replace the defective memory.
0003 0004 0005	See note 7 (Application software error, contact the software vendor's support).
0006 0007 0008	Check the memory. Run CHKDSK. Contact the application software vendor's support.
0009 000A 000B	See note 7 (Application software error, contact the software vendor's support).
000C	If "SYS1942" appears, contact the software vendor's support. If "Exception in Device..." appears, refer to note 4. Run CHKDSK. All other messages: Run CHKDSK and check the memory. If a 113 error appears, see ECA024.
000D	If "SYS1943 A Prog..." appears, contact the software vendor's support. If "Int Proc Error at 0220:3557" appears, set the Token Ring to 16K RAM window, install CSD's. If "double trap 000D" appears, install the latest CSDs. For all other messages or conditions, contact the software vendor's support.
000E	See note 7 (Application software error, contact the software vendor's support).
0010	Hardware of software error. Run diagnostics to check math coprocessor. If diagnostics find no problem, see note 7 (contact the software vendor's support).

Notes:

1. Memory intensive operating systems such as OS/2, AIX*, or UNIX based operating systems are capable of revealing highly intermittent errors not detected by diagnostics.

2. Highly intermittent errors might go undetected by diagnostics tests. If no error occurs during the test, multiple replacements of memory might be required to resolve the problem.

3. Install all software updates. This applies to applications and operating systems.

4. The enhanced memory adapter (FRU 34F2825) might experience Trap 0002 errors if it does not have diagonal resistors across U21-U24. See ECA042. (The enhanced memory adapter has been redesigned without resistors, so this note might not apply to the computer you are servicing.)

5. Intermittent errors can be caused by outside sources of static, noise, or power.

6. Trap 0002 can be caused by a memory or adapter failure. Read the message details. It might be the system board, system-board memory, or adapter.

7. Trap 000D errors are software errors. The customer should contact the software vendor for possible patches.

8. For 8570 systems, refer to ECA059, ECA051.

9. For 8580-AXX Models, see ECA051 for possible system board replacement to correct Trap 002, NMI, or DOS parity errors.

System Aid Diskette

A system aid diskette is now available for Trap 0002 errors. Dealers can download it from the Technical Advisors Bulletin Board as file "TRAP2LOG." The diskette will read NVRAM and indicate which of four possible sources caused the error. The four possible errors and their causes are listed below.

Error Code	Information
110	Usually a system-board memory error. If replacing the memory does not fix the problem, suspect the system board.
111	I/O Channel Check. Any adapter could cause this error, but usually a memory adapter is the cause.
112	Watchdog Timeout. Could be hardware or software. If replacing the system board does not fix the problem, suspect the software.

Error Code	Information
113	DMA Timeout. Usually a software error, but possibly a hardware failure (system board). If it is a 70-A21 with a 113 error, see ECA056, run CHKDSK. Contact the software vendor for more information. If it is any other system with a 113 error, refer to ECA023. Check the hardware.

OS/2 Problems during a New Installation

If you have determined that you *do not* have a hardware failure, and you cannot get the operating system to work, assist the customer in recopying the OS/2 software to the hard disk. **If this is not a new installation, have the customer order the replacement diskettes.** If this is a **new installation** and the customer does not have the diskettes, order replacement diskettes by doing the following:

1. Write down the machine type and serial number.
2. Call **1-800-342-6672** (weekdays 9 a.m to 9 p.m eastern time).
3. Identify yourself as an IBM service representative or IBM authorized servicer.
4. For OS/2 Version 2.0, request diskette package P/N 41G3329. For OS/2 Version 2.00.1, request diskette package P/N 52G9973. The IBM telephone operator will supply the correct package part number for later versions of OS/2. (Supply the machine information and shipping address for either package.)

After you receive the OS/2 diskettes, refer to the pamphlet supplied with the diskettes for OS/2 installation instructions.

The PS/2 diagnostic tests are intended to test *only* IBM-marketed products. Products not marketed by IBM, prototype cards, or modified options can give false errors and invalid system responses.

Refer to the PS/2 Hardware Maintenance manual Reference section related PS/2 reference information.

OS/2 Version Level Check

To determine the OS/2 level on the computer you are servicing, type SYSLEVEL at the OS/2 prompt, then press Enter.

PC Server Flash/Diagnostics/CMOS Access Information

The following table provides the access information for Flash/BIOS, Diagnostics, CMOS, and Setup programs for PC Servers.

Type	Model	Bus	Diags Program Diskette/IML	Access Diags Program	CMOS/Setup	Access CMOS/Setup	Flash
8639	310	ISA	Diskette	Boot Diskette	Yes	F1	Yes
8639	310	MC/A	IML	F1 - Ctrl+Alt	Yes	F1	Yes
8640	300	EISA	Diskette	Boot Diskette	Yes	Ctrl+Alt+S	Yes
8640	320	EISA	Diskette	Boot Diskette	Yes	F2	Yes
8640	320	MC/A	Diskette	Boot Diskette	Yes	F1	Yes
8641	500	MC/A	Diskette	Boot Diskette	No	N/A	Yes
8641	520	EISA	Diskette	Boot Diskette	Yes	F2	Yes
8642	720	MC/A	Diskette	Boot Diskette	No	N/A	Yes

Printer

1. Make sure the printer is properly connected and powered on.
2. Run the printer self-test.

If the printer self-test does not run correctly, the problem is in the printer. Refer to the printer service manual.

If the printer self-test runs correctly, install a wrap plug in the parallel port and run the diagnostic tests to determine which FRU failed.

If the diagnostic tests (with the wrap plug installed) do not detect a failure, replace the printer cable. If that does not correct the problem, replace the system board or adapter connected to the printer cable.

SCSI Fast/Wide PCI Adaptec Adapters (AHA-2940/2940W)

The AHA-2940 and AHA-2940 Wide are PCI Fast and PCI/Wide SCSI adapters. These adapters are supported on computers with a PCI 5v bus master slot.

—— **Note** ——

The Type 8642 computer is shipped with the AHA-2940 Wide SCSI adapter only.

The adapters support the following:

Adapter	Connectors	Devices Supported
AHA-2940 Adapter	1 each internal 8-bit SCSI connector, 1 each external 8-bit SCSI connector.	Supports a maximum of seven 8-bit single-ended SCSI devices.
AHA-2940W Adapter	1 each internal 8-bit SCSI connector, 1 each internal 16-bit SCSI connector, 1 each external 16-bit SCSI connector.	Supports a maximum of fifteen 8-bit and 16-bit single-ended SCSI devices.

