COVER Book Cover

IBM Personal Computer

Power Series 440
- Model 6015

RISC/6000
- Model 7020

Hardware Maintenance Manual

October 1994

We Want Your Comments!
(Please see page 47)

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+--- **Note** ---+
¦ ¦
¦ Before using this information and the products it supports, be sure to ¦
¦ read the general information under "Notices" in topic 3.0. ¦
¦ ¦
+---+

First Edition (October 1994)

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FRONT_1 About This Manual

The Hardware Maintenance Manual contains *both* service and reference information for IBM (*) Personal Computer Power Series* computers.

- The service section includes a general checkout, procedures for isolating problems to a FRU, a Symptom-to-FRU Index, and a parts listing.

- The reference section includes safety information, general information, a product overview, and information about specifications, compatibility, diagnostics, System Management Services, SCSI IDs, SCSI device terminators, and component connector locations.

This manual should be used with the diagnostic tests (found on the Systems Management Services Diskette) to effectively troubleshoot problems.

Important

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

- Before servicing the computer, review "Safety Information" in topic 2.1.

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1.0 Hardware Maintenance Service

This section contains a general checkout and diagnostic test procedure, a Symptom-to-FRU Index, procedures for isolating problems to a FRU, and a parts catalog for IBM Personal Computer Power Series computers.

Important

The diagnostic tests are intended to test *only* IBM products. Non-IBM products or modified options can give false errors and invalid responses.

Subtopics

1.1 How to Diagnose Combined FRUs

If an adapter or device consists of more than one FRU, an error code might be caused by any of the FRUs. Before replacing the adapter or device, remove the FRUs, one by one, to see if the symptoms change.

Notes:

1. If you are instructed to replace the system board and that does not correct the problem, reinstall the original system board, then replace the riser card. If that does not correct the problem, reinstall the original riser card and go to "Undetermined Problem" in topic 1.4.6.

2. If you are instructed to replace any other FRU and that does not correct the problem, reinstall that FRU before you continue.

Warning

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.

1.2 How to Use Error Messages

Use the error messages in the error log to diagnose failures. If more than one error message is logged, diagnose the **first** error message. The cause of the first error message can cause false error messages to be logged. If you did not receive any error messages, see if the error symptom is listed in the "Symptom-to-FRU Index" in topic 1.4.

The general checkout procedure starts on the next page.

1.3 General Checkout

1. Power-off the computer and all external devices.
2. Ensure that all media is removed from the drives.
3. Check all cables and power cords for proper connection.
4. Insert the System Management Services diskette into drive A.
5. Power-on all external devices.
6. Power-on the computer and check for the following:
   a. Power-on indicator light comes on
   b. Power Personal System logo appears
   c. Power Personal System tones are heard
   d. System Management Services menu appears
7. Run **Test the Computer**.
8. If you have no error code or message, find your symptom below, then go to the appropriate page. If an error code or message appears, see "Symptom-to-FRU Index" in topic 1.4. If that does not solve the problem, go to "Undetermined Problem" in topic 1.4.6.

Symptom	**Go to ...**
Error Code or Message	"Symptom-to-FRU Index" in topic 1.4.
Configuration Problem	"Installed Devices List (Manage Configuration)" in topic 1.3.3.
Display Problem	"Display" in topic 1.3.2.
Keyboard Problem	"Keyboard and Pointing Device" in topic 1.3.6.
Memory Problem	"Memory" in topic 1.3.8.
Power Problem	"Power Supply" in topic 1.3.1.
Printer Problem	"Printer" in topic 1.3.7.

Note

For information about diagnostics, error messages, passwords, and other tests and service checks, go to "Diagnostics and Test Information" in topic 2.7.

Subtopics
1.3.1 Power Supply
1.3.2 Display
1.3.3 Installed Devices List (Manage Configuration)
1.3.4 Missing SCSI Devices
1.3.5 Missing Non-SCSI Device
1.3.6 Keyboard and Pointing Device
1.3.7 Printer
1.3.8 Memory

1.3.1 Power Supply

If the power-on indicator is not on, verify that the power receptacle if functional, and then do the following.

1. Power-off the computer and remove the power cord.
2. Check the power cord for proper installation and continuity.
3. Remove or disconnect the following, one at a time:

   Note: When removing any device, remove the device cable also. If the problem goes away, replace the cable, then the device.

   a. External devices (modem, printer, or mouse)
   b. CD-ROM drive
   c. Hard disk drive
   d. Diskette drive
   e. Video adapter
   f. L2 cache memory
   g. System board cables
4. Attach the power cord and power-on the computer.
5. Repeat steps 1 through 4 until you find the failing device or adapter.
6. If the problem continues, go to "Power Supply Voltages" in topic 1.3.1.1.

Subtopics
1.3.1.1 Power Supply Voltages

1.3.1.1 Power Supply Voltages

Check the voltages listed below. The voltages must be checked with the power supply cables connected to the system board, the drive connector connected to the drive, and the computer powered-on.

PICTURE 1

PICTURE 2

Positive Meter-lead on Pin	**Negative Meter-lead on Pin**	**V dc Minimum**	**V dc Maximum**
2	1	+ 9.0	+15.0
2, 3	Ground	Ground	Ground
3	4	+3.75	+6.25

If the voltages are not correct, and the power cord is good, replace the power supply. If the problems remains, replace the system board.

1.3.2 Display

The following provides some general display information for the computer. For specific display service procedures and other display information, refer to the *Monitor Hardware Maintenance Manual* (part number 83G7827, form number S71G-4197).

+--- **Important** ----------+
¦ The Power Series computer **Does Not Support** these displays: **6312, 6314, 6317, 6318, 6319**. Attaching these displays to a Power Series computer can damage the display. ¦
+---------------------------+

The following is a *Quick Test* for the display:

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 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.

If the display test fails, replace or service the display. If that does not solve the problem or if the display test is successful, do the following.

1. Remove the L2 Cache Card (if installed).
2. Retry the test that failed.
   - If the problem is resolved, replace the L2 Cache Card.
   - If the problem remains, replace FRUs in the following order until the problem goes away:
     - Video adapter
     - Riser card
     - 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 ¦
¦ These sounds and display patterns are normal; do not replace any parts. Also, a noticeable odor might occur on new displays or displays recently removed from storage. ¦
+---------------------------+

1.3.3 Installed Devices List (Manage Configuration)

Warning

1. Note the installed devices current configuration settings.
2. Verify that no two devices are set to the same (conflicting) address.
3. A customized setup configuration (other than default settings) might exist on the computer you are servicing. Verify that the settings are correct when service is complete.

1.3.4 Missing SCSI Devices

If the number, types, and addresses of the SCSI devices shown are not correct, do the following:

1. If no external SCSI devices are attached, go to step 8.
2. Power-off the computer and any external SCSI devices.
3. Disconnect the internal SCSI data cable from the system board.
4. Power-on all external devices, then power-on the computer.
5. Run Manage Configuration, then select SCSI Information. Note the SCSI IDs of devices listed. Verify that each SCSI ID is correct and unique. If the list is not correct, go to step 9. If the list is correct, continue with the next step.
6. Power-off the computer and any external devices. Disconnect the external SCSI data cable. Re-connect the internal SCSI data cable to the system board.
7. Power-on the computer.
8. Run Manage Configuration, then select SCSI Information. Note the SCSI IDs of devices listed. Verify that each SCSI ID is correct and unique.
9. Change any incorrect SCSI ID.
10. If you cannot correct the list, replace FRUs in the following order.

One SCSI Device Missing	**All SCSI Devices Missing**
1. SCSI Device	1. System Board
2. Device Cables	2. Device Cables
3. System Board	3. SCSI Device

1.3.5 Missing Non-SCSI Device

If a non-SCSI device is missing from the Manage Configuration list, replace it. If more than one non-SCSI device is missing, isolate them one at a time until you find the device causing the failure. If the number of devices shown on the list is incorrect, an error can occur during the tests.

1.3.6 Keyboard and Pointing Device

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/mouse cable from the computer.
- Power-on the computer and check the keyboard cable connector on the computer for the voltages shown.
  All voltages are ± 5%.

PICTURE 3

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.

1.3.7 Printer

1. Make sure the printer is properly connected.
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 printer port (parallel or serial, depending on your printer) and run the diagnostic tests.

If the diagnostic test detects a failure, replace the system board, then the internal parallel port cable.

If the diagnostic tests do not detect a failure, replace the printer cable. If that does not correct the problem, replace the system board, then the internal parallel port cable.

1.3.8 Memory

001

- Power-on the computer.
- Make a note of any errors you receive.

DID THE COMPUTER SUCCESSFULLY POWER-ON?

Yes **No**

002

If the computer did not power-on or the Power Personal Systems screen did not appear, go to "Symptom-to-FRU Index" in topic 1.4.

003

DID YOU RECEIVE A 00020000 ERROR?

Yes **No**

004

The computer memory is functioning correctly. If you still suspect a problem, go to Step 005.

005

- Run **Test the Computer**.
  (You might have to press **F1**.)
- Run the memory tests.

DID YOU RECEIVE A 000210X0 ERROR?

Yes **No**

006

The computer memory is functioning correctly. If you still suspect a problem, go to Step 007.

007

Replace the memory module indicated. If this does not solve the problem, do the following.

- Replace the other memory modules, one at a time, until the problems is resolved.
- If the problems remains, replace the system board.