Adapter Locations
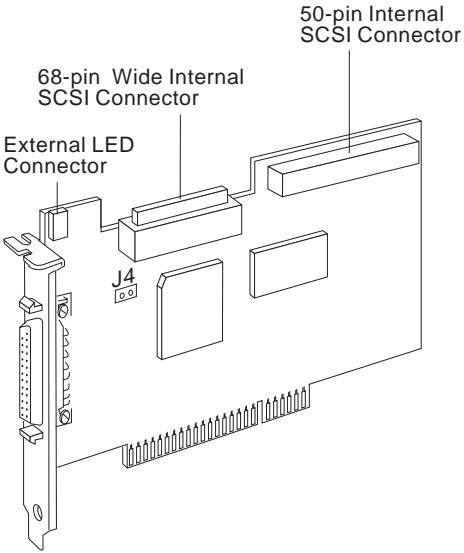
J4 Termination jumper for multiple-computer configurations. See "Termination (for Multiple-Computer Configurations)" on page 545.

BIOS Startup Messages

After you have installed the host adapter, BIOS displays a message when you boot the computer. Normally, this message lists the SCSI ID, manufacturer, model number and other information for each SCSI device that the BIOS detects.

If an initialization failure occurs, the host BIOS displays a specific error message followed by a BIOS Installation Failure message. The following are some of the installation failure messages and their meaning:

A drive larger than 1 gigabyte has been detected with 64 head / 32 sector partitioning. This drive is not compatible with the 255 head / 63 sector translation which has been enabled on this adapter. Data could be corrupted! Please check your system setup. Press any key to continue.

This message occurs only if Extended BIOS Translation is enabled in the SCSISelect utility. It means that the BIOS detected a large-capacity drive invalid partition in the master boot record.

Extended BIOS Translation is used only with MS-DOS 5.0 or above. You do not need to enable this option if you are using another operating system such as OS/2 or UNIX.

If you are using a driver larger than 1GB under MS-DOS 5.0 or above and this message appears, do the following:

1. Run the SCSISelect utility and set Extended BIOS Translation to Disabled.
2. Exit from the SCSISelect utility and back up the data on the disk drive, if you want to save it.
3. Perform a SCSI low-level format with the Format Disk utility under SCSI Disk Utilities in the SCSISelect utility.

   - **Note**

   All data on the target drive will be lost when you run the Format Disk utility. Back up your data before you run it.

4. In the SCSISelect Advanced Configuration Options menu, set Extended BIOS Translation to Enabled.
5. Partition the drive again.
6. Restore data to the drive, if necessary.

Device connected, but not ready.

This message appears if the host adapter receives no answer when it requests data from an installed SCSI device. The host adapter skips this device and moves to the next device on the bus.

Do the following if you see this message when you request data from the SCSI drive:

1. Run the SCSI*Select* utility and access SCSI Device Configuration. Locate the SCSI ID of the host adapter and set Send Unit Commands to yes.
2. Exit the SCSI*Select* utility and request data from the drive again.
3. If the message still appears, follow the drive manufacturer's instructions to make sure the drive is set to spin-up when the power is switched on.

Start unit request failed.

The BIOS was unable to send a Start Unit Command to the device. Run the SCSI*Select* utility and disable Send Start Unit Command for the device.

Time-out failure during SCSI Inquiry command!
   or

Time-out failure during SCSI Test Unit Ready command!
   or

Time-out failure during Start Unit command!

An unexpected time-out occurred. Try disconnecting the SCSI device cables from the host adapter and then starting the computer. If the computer successfully restarts check the following.

- SCSI bus termination (See, "Termination (Devices)" on page 544, "Termination (AHA-2940/2940W Adapters)" on page 544, and "Termination (for Multiple-Computer Configurations)" on page 545),
- Cable connections.

One of the devices on the SCSI bus may be defective.

Booting the Computer from a SCSI Drive

- Be sure the standard hard disk drives are not configured in the system, using the Setup program.

  - **Note**

    Standard hard disk drive means the disk drives(s) attached to the system by a standard ISA/EISA, non-SCSI disk adapter (example, IDE drives). Standard hard disk drives can be set to the installed or not installed state by the Setup program supplied with the computer. The Setup program allows you to select a number of standard hard disk drives that are recognized by the system, regardless of whether they are physically installed. SCSI drives are not controlled through the Setup program.

- Be sure the SCSI boot drive address is set to SCSI ID 0 and that there are no SCSI ID conflicts. You can use the Adaptec SCSI*Select* Configuration Utility to determine the SCSI address of the devices attached to the SCSI bus.
- Be sure that SCSI parity is consistently enabled or disabled on all devices on the SCSI bus.

  > **Note**
  >
  > All SCSI devices currently supported on PC Servers support parity checking.

  To check the parity setting(s) of the devices on the SCSI bus, do the following:
  1. Start the SCSI*Select* utility.
  2. Select the Configure/View Host Adapter Settings menu.
  3. Set SCSI Parity Checking to Enable for all the devices connected to the SCSI bus.

     > **Note**
     >
     > Some early developed SCSI devices may not support parity checking. If one or more of the devices connected to SCSI bus **do not** support parity checking, set SCSI Parity Checking to Disabled for all of the SCSI devices connected to the SCSI bus.

- Try enabling Include in BIOS Scan in the SCSI Device Configuration option of the SCSI*Select* utility.
- Be sure to power-off; then, power-on the computer after changing any value on a host adapter, in a Setup program, or on a SCSI device.
- Be sure the SCSI bus is properly terminated. See, "Termination (Devices)" on page 544, "Termination (AHA-2940/2940W Adapters)" on page 544, and "Termination (for Multiple-Computer Configurations)" on page 545.
- Be sure the intended boot disk has an active DOS partition and has been formatted.
- Check cable connections.

Computer Hangs, or HOST Adapter Cannot Always Find the Drives

- Check SCSI parity for consistency and be sure SCSI termination is set correctly. See, "Termination (Devices)" on page 544, "Termination (AHA-2940/2940W Adapters)" on page 544, and "Termination (for Multiple-Computer Configurations)" on page 545.
- Check cable length and integrity.
- If the host adapter LED remains on when the computer hangs, the host adapter may be interfering with the operation of the computer. It may not

support First-Parity DMA (that is, Bus Master) data transfers.

Connectivity (Cables/Devices)

If you attach both internal and external SCSI devices to the host adapter, you must terminate the last external device and the last internal device. (This applies to both the AHA-2940 and AHA-2940W adapters.)

Important

If you connect external devices to the AHA-2940W adapter, you can only attach devices to one of the internal SCSI connectors.