1.4 Symptom-to-FRU Index

The Symptom-to-FRU Index lists error symptoms and possible causes. The most likely cause is listed first. Always begin with "General Checkout" in topic 1.3. Use this index 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" in topic 1.4.6.

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 an error message, diagnose the error message.
- If you did not receive an error message, look for a description of your error symptoms in the Symptom-to-FRU Index.
- Check all power supply voltages before you replace the system board. See "Power Supply" in topic 1.3.1.
- Check the SCSI device settings, SCSI bus termination, and cable connections before you replace a device. See "SCSI Device Information" in topic 2.9.2.

Subtopics

1.4.1 Numeric Error Codes

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

Symptom/Error	**FRU/Action**
00001XXX	1. **System Board**
00010000	1. **System Board**
0001500X	1. **Perform the Update Firmware procedure**. (Firmware update was not completed.) 2. System Board
0001550X	1. **System Board**
00016002	1. **System Board**
00017001	1. **Battery** 2. System Board
0001700X	1. **System Board**
000210X0	1. **See** "Memory" in topic 1.3.8. 2. Memory Module 3. System Board
000300X0	1. **Keyboard**
00061XX0	1. **System Board** 2. Diskette Drive
00062XX0	1. **Diskette Drive** 2. Diskette Drive Cable 3. System Board
00063XX0	1. **Diskette Media** 2. Diskette Drive 3. Diskette Drive Cable 4. System Board
0011XXXX	1. **System Board**
0014XXXX	1. **See** "Printer" in topic 1.3.7.
0086XXXX	1. **Mouse**
01291000	1. **L2 Cache Memory** 2. System Board
02430250	1. **Video Adapter** 2. Riser Card 3. System Board
0942042X	1. **Video Adapter** 2. Riser Card 3. System Board
5333000X	1. **Video Adapter** 2. Riser Card 3. System Board

1.4.2 SCSI Symptoms and Error Codes

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

Important

Before replacing any SCSI FRUs:

1. See "SCSI Device Information" in topic 2.9.2.
2. Check the device SCSI ID switch setting.

Symptom/Error	FRU/Action
SCSI ID setting does not match the SCSI ID shown in configuration.	1. **Device Switch Settings** 2. Device 3. Device Cable 4. System Board
Tape is automatically ejected from the drive.	1. **Tape Cassette** 2. Drive
Tape sticks/breaks in the drive. (Verify that the tapes used meet ANSI standard X3B5)	1. **Tape Cassette**
0037XXXX	1. **SCSI Device** 2. SCSI Cable 3. System Board
0208XXXX	1. **Disconnect SCSI devices one at a time to isolate problem.** 2. If problem remains with no SCSI devices attached, replace system board.
0209XXXX	1. **SCSI DASD Device** 2. Device cables 3. Removable Media 4. System Board
0210XXXX (See "SCSI FRU Codes" in topic 1.4.3 before replacing a FRU. If it is an external device, check the external voltages before replacing a FRU.)	1. **SCSI Hard Disk Drive** 2. SCSI Cable 3. System Board
0211XXXX (Check for the two symptoms listed below. Or, if it is an external drive, and the power-on LED is off, check the external voltages)	1. **SCSI Tape Drive** 2. SCSI Cable 3. System Board
Amber LED remains on.	1. **Tape Drive** 2. SCSI Cable (internal) 3. System Board
Green "in use" LED fails to come on.	1. **Tape Drive** 2. SCSI Cable (internal) SCSI Cable (external) 3. System Board
0212XXXX	1. **SCSI Printer** 2. Printer Cable
0213XXXX	1. **SCSI Processor**
0214XXXX	1. **WORM Drive**
0215XXXX (See "SCSI FRU Codes" in topic 1.4.3 before replacing a FRU. If it is an external device, and the power-on LED is off, check external voltages before replacing a FRU.)	1. **CD-ROM Drive** 2. SCSI Cable 3. Removable Media 4. System Board
0216XXXX	1. **Scanner** 2. Cables

	3. System Board
0217XXXX (See "SCSI FRU Codes" in topic 1.4.3 before replacing a FRU. If it is an external device, and the power-on LED is off, check external voltages before replacing a FRU.)	1. **Rewritable Optical Drive** 2. SCSI Cable 3. Removable Media 4. System Board
0218XXXX	1. **Multi-disc Tray CD-ROM** 2. Cables 3. System Board
0219XXXX	1. **SCSI Communications Device** 2. Cables 3. System Board

1.4.3 SCSI FRU Codes

When the system detects a SCSI device error, one of the letters in the following list is displayed to identify which device is causing the error. The associated error code is in the right-hand column.

Letter	SCSI Device FRU	Error Code
B	Rewritable Optical Drive	**0217XXXX**
C	CD-ROM Drive I	**0215XXXX**
D	CD-ROM Drive II	**0215XXXX**
E	Enhanced CD-ROM Drive II	**0215XXXX**
F	Enhanced CD-ROM Drive II	**0215XXXX**
H	Enhanced CD-ROM Drive II	**0215XXXX**
H	1GB SCSI Hard Disk Drive	**0210XXXX**
M	2GB SCSI Hard Disk Drive	**0210XXXX**
N	540MB SCSI Hard Disk Drive	**0210XXXX**
O	1GB SCSI Hard Disk Drive	**0210XXXX**
P	2GB SCSI Hard Disk Drive	**0210XXXX**
Q	540MB SCSI Hard Disk Drive	**0210XXXX**
T	360MB SCSI Hard Disk Drive	**0210XXXX**
V	270MB SCSI Hard Disk Drive	**0210XXXX**
U	Undetermined SCSI Device	

1.4.4 Audio Symptoms

Symptom/Error	**FRU/Action**
No audio or poor quality audio from internal and external speakers during SCSI CD-ROM Audio Test.	1. **Verify the following:** a. Volume control properly set? b. CD-ROM disk has audio tracks? c. CD-ROM cabled properly? d. CD-ROM power voltages OK? e. Speaker or headphones connected? 2. CD-ROM Drive 3. CD-ROM Drive Cables 4. System Board
No audio or poor quality audio from headphones connected to CD-ROM drive.	1. **Try another headphone set.** 2. CD-ROM Drive
No audio or poor audio quality from internal speaker.	1. **Speaker** 2. System Board
No audio or poor quality from headphones connected to rear headphone jack.	1. **Try another headphone set.** 2. System Board
No audio or poor quality from speaker connected to rear audio-out jack.	1. **Try another set of external speakers.** 2. External Speaker Cable 3. System Board
No audio or poor quality audio from left or right speaker when using microphone.	1. **Microphone** 2. System Board
No audio or poor quality audio from left or right speaker using line in/out.	1. **Verify Line Cables** 2. System Board

1.4.5 Miscellaneous Symptoms

Symptom/Error	**FRU/Action**
Time/Date inaccurate	1. **Battery** 2. System Board
Diskette drive in-use light remains on or does not light when drive is active	1. **Diskette Drive** 2. Diskette Drive Cable 3. System Board
Display Problems Incorrect or missing colors, wavy screen, all black or all white, or blank screen	1. **See** "Display" in topic 1.3.2.
Hard disk drive in-use light not on, but computer works OK	1. **Hard Disk In-use Light** 2. Disk Drive Cable 3. System Board
Hard disk drive in-use light remains on, but no display.	1. **Remove L2 Cache Card, retry test.** 2. If problem is resolved, replace L2 Cache Card. 3. If problem remains, remove all but one memory module, retry test. 4. If problem is resolved, replace the memory modules one at a time and retry the test to identify the failing module. 5. If problem remains, replace the remaining memory module, retry test. 6. If problem is resolved, replace the memory module. 7. If problem remains, replace the system board.
"Non-system disk" or diskette-type error message. (Can't read/write diskette.)	1. **Wrong Diskette** 2. Diskette Drive 3. Diskette Drive Cable 4. System Board
Memory error	1. **See** "Memory" in topic 1.3.8.
No power (computer is not functional)	1. **See** "Power Supply" in topic 1.3.1.
Computer hangs during power-on - or - no beep or one beep and no display	1. **Remove L2 Cache Card, retry test.** 2. If problem is resolved, replace L2 Cache Card. 3. If problem remains, remove riser card and installed adapters one at a time, and retry test. 4. If problem is resolved, replace last adapter (or riser card) removed. 5. If problem remains, replace system board.
Power-on indicator on, System tones OK, and no display	1. **See** "Display" in topic 1.3.2. 2. Video Adapter 3. Riser Card 4. L2 Cache Card (if installed) 5. System Board
Power-on indicator on, no display, tones/beeps distorted or continuous	1. **System Board**
Power-on indicator not on, but computer works OK	1. **Power-on Indicator** 2. System Board 3. Power Supply
Printer problems	1. **See** "Printer" in topic 1.3.7.
Serial or parallel port device failure	1. **Device Self-Test OK?** 2. Device 3. Cable

	4. System Board
Some or all keys on the keyboard do not work	1. **See** "Keyboard and Pointing Device" in topic 1.3.6 2. Keyboard 3. Keyboard Cable 4. System Board

1.4.6 Undetermined Problem

Check the power supply (see "Power Supply" in topic 1.3.1). If the power supply is functional, return here and continue with the following steps.