If you connect both internal and external SCSI devices, you must also change the host adapter termination settings from the default, because the host adapter is now in the middle of the SCSI bus. See "Termination (AHA-2940/2940W Adapters)" on page 544.

Component	Requirement
Maximum external cable length	3 m (9.8 ft.)
Maximum combined length of all cables connected internally and externally to each adapter	6 m (19.7 ft.)
SCSI Devices	Supports single-ended devices only
CD-ROM Drive	The CD-ROM drive has a 50-pin connector. If it is connected to the 68-pin connector on the adapter using a 68-pin to 68-pin cable, a 16/8 Bit Converter must be used to connect the CD-ROM drive to the 68-pin cable.
AHA-2940 and AHA-2940W 50-pin internal connector	50-pin to 50-pin SCSI ribbon cable
AHA-2940W 68-pin internal connector	68-pin to 68-pin SCSI ribbon cable
AHA-2940 50-pin external connector	50-pin to 50-pin SCSI shielded cable
AHA-2940W 68-pin external connector	68-pin to 68-pin SCSI shielded cable

Disk Drive Configuration Problems

Problems may occur if a combination of standard and SCSI drives are installed in the computer.

Standard hard disk drives can be set to the installed or not installed state by the Setup program supplied with computer. SCSI drives are not controlled through the Setup program.

If SCSI and non-SCSI drives are installed, the non-SCSI disk drive is always the boot drive.

Note

If too many large-capacity drives are set to start instantly at system power-on, this could cause the power supply to shut down. See "Power Supply Shutdowns" on page 285.

LED (AHA-2940/2940W Adapters)

The red light emitting diode (LED) on the AHA-2940/2940W adapter lights up when the host adapter is performing activity on the SCSI interface or when other SCSI devices are using the SCSI bus. An external LED connector is provided on the adapter so you can attach a cable to an externally visible LED.

Note

If the light stays on when there is no activity on the SCSI bus, one of the following failures may be indicated:

- The bus is hung.
- The processor(s) failed.
- Unexpected activity is occurring or the SCSI cables are incorrectly installed. (If the SCSI cables are installed in reversed position, the host adapter is forced into a solid SCSI reset state, which halts normal operation.)

Other Problems and Solutions

The screen is difficult to read when running the SCSI Select **utility.**

Press **F5** to toggle the display between color and monochrome modes. This may make the screen easier to read.

Important

When the format/verify utility is attempted on a disk device, an Unexpected SCSI Command Failure pop-up box containing error information is displayed.

This probably means that the utility encountered a problem with the disk device or the media and cannot run. The following information is displayed in the pop-up window:

- SCSI Target ID of the device
- SCSI CDB Sent (for example, 2F 00 00 00 00 00 00 08 00 00)
- Host Adapter Status (for example, 11h - Selection Timeout)
- Target Status (for example, 00h - Good Status)
- Sense Key (for example, 06h - Unit Attention)
- Additional Sense Code
- Additional Sense Code Qualifier

You can probably determine from the Sense Key information both the cause of the problem and its solution. The following are more common Sense Key values and their meanings:

- **02h - Not ready**
  The media is not ready to format. Be sure that media is inserted in the drive.
- **03h - Medium error**
  The disk media may be defective. If it is a removable-media drive, try using a different media disk. If it is a hard disk drive, the disk may be physically damaged. Verify and format the media with SCSISelect.
- **04h - Hardware error**
  The disk drive may be defective. Consult the hardware documentation and contact the manufacturer.
- **05h - Illegal request**
  The Adaptec formatting utility does not support a low-level format of this device; however, the device may already be low-level formatted by the manufacturer.
- **06h - Unit attention**
  The removable media may be write-protected. Disable write protection and run the utility again.

The Additional Sense Code field provides more information about the error.

The computer locks up when the Esc key is pressed to exit SCSI Select**.**
If this happens, power-off; then, power-on the computer. Any settings you changed before you tried to exit the program were recorded in the EEPROM and will not be lost.

One of the SCSI devices in the computer will not allow you to disable termination. How can it be attached to the SCSI bus?
Attach the device on the end of the SCSI bus so that you do not need to disable termination.

After connecting the LED cable to the host adapter, the light stays on all the time and the computer hangs.
The red LED on the AHA2940/2940W normally lights when there is activity in the SCSI bus.
If the light stays on when there is no activity on the SCSI bus, the SCSI cables might be installed in a reverse position.

Problems Detected During Installation

If the system will not boot from the standard hard disk drive or a boot program on the diskette drive (after the initial hardware installation), check the following:

- If the AHA-2940/2940W LED and the SCSI drive LED are always on, the SCSI cables might be installed in a reverse position between the host adapter and the drive.
- If the AHA-2940/2940W BIOS message is not displayed on the screen during system boot, the system does not recognize the host adapter BIOS. Be sure that host adapter BIOS is enabled.
- Be sure there are no address conflicts between a PCI device and an EISA or ISA device.
- If you see the message *Host adapter not found*, the host adapter has detected an internal failure. Be sure the host adapter is firmly seated in the PCI slot.
- If you see the message *Host adapter found but not configured*, run the SCSI*Select* utility to configure the host adapter. See "SCSISelect Configuration Utility" on page 534.

SCSISelect Configuration Utility

The SCSISelect Configuration Utility program, located on the ROM of the AHA-2940 and AHA-2940W adapters, allows you to change the default settings for the adapter and the devices connected to the adapter. The following are the default settings for the AHA2940 and AHA2940W adapters.

The following settings are for the adapter and the devices connected to the adapter:

Setting	Default Value
Host Adapter SCSI ID	7
SCSI Parity Checking	Enabled
Host Adapter SCSI Termination AHA-2940 AHA-2940W	Enabled Low On / High On
Reset SCSI Bus at Host Adapter Initialization	Enabled
Host Adapter BIOS[1]	Enabled
Support Removable Disks Under BIOS as Fixed Disks[1]	Boot only
Extended BIOS Translation for DOS, 1GB[1]	Enabled
BIOS Support for More Than 2 Drives[1]	Enabled
[1] Settings are valid only if the adapter BIOS is enabled.	

Individual Settings

The following settings are for each SCSI device connected to the adapter:

Setting	Default Value
Initiate Sync Negotiation	Yes
Maximum Sync Transfer Rate	10MB per second[2]
Enable Disconnection	Yes
Send Start Unit SCSI Command[1]	No
Include In BIOS Scan[1]	Yes
Initiate Wide Negotiations[3]	Enabled
[1] Settings are invalid only if the adapter BIOS is enabled. [2] 20MB per second maximum synchronous transfer on AHA-2940W. [3] AHA-2940W adapters only.	