1. Power-off the computer.
2. Remove or disconnect the following, one at a time:

   Note: When removing any device, remove the device cable also. If the problem goes away, replace the cable, then the device.

   a. Non-IBM devices
   b. External devices (modem, printer, or mouse)
   c. Fan
   d. Memory modules (at least one memory module must remain on the system board at all times).
   e. L2 Cache (if installed)
   f. Any adapters
   g. Riser card
   h. Hard disk drive
   i. CD-ROM drive
   j. Other SCSI devices
   k. Diskette drive
3. Power-on the computer.
4. Repeat steps 1 through 3 until you find the failing device or adapter.

If all devices, cables, and adapters have been removed, and the problem continues, replace the system board.

1.5 Parts

PICTURE 4

Index	System Unit	
1	Top Cover, Power Series 440	8185208
1	Top Cover, RISC/6000 Model 7020	11H6100
	Logo, Power Series 440 Model 6015	8185289
	Logo, RISC/6000 Model 7020	11H6101
	Bezel, Power Series 440 Model 6015	8185215
	Visor, Top Cover	8185211
	Security Strap	8185224
	Floor Stand	8185220
2	Riser Support Bracket/Guide Assembly	8185212
3	Riser Card	8185005
4	Power Supply (VP 200W)	06H2967
	Power Switch Cable Assembly	06H2863
5	1MB Video Adapter, S3** 928	8185109
5	2MB Video Adapter, S3 864	8185291
5	2MB Video Adapter, S3 928	8185006
5	2MB Video Adapter, Wietek** P9000	8185292
5	2MB Video Adapter, Wietek P9100	11H6095
5	4MB Video Adapter, Wietek P9100	11H6096
5	Power GXT150P Graphics Adapter	8184190
5	Video Capture Adapter	11H6097
5	Ethernet Adapter	48G7170
5	Token Ring Adapter	73G2048
5	X.25 Communications Adapter	71G6458
6	Keylock	8185418
7	Bottom Cover	8185221
8	Diskette Drive Data Cable	8185217
8	SCSI II Data Cable	8185218
9	680MB CD-ROM Drive	06H2150
	CD-ROM Gasket	11H6173
	CD Audio, Internal Cable	8185216

	1.2MB 5.25-inch Diskette Drive	71G0659
10	5.25-inch Cage	8185209
	5.25-inch Slim Filler Panel	11H6099
	2GB Tape Drive, 4mm DAT	16G8404
	4GB Tape Drive, 4mm DAT	16G8454
	5.25-inch Blank Panel w/ EMI Shield	8185173
11	System Board, PowerPC 601 66Mhz	8185003
	Important: System Board 8185003 is manufactured with RISC/6000 Model 7020 Firmware. If you install this system board in a Power Series 440 Model 6015, order Diskette 11H6105 and perform the "Update Firmware" procedure.	
	PowerPC 601 66Mhz Oscillator	11H6059
	PowerPC 604 Processor Upgrade (Plugs into L2 Cache Connector)	52G0728
	PowerPC 604 Upgrade Oscillator	11H6084
	Model 6015 Services Maint. Diskette	11H6105
	Model 7020 Services Maint. Diskette	11H6107
	Battery	8185417
	Parallel Port Cable, Internal	8185219
	8-Port Asynch ISA Adapter	11H5969
	System Board EMI Gasket	8185222
	LED, Hard Disk Drive	34G1864
	LED, Power	34G1863
	Fan	8185174
	Speaker/Bracket, 20-inch Cable	8185213
	8MB Memory Module (70 ns)	73G3125
	32MB Memory Module (70 ns)	92G7429
12	L2 Cache Card - 256KB	8185175
13	L2 Cache Support Bracket	8185288
14	270MB SCSI Hard Disk Drive	82G5930

14	340MB SCSI Hard Disk Drive	71G6551
14	360MB SCSI Hard Disk Drive	82G5931
14	540MB SCSI Hard Disk Drive	82G5932
14	720MB SCSI Hard Disk Drive	82G5933
14	1GB SCSI Hard Disk Drive	92F0428
14	2GB SCSI Hard Disk Drive	06H3370
15	1.44MB 3.5-inch Diskette Drive	93F2361
15	2.88MB 3.5-inch Diskette Drive	82G1887
16	3.5-inch Cage	8185210
	3.5-inch Blank Panel w/ EMI Shield	8185172
	Parts Kit Screws, 3m, 3.5m, 6-32 Bottom cover feet, Fan isolator Jackscrew, D-shell connector TrackPoint II stick tip, Card guide LED holder, 2-pin jumper Tie-down strap, White plastic latch	8185176

Power Cords

Arabic Countries	14F0033
Australia	93F2365
Belgium	13F9979
Bulgaria	13F9979
Canada	93F2364
Czechoslovakia	13F9979
Denmark	13F9997
Finland	13F9979
France	13F9979
Germany	13F9979
Hungary	13F9979
Israel	14F0087
Italy	14F0069
Latin-America	93F2366
Netherlands	13F9979
New Zealand	93F2365
Norway	13F9979
Poland	13F9979