SCSISelect Configuration Utility Control Keys

Keys	Action/Response
↓ and ↑	Moves the highlighted bar from one adapter selection to another. If more than one adapter is displayed, the PCI bus number and the PCI device number that correspond to the highlighted adapter are also highlighted.
Enter	Selects the highlighted item.
Esc	Returns to the previous menu.
F5	Switches between color and monochrome display modes.
F6	Resets all settings to the host adapter default settings.

Starting the SCSISelect Configuration Utility: You can start the SCSISelect utility program from the BIOS banner if the adapter BIOS is enabled, or from the SCSISelect Configuration Utility diskette shipped with the computer.

From the BIOS Banner: The BIOS banner is displayed when you power-on or reboot the computer. The banner lists the model number and SCSI ID of the SCSI devices connected to the adapter. To start the utility, do the following:

1. Power-off; then, power-on the computer (or reboot the computer).
2. When the BIOS banner is displayed on the screen, press **Ctrl+A**.

From the SCSISelect Configuration Utility Diskette: To start the utility from the SCSISelect Configuration Utility diskette, do the following:

1. Insert the SCSISelect Configuration Utility diskette into diskette drive A.
2. At the DOS prompt type, *A:2940cfg.exe*
3. Press **Enter**.

SCSISelect Configuration Utility

Menus/Options: If the SCSISelect utility detects only one AHA-2940/2940W host adapter in your system, it displays the following Options menu:

```
      AHA-2940/2940W at Bus:Device xx:xxh

Would you like to configure the host adapter or run
the SCSI disk utilities?  Select the option and press
<Enter>.  Press <F5> to switch between color and
monochrome modes.

               Options
      Configure/View Host Adapter Settings
             SCSI Disk Utilities

Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

> **Note**
>
> If the SCSISelect utility finds multiple AHA-2940/2940W host adapters in your system, the PCI Bus and PCI device number of each adapter is displayed. As you move the highlighted bar to different host adapters (using the up and down arrow keys), the red light on the corresponding adapter installed in the system lights to allow you to identify the correct adapter. The Option menu is displayed after you select a host adapter.

Configuration/View Host Adapter Settings Menu/Options

```
      AHA-2940/2940W at Bus:Device xx:xxh

Configuration

SCSI Channel Interface Definitions
 Host Adapter SCSI ID ................... 7
 SCSI Parity Checking ................... Enabled
 Host Adapter SCSI Termination .......... Enabled
Additional Options
 SCSI Device Configuration .............. Press <Enter>
 Advanced configuration Options ......... Press <Enter>

       <F6> - Reset to Host Adapter Defaults

Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

Host Adapter SCSI ID: changes the host adapter SCSI ID from its default value of 7.

```
        AHA-2940/2940W at Bus:Device xx:xxh

                        0
                        1
                        2
                        3
                        4
                        5
                        6
                *       7


Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

> **Note**
>
> The menu for the A-2940W adapter displays SCSI IDs
> #0 to #15.

SCSI Parity Checking: enables or disables host adapter SCSI parity checking.

```
        AHA-2940/2940W at Bus:Device xx:xxh

                *       Enabled
                        Disabled

Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

Host Adapter SCSI Termination: configures host adapter SCSI termination.

The following menu is displayed if an AHA-2940 adapter is installed:

```
        AHA-2940/2940W at Bus:Device xx:xxh

                *       Enabled
                        Disabled

Both ends of the SCSI bus should be terminated.  Host Adapter
termination should be disabled if you attach SCSI devices to
both internal and external connectors, since the host adapter
would then be in the middle of the SCSI bus.

        Device Connection              | Termination
                                       |
        Internal devices only          | Enabled
        External devices only          | Enabled
        Internal and External devices  | Disabled


Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

The following menu is displayed if an AHA-2940W adapter is installed:

```
        AHA-2940/2940W at Bus:Device xx:xxh

                *  Low ON  / High ON
                   Low OFF / High OFF
                   Low OFF / High ON

Both ends of the SCSI bus should be terminated.  Host Adapter
termination should be disabled if you attach SCSI devices to
both internal and external connectors, since the host adapter
would then be in the middle of the SCSI bus.

         Device Connection              | Termination

         Internal devices only          | Enabled
         External devices only          | Enabled
         Internal and External devices  | Disabled

Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

SCSI Device Configuration: allows you to configure certain parameters of each SCSI device on the SCSI bus. If selected, the following information for each SCSI ID is displayed even if some SCSI IDs are not assigned to a device:

```
              SCSI Device Configuration

SCSI Device ID              #0    #1    #2    #3    #4    #5    #6    #7

Initiate Sync Negotiation   yes   yes   yes   yes   yes   yes   yes   yes
Maximum Sync Transfer Rate  10.0  10.0  10.0  10.0  10.0  10.0  10.0  10.0
Enable Disconnection        yes   yes   yes   yes   yes   yes   yes   yes
------ Options Listed Below Have NO EFFECT if BIOS is Disabled ------------
Send Start Unit Command     no    no    no    no    no    no    no    no
Include in BIOS Scan        yes   yes   yes   yes   yes   yes   yes   yes

Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

- - - Note - - -

The menu for the AHA-2940W adapter displays SCSI IDs #0 to #15

- **Initiate Sync Negotiation**: determines whether the host adapter initiates synchronous negotiation with the SCSI device. However, the host adapter always responds to synchronous negotiation if the SCSI device initiates it.

    - - - Note - - -

    If Initiate Sync Negotiation is set to yes and the attached SCSI devices **do not** support synchronous negotiation, the system may operate erratically or hang.

- **Maximum Sync Transfer Rate**: determines the maximum synchronous data transfer rate that the host adapter can support. The host adapter supports rates up to the FAST SCSI maximum of 10MB per second. The default value is 10.0. The AHA-2940W has a 16-bit (2-byte) channel that provides an effective maximum synchronous transfer rate of 20.0MB per second (10MB per 8-bit channel). The valid settings are:

SCSISelect Transfer Rate	AHA-2940 Effective Transfer Rate	AHA-2940W Effective Transfer Rate
10.0	10MB per second	20MB per second
8.0	8MB per second	16MB per second
6.7	6.7MB per second	13.4MB per second
5.0	5MB per second	10MB per second

- **Notes**

    1. In most cases, you can use the maximum value of 10.0. If the host adapter is set not to negotiate for synchronous data transfer (Initiate Sync Negotiation is set to no), the value selected here is the maximum rate that the host adapter accepts from the device during negotiation.
    2. Some older SCSI devices do not support Fast SCSI data transfer rates (10.0, 8.0, and 6.7). This might cause the computer to operate erratically or hang if the transfer rate is set to high. Select a Maximum Sync Transfer Rate of 5.0 for these devices. If Initiate Sync Negotiation is set to yes and the attached SCSI devices **do not** support synchronous negotiation, the system may operate erratically or hang.

- **Enable Disconnection**: determines whether the host adapter allows a SCSI device to disconnect from the SCSI bus (sometimes called Disconnect/Reconnect). Disconnect/Reconnect allows the host adapter to perform other operations on the SCSI bus while the SCSI device is temporarily disconnected.

    - **Note**

      You should leave Enable Disconnection set to yes if two or more SCSI devices are connected to the host adapter. This optimizes SCSI bus performance. If only one SCSI device is connected to the SCSI adapter, set Enable Disconnection to no for optimum performance.

- **Send Start Unit Command**: is supported by some SCSI devices and determines whether the Start Unit command (SCSI command 1B) is sent to the SCSI device (most devices do not require this). Enabling this option reduces the load on the power supply by allowing the host adapter to power-on SCSI devices one at a time when you boot the computer. Otherwise, the devices all power-on at the same time. Most devices require that you set a jumper before they can respond to this command. If this option is enabled for more than one SCSI device, the Start Unit Command is sent first to the SCSI device with the lowest SCSI ID. After this device responds to the host adapter, the Start Unit Command is sent to the next highest SCSI ID with a setting of yes. The default setting is no.

  > **Note**
  >
  > The Send Start Unit command setting is valid only if the host adapter BIOS is enabled.

- **Include in BIOS Scan**: determines whether the host adapter BIOS supports devices attached to the SCSI bus without the need for device driver software. When set to yes, the host adapter BIOS controls the SCSI device. When set to no, the host adapter BIOS does not search the SCSI ID for devices to control and device driver software is needed to control the SCSI device. The default setting is yes.

  > **Note**
  >
  > The host adapter BIOS must be enabled for this setting to be valid.

Advanced Configuration Options Menu