Portugal	13F9979
Serbia	13F9979
Slovakia	13F9979
South Africa	14F0015
Spain	13F9979
Switzerland	13F9979
Switzerland (French, German)	14F0051
U.S.	93F2364
UK, Ireland	14F0033
Yugoslavia	13F9979

101/102 Key Keyboards

Arabic	1391490
Belgian	1391414
Belgian/French	1391526
Brazil	61G3976
Bulgarian	1399583
Canadian French	1392022
Canadian French (attached cable)	92F0334
Czechoslovakian	1399570
Cyrillic	1393866
Danish	1391407
Dutch	1391511
Finnish	1391411
French	1391402
German	1391403
Greek	1399046
Hebrew	1391408
Hungarian	1399581
Italian	1393395
Latin-American Spanish	61G3976
Latin-American Spanish (attached cable)	92F0333
Norwegian	1391409
Polish	1399580
Portuguese	61G3976
Romanian	1399582
Russian/Cyrillic	1399579
Serbian/Cyrillic	1399578
Slovakian	1399571
Spanish	1391405
Swedish	1391411
Swiss	1391412

Swiss/French	1395881
Swiss/German	1395882
Turkish	1393286
U.K. English	1391406
U.S. English	1392090
U.S. English (attached cable)	82G3295
U.S. English (EMEA only)	1396790
Yugoslavian	1393669

Keyboard Cable and Mouse

101/102 Key Keyboard Cable, 0.9 m (3 ft.)	61X8898
TrackPoint II Keyboard Cable	61G2913
Keypad Cable	1397482
Keyboard Parts Kit	33F8174
Mouse (PS/2, 2-button)	33G5420
Mouse (Enhanced PS/2, 2-button)	96F9258
Mouse (AIX, 3-button)	8185429

Track Point II Keyboards

Arabic	61G2897
Belgian	61G2877
Bulgarian	82G3257
Canadian French	61G2909
Danish	61G2857
Dutch	61G2881
Finnish/Swedish	61G2853
French	61G2841
German/Austrian	61G2845
Greek	61G2893
Hebrew	61G2889
Hungarian	82G3259
Icelandish	82G3261
Italian	61G2849
Latin-American Spanish	61G2905
Norwegian	61G2869
Polish	82G3263
Portuguese	61G2885
Romanian	82G3265
Russian/Cyrillic	82G3267
Serbian/Cyrillic	82G3269

Slovakian	82G3271
Spanish	61G2873
Swedish	61G2873
Swiss/French	61G2865
Swiss/German	61G2861
Turkish	82G3273
U.K. English	61G2837
U.S. English	61G2901
Yugoslavian	82G3277

TrackPoint II Keypads

Arabic	61G2899
Canadian French	61G2911
Danish	61G2859
French	61G2843
German/Austrian	61G2847
Italian	61G2851
Latin-American Spanish	82G3294
Spanish	61G2907
Swedish/Finnish	61G2855
Swiss German	61G2863
U.K. English	61G2903
U.S. English	82G3278

Displays

17-Inch Sight-Sound (Northern Hemisphere)	11H3996
17-Inch Sight-Sound (Southern Hemisphere)	11H3998
Audio/Camera Cable	11H4002
15-Pin Video Cable	11H4003
13W3 Video Cable	11H4004

For all other displays, see the *IBM Monitor Hardware Maintenance Manual* for display FRU numbers.

Special Tools

The following special tools are required to service these computers:

- A meter similar to the Triplett (**) Model 310, IBM P/N 9900167
- PCMCIA Wrap Plug, IBM P/N 35G4680
- Tri-Connector Wrap Plug, IBM P/N 72X8546

Note: The Tri-Connector wrap plug is used to test the serial and parallel ports.

PICTURE 5

(**) Trademark of the Wietek Corporation.

(**) Trademark of S3 Incorporated.

(**) Trademark of the Triplett Corporation.

2.0 Hardware Maintenance Reference

This section contains general product and diagnostic information and covers the following:

Subtopics

2.1 Safety Information

The following section contains the safety information required to service the Power Series computer. Familiarize yourself with this information before servicing a computer.

Subtopics

2.1.1 General Safety

Use these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during maintenance and after completing it.
- 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.
- Put 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; for example, put it under a desk or table.
- 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 other clothing or fasten the necktie with a clip, preferably nonconductive, approximately 8 cm (3 in.) from the end.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

  Remember: Metal objects are excellent conductors.
- Wear safety glasses when you are:
  - Using a hammer to drive pins or similar parts
  - Drilling with a power hand-drill
  - Using spring hooks or attaching springs
  - Soldering parts
  - Cutting wire or removing steel bands
  - Cleaning parts with solvents, chemicals, or cleaning fluids
  - Working in any other conditions that might be hazardous to your eyes.
- After maintenance, reinstall all safety devices such as shields, guards, labels, and ground wires. Exchange any safety device that is worn or defective for a new one.