```
                 Advanced Configuration Options

  Reset Bus at HOST Adapter Initialization........................ Enabled

-------Options Listed Below Have NO EFFECT if the BIOS is Disabled---------

  Host Adapter BIOS (Configuration Utility Reserves BIOS).......... Enabled
  Support Removable Disk Under BIOS as Fixed Disks................ Enabled
  Extended BIOS Translation for DOS Drives > 1 GByte.............. Enabled
  BIOS Support for More Than 2 Drives (MS-DOS (R) 5.0 and above)... Enabled

Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

> **Note**
>
> Do not change these file options unless absolutely necessary.

- **Reset SCSI Bus at Host Adapter Initialization**: allows you to enable or disable a SCSI bus reset generated by the host adapter during its power-on initialization and after a hard reset. If enabled, the SCSI bus resets the first time the host adapter is initialized. If the host adapter BIOS is enabled, the BIOS resets the SCSI bus, then waits two seconds before scanning the bus for SCSI devices. If Reset SCSI Bus at Host Adapter Initialization is disabled, there is no two-second delay. The default setting is enabled.

  > **Note**
  >
  > Normally, SCSI Bus Reset at Host Adapter Initialization should always be enabled.

- **Host Adapter BIOS**: enables or disables the host adapter BIOS. The default setting is Enabled.

  > **Note**
  >
  > The host adapter must be enabled for the computer to boot from a SCSI hard disk drive connected to the host adapter.

  The following SCSI*Select* options cannot be used unless the host adapter BIOS is enabled:
  - Support Removable Disks Under BIOS as Fixed Disks
  - Extended BIOS Translation for DOS Drivers > 1 GByte
  - BIOS Support for More Than 2 Drives
  - Send Start Unit SCSI Commands
  - Include In BIOS Scan

- **Support Removable Disk Under BIOS as Fixed Disk**: allows you to control which removable-media drives are supported by the host adapter BIOS. It is only valid if the host adapter BIOS is enabled. The default setting is Boot Only. The following choices are available:
  - **Boot only**: Only the removable-media drive designated as the boot device is treated as a hard disk drive.
  - **All Disks**: All removable-media drives supported by the BIOS are treated as hard disk drives.

– **Disabled**: Removable-media drives are not treated as hard disk drives. In this situation, software drivers are needed because the drivers are not controlled by the BIOS.

> **Note**
>
> Support for removable-media drives means only that the host adapter BIOS allows you to use a removable-media drive as if it were a hard disk drive. If you remove the media while the drive is powered-on, data may be lost. If you want to be able to remove the media while the drive is powered-on, install the removable-media device driver and set this option to Disabled.

- **Extended BIOS Translation for DOS Drives more than 1GB**: allows you to enable or disable extended translation for SCSI hard disk drives with a capacity greater than 1GB. It is only valid if the BIOS is enabled. The default setting is Enable. If this option is enabled, the following translation schemes are used:
  - SCSI hard disk drives with a capacity of 1GB or less use a translation scheme of 64 heads, 32 sectors per track.
  - SCSI hard disk drives with a capacity greater than 1GB use a translation scheme of 255 heads, 63 sectors per track.
- **BIOS Support for more than 2 Drives**: allows you to enable or disable BIOS support for more than two and up to eight SCSI hard disk drives. The host adapter BIOS must be enabled. This feature is supported by DOS 5.0 and above. The default setting is Enable.

SCSI Disk Utility

```
          AHA-2940/2940W at Bus:Device xx:xxh

            Select SCSI Disk and press <Enter>

   SCSI ID# 1 :  Quantum P140S 940-40-94xx
   SCSI ID# 2 :  No Device
   SCSI ID# 3 :  SyQuest SQ 5110
   SCSI ID# 4 :  No Device
   SCSI ID# 5 :  No Device
   SCSI ID# 6 :  No Device
   SCSI ID# 7 :  AHA-2940/2940W

 Arrow keys to move cursor, <Enter> to select option, <Esc> to exit (*=default)
```

> **Note**
>
> The menu for the AHA-2940W adapter displays SCSI IDs #0 to #15

When you select SCSI Disk Utilities from the Options menu, the SCSI*Select* utility scans the SCSI bus and lists all SCSI devices installed on the SCSI bus. When you highlight a device by moving to it with the cursor keys and pressing **Enter**, a small window appears. You can select **Format Disk** or **Verify Media** from this menu.

- **Format Disk**: performs a low-level format on disk devices.

  > **Note**
  >
  > A low-level format destroys all data on the drive. Be sure to back up all data before performing this operation. You cannot abort a low-level format once it is started.

  Most SCSI disk devices are pre-formatted and do not need to be formatted again. The Adaptec Format Disk utility is compatible with most SCSI disk drives. Run it on hard disk drives or removable-media drives that were previously used with non-Adaptec host adapters.

- **Verify Disk Media**: scans the selected device's media for defects.

  > **Note**
  >
  > Press **Esc** at any time to abort the Verify Disk Media utility.

  If this utility finds bad blocks, it prompts you to reassign them. If you select yes, the blocks will no longer be used.

Self Diagnostics (AHA-2940/2940W Adapters)

AHA-2940/2940W host adapters execute a self-diagnostics Power-On Self-Test (POST) during BIOS initialization. If the diagnostics fails, the BIOS displays the message *Initialization failed* and halts any further operation of the adapter. If this occurs, remove the adapter and check for the following:

- Components that are not correctly installed or properly seated
- Broken wires
- Missing or damaged components
- Conductive debris on the adapter.

If you see any physical damage, replace the adapter.

Termination (Devices)

Note

Hot-Swap Back Planes are automatically terminated.
Do not terminate devices connect to a Hot-Swap Back
Plane.

Each connector on the adapter and the devices attached
to the connector make up a separate daisy-chain.
Termination is required on the last device in each chain. If
only one device is attached, termination is required for that
device.

Termination (AHA-2940/2940W Adapters)

Use the following information to determine the termination
required for the adapter; then, run the SCSI*Select* Utility
Configuration program if required. (To run the SCSI*Select*
Configuration Utility program, see "SCSISelect
Configuration Utility" on page 534 and "Starting the
SCSISelect Configuration Utility" on page 535.)

AHA-2940 Adapter

Adapter Termination	Devices Connected To
Enabled	Internal connector only
Enabled	External connector only
Disabled	Internal and external connectors

AHA-2940W Adapter

Adapter Termination	Devices Connected To
Low On / High On	68-pin internal connector only
Low On / High On	68-pin external connector only
Low On / High On	50-pin internal connector only
Low Off / High Off	68-pin internal and 68-pin external connectors
Low Off / High On	50-pin and 68-pin internal connectors
Low Off / High On	50-pin internal and 68-pin external connectors
Invalid	50-pin and 68-pin internal connectors, and 68-pin external connector

Termination (for Multiple-Computer Configurations)

If more than one computer is attached to the SCSI bus, you can configure the adapter to provide termination when the adapter host computer is powered off. The termination is applied only when the computer containing the adapter is powered off and another computer connected to the SCSI bus accesses the device.

To activate this termination, install a jumper on J4 on the adapter.

Troubleshooting Checklist — SCSI (AHA-2940/2940W Adapters)

Most problems that occur during installation result from errors in preparing and connecting devices on the SCSI bus.

Answer these questions first if a problem occurs during installation:

1. Are the power cables and SCSI cables properly connected?
2. Is the Host adapter firmly seated and secure in a 5-volt PCI slot that is capable of bus mastering?
3. Is the SCSI cable installed correctly throughout the SCSI bus?
4. Are the PCI bus slot parameters set correctly in the computer's Setup program?

   Note

   The PCI bus is designed to assign the IRQ port address, and BIOS address settings. You may need to assign some of these values manually in the Setup program.

5. Is each adapter, including the host adapter, set to a unique SCSI ID (0-7 for the AHA-2940 and 0-15 for the AHA2940W)?
6. Is the termination set correctly?

Using a SCSI Drive as C and Another SCSI Drive as D

1. Be sure the computer's CMOS Setup is set to No Drives Installed, as required for SCSI host adapters.
2. Be sure the SCSI drive to be used as drive C is set to SCSI ID 0. See "SCSI Disk Utility" on page 542.
3. Set the SCSI drive to be used as drive D to SCSI ID 1.
4. Try enabling Include in BIOS Scan in the SCSI Device Configuration option of the SCSISelect utility. See "SCSI Device Configuration" on page 538.
5. Be sure to power-off, then power-on the computer after changing any values on the host adapter, in Setup, or on a SCSI device.
6. Be sure that SCSI parity checking is consistently enabled or disabled on the SCSI bus.
7. Verify that the host adapter and the SCSI devices are properly configured and installed.
8. Be sure the SCSI bus is properly terminated.
9. Be sure the disk is formatted and has a DOS partition. Run the Format Disk utility accessible through SCSISelect. See "SCSI Disk Utility" on page 542.

Using a Standard Drive as C and a SCSI Drive as D

1. If a second hard disk drive is installed, use the Setup program to map the second hard disk drive out of the configuration.
2. Be sure the SCSI drive to be used as drive D is set to SCSI ID 0. You can use the SCSISelect utility to determine the SCSI address of the peripherals on the SCSI bus.
3. Be sure the SCSI parity checking is consistently enabled or disabled on all devices on the SCSI bus.
4. Verify that the host adapter and the SCSI devices are properly configured and installed.
5. Be sure to power-off, then power-on the computer after changing any values on the host adapter, in Setup, or on a SCSI device.
6. Be sure the SCSI bus is properly terminated.
7. Be sure the disk is formatted and has a DOS partition. Run the Format Disk utility accessible through SCSISelect. See "SCSI Disk Utility" on page 542.
8. Check cable connections.

SCSISelect Utility Program

The SCSI-2 controller has a built-in menu-driven configuration utility program that allows you to view and change SCSI settings.

You can use the SCSISelect Utility program to:

- Change the default values
- Verify and change configuration conflicts
- Format a new SCSI hard disk

Starting the SCSISelect Utility Program

You can access this program when you start the server. The SCSISelect prompt appears after the IBM PC Server screen appears briefly and then disappears. Press **Ctrl**+**A** immediately after the SCSISelect prompt appears.

Use the Up Arrow (↑) or Down Arrow (↓) key to move the highlight bar to the various menu choices. Press **Esc** to return to the previous menu. Also, you can press F5 to switch between color and monochrome modes (if your display permits). To change the current settings of the items displayed in the menus, follow the directions on the screen.

SCSISelect Utility Program Options

The following options are displayed on the SCSISelect Utility program menu:

- Configure/View Host Adapter Settings
- SCSI Disk Utilities

Configure/View Host Adapter Settings: To view or change the SCSI-2 controller settings, select **Configure/View Host Adapter Settings** and follow the directions on the screen. Refer to the following table for information on the choices on this menu.

- Host Adapter SCSI ID

  Select this choice to change the SCSI ID of the SCSI-2 controller from its default value of 7.

- SCSI Parity Checking

  Select this choice to enable or disable SCSI-2 adapter parity checking. The default value is *Enabled*.