  Remember: Safety devices protect personnel from hazards. You destroy the purpose of the devices if you do not reinstall them before completing your service call.
- Reinstall all covers correctly before returning the machine to the customer.

2.1.2 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, can cause serious injury.
- Mechanical hazards, such as loose or missing hardware, can cause serious injury.

The guide consists of a series of steps presented in a checklist. Begin the checks with the power-off and the power cord removed from the power receptacle.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord from the electrical outlet.
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. 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.

2.1.3 Changing the Battery

The battery (FRU 8185417) is located on the system board.

Replace with only the same or equivalent type. Dispose of used batteries according to local ordinances.

CAUTION:
A danger of explosion exists if battery is incorrectly replaced.

2.1.4 Handling Electrostatic Discharge (ESD) 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 computer. You can use coax or connector-outside shells on these computers.
  - Use the round ground-prong of the AC plug on AC-operated computer.

2.1.5 Electrical Safety

Observe the following rules when working on electrical equipment:

- Find the room emergency power-off (EPO) switch or disconnecting switch. If an electrical accident occurs, you can then operate the switch quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power:
  - Before doing a mechanical inspection
  - Before working near power supplies
  - Before removing or installing main units
- Before you start to work on the machine, unplug its power cable. If you cannot unplug the cable, ask the customer to switch 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.

    CAUTION:
    Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents. Use only approved tools and testers.

  - 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 might 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.

    CAUTION:
    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.

  - 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 switched 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 any FRUs *with the power on* when they are removed from the computer.
- If an electrical accident occurs:
  - **Use caution; do not become a victim yourself.**
  - **Switch off power.**
  - **Send another person to get medical aid.**

2.2 Moving the Computer

The computer top-cover assembly slides onto the base frame and is held by the cover screws and cover lock. Before moving the computer, make sure that the cover is installed and the cover lock is locked.

2.3 Computer Memory

Memory modules supported are 8MB or 32MB. Memory module speed is 70 ns.

Notes:

1. At least one memory module must remain installed in the system board at all times.

2. Memory modules can be installed in any order.

2.4 Product Overview

The following table provides an overview of the computer.

Feature	**Description**
Processor	PowerPC 601* 66 MHz
Cache	32KB L1 Standard 256KB L2 (Optional)
Math Coprocessor	Built-in
Bus Architecture	ISA, PCI, SCSI
Memory (70-ns parity) (168-pin)	16MB (Minimum) 192MB (Maximum)
Video	**Displays Supported**: 6324, 6325, 6327, 9521 9524, 9525, 9527 **Displays Not Supported**: 6312, 6314, 6317, 6318, 6319
Diskette Drive	3.5-inch, 1.44MB 5.25-inch, 1.2MB (Optional)
Hard Disk Drive (2 internal drives supported)	360MB, 540MB, 720MB, 1GB, 2GB
CD-ROM Drive	5.25-inch, 680MB
Power Supply	200-watt Manual Voltage Selection
Keyboard	101/102-Key Keyboard Quiet (*) Touch TrackPoint II (*)
Mouse	2-button, 3-button
Integrated Function	9-Pin Serial Ports (2) 25-pin Parallel Port Mouse Port Keyboard Port SCSI-2 Port Stereo Microphone Port Stereo Headphone Port Audio In Port Audio Out Port Integrated Speaker Diskette Drive Controller SCSI Drive Controller
Security Features	Cover Lock Tie-down Cable Password Protection
Operating Systems Supported	AIX Windows NT (**)

(*) Trademark of the IBM Corporation.

(**) Trademark of the MicroSoft Corporation.

2.5 Product Specifications

The following table contains the product specifications.

Specification	**Description**
Size	Depth: 429 mm (16.9 in.) Height: 124 mm (4.9 in.) Width: 454 mm (17.9 in.)
Weight	Minimum Configuration: 11.8 kg (26 lb.) Maximum Configuration: 14.5 kg (32 lb.)
Heat Output	Maximum Configuration: 120 BTU/hr
Maximum Altitude	2134 meters (7000 feet)
Environment	Temperature (Display and Computer) Power on: 16° to 32° C (61° to 90° F) Power off: 10° to 43° C (50° to 110° F)
Environment	Humidity (Display and Computer) Power on: 8% to 80% Power off: 8% to 80%
Input Voltage - Low	Low Range Minimum: 100 V ac Maximum: 125 V ac
Input Voltage - High	High Range Minimum: 200 V ac Maximum: 240 V ac

2.6 Hardware Compatibility

IBM Power Series computers are designed to maintain compatibility with adapters, devices, and drives which fully support the following interfaces and physically fit into the computer.