- Host Adapter SCSI Termination

  Select this choice to configure SCSI-2 controller termination. The default value is *Low On / High On*.

- SCSI Device Configuration

  Select this choice to configure SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.

- Advanced Configuration Options

Select this choice to view or change the settings for advanced configuration options. These options include setting the SCSI ID scanning order, and enabling support for a startable CD-ROM and for Int13Extensions.

SCSI Controller Settings/Description: The following is a list of the Configuration/View Host Adapter Settings and descriptions.

SCSI Controller Settings	Description
Host Adapter SCSI ID	Change the SCSI ID of the SCSI-2 controller from its default value of 7.
SCSI Parity Checking	Enable or disable parity checking on the SCSI-2 adapter or controller. The default value is *Enabled*.
Host Adapter SCSI Termination	Configure SCSI-2 adapter or controller termination. The default value is *Low On / High On*.
SCSI Device Configuration	Configure SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.
Advanced Configuration Options	View or change the settings for advanced configuration options. These include: • Startable CD-ROM drive. When set to *On*, the CD-ROM drive can be included as a startup device For this option to take effect, you must insert a startable CD in the CD-ROM drive. • Init13Extensions. When set to *On*, these BIOS extensions are enabled. • Reverse Scan. When Reverse Scan is set to *Off* and the SCSI controller is set to the default value of 7, scanning order proceeds from 0 to 6, then 8 to 15. When this choice is set to *On*, the scanning order proceeds from SCSI ID 6 to 0, then 15 to 8.

SCSI Disk Utilities: To see the IDs that are assigned to each SCSI device or format a drive, select **SCSI Disk Utilities** from the SCSISelect Utility program menu.

To use the utility program, select a drive from the list. Read the screens carefully before making a selection.

Using the Low-Level Format Program: On non-disk array models, you have the option of formatting your hard disk using the *Low-Level Format* feature of the SCSISelect Utility program.

Depending on the hard disk capacity, the Low-Level Format program could take up to two hours.

Note: For disk-array models, you must use the programs provided on the RAID Configuration diskette to format your hard disk drives. Refer to "Disk Array Configuration" on page 461 for instructions.

When To Use the Low-Level Format

Program: Use the Low-Level Format program:

- When you are installing software that requires a low-level format
- When you get recurring messages from the diagnostic tests directing you to run the Low-Level Format program on the hard disk
- As a last resort before replacing a failing hard disk drive

- **Note**

 For information about backing up all of the files, see the operating-system documentation for the system you are servicing.

Starting the Low-Level Format Program

- **Attention**

 The Low-Level Format program erases *all* data and programs.

1. If the hard disk is working, make a backup copy of all the files and programs on the hard disk.
2. Select **Format disk** from the SCSISelect Disk Utilities menu; then follow the instructions on the screen.
3. To install an operating system, refer to the ServerGuide CD documenation.

Setting the Motor-Start Jumper

The jumper in position **5** (illustrated above) is the motor-start jumper. If the jumper is installed, all hard disk drive motors start instantly at power-on. If the jumper is removed, POST starts the drives sequentially. Some drives are shipped with the motor-start jumper installed (to reduce POST time). If many large-capacity drives are added to the computer, and they are set to start 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 startup exceeds the reserve-current

capacity of the power supply. You might have to *remove* one or more motor-start jumpers.

Note: Non-IBM drives use either a jumper or a switch to set the motor-start mode.

To set the SCSI ID on a Rewritable Optical Drive, do the following:

1. Position the device so that the three position jumper is at the lower-right corner.
2. Refer to the table below to position the Rewritable Optical Drive jumpers for IDs 6 through 0.

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

ServerGuide

It is important that you read and understand the following information, whether you choose to install an operating system that is available in the ServerGuide package or you choose to install *your own* operating system.

One of the easiest and most efficient ways to install an operating system and take advantage of a wide variety of the latest software for the network environment is to use ServerGuide.

You can install an operating system from ServerGuide or you can install *your own* operating system and still use many of the features available on ServerGuide. (For example: you can install NetFinity, which is a LAN systems-management program; run demonstration programs; use the performance-tuning feature; and do much more.) Refer to the ServerGuide CD documentation.

Software/Hardware Mismatch Problems

If a failure appears to be the result of a defective FRU, but the diagnostic tests run error-free, there might be a software and hardware mismatch. These problems might be intermittent, and they are usually difficult to diagnose.

If you are experiencing this type of problem, and the operating system is of the "direct driver" variety, which bypasses the BIOS interface, such as:

- AIX
- Netware
- SCO XENIX
- Some "windowing" interfaces

- Other Unix-based software

the most-likely cause of the problem is a mismatch between the software and the hardware.

Applications that use the Multiprotocol Adapter/A, magnetic tape drives, and some SCSI devices such as CD-ROM, require direct software drivers. There is no BIOS interface for these devices in PS/2 products.

The following information is provided to help you resolve these problems:

Software Can Be Sensitive to the Hardware

Direct-driver software is sensitive to variations in hardware design. The resulting incompatibilities are usually addressed with a revision (sometimes referred to as a patch), to the direct-driver software. Make certain the software is current and that all known revisions are installed. The IBM on-line bulletin board (sometimes referred to as PCPROD), and other software tools sources, such as Novell Netware, should be referenced by the software support personnel for any revisions provided by the appropriate software vendor.

The most-likely cause of these types of problems, when direct-driver software is involved, is the failure to obtain the latest revisions from the software vendor.

Software Installation

It is very important to follow the vendor's installation procedures. The software should not be migrated from another system, unless the installation instructions indicate that migration is supported (especially from a different model in the product line).

> **Important**
>
> Migrating adapters from slower systems to faster systems might cause problems. This is due to device-specific, system-specific, or time-dependent software code, that controls these devices.

Adapter and Software Compatibility

Hardware adapters for some operating systems must be approved by the software vendor to be compatible with that software. The approval is specific to the system, adapter E.C. level, and the software version. Contact the software vendor to confirm that system and adapter configuration is supported by their software level. The compatibility support is especially important for, (but not limited to), all LAN adapters and RIPL applications.

Software Failures After a Hardware Change

After the initial installation, any changes in the hardware configuration (addition or changes of adapters or features), might result in computer failures and require the reinstallation of the operating system or the software revisions.

Specific hardware configuration changes (such as memory address, interrupt level, or programmable option select), might result in a computer failure if the software has unique operating requirements.

Undetermined Problems

You are here because the diagnostic tests did not identify the failure, the Devices List is incorrect, or the system is inoperative.

Note: If you suspect a software mismatch is causing failures (solid or intermittent), be sure to see "Software/Hardware Mismatch Problems" on page 550.

Check the power supply voltages. If the voltages are not correct, replace the power supply. If the voltages are correct, return here and do the following:

1. Power-off the computer.
2. Remove or disconnect the following (one at a time) until you find the failure (power-on the computer and reconfigure each time).
   - Any external devices
   - Surge suppressor device (on the computer)
   - Modem, printer, mouse, or non-IBM devices
   - Each adapter
   - Drives
   - Memory-Module Kits
   - Bus adapter

- Math coprocessor (if installed)

  Note: Minimum operating requirements vary for each computer. For example:
  - AT Bus computers require 256KB of memory.
  - Micro Channel computers require 1MB of memory.
  - IML drive in the drive startup sequence (IML systems only).
  - If the computer is a workstation, (no drives), a default hard disk drive is not required.

3. Power-on the computer. If the problem remains, suspect the system board, then the processor board in that order.

Note: If the problem goes away when you remove an adapter from the bus adapter, and replacing that adapter does not correct the problem, suspect the system board, processor board, then the bus adapter in that order.

Problem Determination Tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type and model
- Processor or hard disk upgrades
- Failure symptom
  - Do diagnostics fail?
  - What, when, where, single, or multiple systems?
  - Is the failure repeatable?
  - Has this configuration ever worked?
  - If it has been working, what changes were made prior to it failing?
  - Is this the original reported failure?
- Reference/Diagnostics Diskette Version
  - Type and version level
- Hardware configuration
  - Print (print screen) configuration currently in use
  - BIOS level
- Operating system software
  - Type and version level

> **Important**
>
> To eliminate confusion, identical systems are considered *identical* only if they:
>
> 1. Are the exact machine type and models
> 2. Have the same BIOS level
> 3. Have the same adapters/attachments in the same locations
> 4. Have the same address jumpers/terminators/cabling
> 5. Have the same software versions and levels
> 6. Have the same Reference/Diagnostics Diskette (version)
> 7. Have the same configuration options set in the system
> 8. Have the same setup for the operation system control files
>
> Comparing the configuration and software set-up between "working and non-working" systems will often lead to problem resolution.

Phone Numbers, U.S. and Canada

> **Note**
>
> EMEA customers should contact their Dealer or IBM Service organization.

Before you place a call to the Support Center, refer to "Problem Determination Tips" on page 553.

Authorized Dealers or Servicers

Number	Information
919-517-0001	Bulletin Board Service - PC Company
800-528-7705	Bulletin Board Service - TSS Only
800-937-3737	IBM Business Partner Education
800-426-2472	IBM Customer Engineer Technical Support
800-IBM-DEAL	IBM Dealer Support Center
800-342-6672	IBM Direct Desktop Software Sales
303-924-4015	IBM Part Number ID and Look Up
800-426-7763	IBM PC HelpCenter
800-237-5511	IBM Software Defect Support (CSDs)
800-327-5711	IBM Software Ordering (Publications)
800-426-1484	IBM Supplies Technical Hotline
800-388-7080	IBM Warranty Parts Claims Center

U.S. Customers and Helpware Subscribers

Number	Information
919-517-0001	Bulletin Board Service - PC Company
800-426-8322	Customer Education Business Unit
800-999-0052	Customized Operational Services
800-237-4824	EduQuest (Educational Computers)
800-964-8523	End User HelpDesk Support
800-742-2493	IBM Anti-Virus Services
800-447-4700	IBM Authorized Dealer Referrals
800-426-2468	IBM Dealer Referral
800-426-3333	IBM Information Referral Service
800-IBM-SERV	IBM Service
800-772-2227	IBM PC HelpCenter and HelpDesk
800-426-7282	IBM Technical Manuals
800-426-9402 (Ext. 150)	Multimedia Information Center
800-241-1620	Multimedia HelpCenter
800-342-6672	OS/2 Information Line
800-237-5511	OS/2 Support Services
800-284-5933	Prodigy
914-962-0310	Prodigy User Questions
800-547-1283	Technical Coordinator Program SystemXtra for Personal Systems LAN Automated Distribution/2 OS/2 Bulletin Board OS/2 Application Assistance Center
800-551-2832	Technical Solutions Magazine

IBM Canada Customer and Servicer Support

Number	Information
800-661-PSMT	Business Partner Marketing Support
905-316-5556	Business Partner Marketing Support - Toronto
514-938-6048	Business Partner Marketing Support - French
800-465-6600	Customer Relations
905-316-6666	Customer Relations - Toronto
800-465-6666	Customer Service Dispatch
800-263-2769	Customer Service Parts
800-465-2222	Customer Support Center (ISC)
416-443-5701	Customer Service Repair Centre
800-465-7999	HelpClub Registration
800-465-7999	IBM Direct
905-513-3367	IBM Certification Administrator

905-316-2683	IBM Certification Coordinator
	    Mail to: 50 Acadia Drive
	    Markham, Ontario L3R 0B3

800-465-3299	IBM HelpFax
905-316-3299	IBM HelpFax - Toronto
800-565-3344	IBM HelpPC
800-268-3100	IBM Information Network Support
800-268-3100	IBM Information Network Support - Toronto
800-387-8343	IBM PC Service Partners
800-663-7662	Lexmark Product Information
800-263-2769	Parts Orders, Exchange or Emergency
416-443-5808 (Fax)	Parts Regular Orders, Exchange
416-443-5755	Parts Orders, Inquiries
514-938-3022	PC Co Bulletin Board - Montreal
905-316-4255	PC Co Bulletin Board - Toronto
604-664-6464	PC Co Bulletin Board - Vancouver
204-934-2735	PC Co Bulletin Board - Winnepeg
800-661-7768	PS Marketing Support (PSMT)
800-465-1234	Publications Ordering
905-316-4148	Service Management Support
905-316-4100 (Fax)	Service Management Support
905-316-4150	Service Manager
905-316-4100 (Fax)	Service Manager
905-316-4872	Service Quality Programs
905-316-4100 (Fax)	Service Quality Programs
800-661-2131	Skill Dynamics (Education)
800-565-3344	PS/1 Warranty Customer Helpline
800-387-8483	PS/1 Warranty Service (DOAs)
416-443-5835 (Fax)	Warranty Claim Fulfillment
905-316-2445	Warranty Claim Reimbursement
905-316-3515 (Fax)	Warranty Claim Reimbursement
416-443-5778	Warranty Claim Parts Inquiry
800-505-1855	Warranty Provider Support Hotline
800-267-7472	Warranty Service, ThinkPad

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