Item	**Interface**
CD-ROM Drives	SCSI Interface
Diskette Drives	Industry Standard Interface
Hard Disk Drives	SCSI Interface
I/O Adapter Cards	ISA and PCI Standard Adapters

2.7 Diagnostics and Test Information

The following information is helpful when diagnosing the computer.

Subtopics
2.7.1 Power-Up Initialization Test

2.7.1 Power-Up Initialization Test

Each time you power-on the computer, the power-up initialization test runs. The test takes approximately 30 seconds to complete, depending on the options installed.

The test checks the following:

- System board
- Memory
- Video
- Hard disk drive(s)
- Diskette drive(s)
- Other SCSI devices
- Keyboard installed

To start the test, power-on the display and the computer. The following happens:

1. Computer performs initialization test.
2. If an error is detected, the error code information is displayed and logged.
3. The computer has successfully passed the initialization test when the Power Personal System tones are heard and no errors are displayed.
4. The computer attempts to load the operating system. If an operating system is not found, a "boot subsystem failure" message appears followed by an "Insert Media" message. Insert the System Management Services diskette into drive A, then press Enter. The System Management Services menu appears.
5. If a critical error is encountered, the test is halted.

2.8 System Management Services

The System Management Services diskette provides access to the following functions.

Item	**Description**
Manage Configuration	Provides configuration and setup information.
Select Boot Devices	Provides a view and change utility for the startup (boot) sequence.
Test the Computer	Provides a hardware test function for the computer.
Utilities	Provides access to various utilities (passwords, updating firmware, error log information).

Subtopics
2.8.1 Starting System Management Services
2.8.2 Manage Configuration Program
2.8.3 Selectable Boot Devices
2.8.4 Test the Computer Program
2.8.5 Power-on Password
2.8.6 Removing a Power-on Password
2.8.7 Updating/Restoring Firmware
2.8.8 Error Log

2.8.1 Starting System Management Services

1. Remove all media from all drives.
2. Power-off the computer.
3. Insert the System Management Services diskette into drive A.
4. Power-on the computer.

   Note: If a Supervisory Password is installed, enter the password, then continue.

5. When the Power Personal System screen appears, press **F4**. The System Management Services main menu appears.

2.8.2 Manage Configuration Program

The Manage Configuration Program lets you view and change the hardware configuration information. Use the Manage Configuration program to do the following:

- Check the computer configuration when you get an error code and description.
- Check the computer hardware features, such as the amount of memory.
- Verify or make a change when you add a *hardware option*, such as a diskette drive or memory module.

  Note: Some options such as Ethernet and TokenRing will not be included on the hardware configuration list.

- Change the computer serial port settings.
- Change the SCSI bus ID.

2.8.3 Selectable Boot Devices

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

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

Note: When the startup sequence is changed, the drive letters might also be changed. The operating system assigns the drive letters when the system starts. The assignment of the subsequent drive names will vary with the operating system or the device drivers used.

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

2.8.4 Test the Computer Program

The Test the Computer program is intended to test only IBM products. Non-IBM products, prototype cards, or modified options can give false errors and invalid computer responses.

You can start the Test the Computer program from the System Management Services menu. Follow the instructions on the screen to test the computer.

When running loop (continuous) tests on any subsystem, do the following.

1. Select Test the Computer.
2. At the Test Parameters menu, select Loop Tests.
3. Set the desired number of tests (loops).
4. At the Subsystem to Test menu, select the tests you want to run.

2.8.5 Power-on Password

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

2.8.6 Removing a Power-on Password

To service a computer with an active and unknown power-on password, power-off the computer, remove the battery for 30 seconds, then reinstall the battery.

Note: Remind the user to enter a new password when service is complete.

Subtopics
2.8.6.1 Unattended Start Mode

2.8.6.1 Unattended Start Mode

After a power-on password has been set, you can set it to operate in the *unattended start mode*. This mode is ideal for network servers and other computers that operate unattended. If a power failure occurs, the computer automatically restarts when the power returns and resumes normal operation, without operator intervention.

Note: The supervisor must ensure that the hard disk drive is the first bootable device and that the operating system provides screen-lock or any other required security.

2.8.7 Updating/Restoring Firmware

You can update the system programs through the Update Firmware program. You would do this for the following reasons:

- A newer version was released to enhance or correct the System Programs currently being used.
- The System Programs are corrupted (not functional).

To update the firmware from the System Management Services menu:

1. Insert the update media (or recovery diskette in case of flash corruption) into the drive.
2. Select Utilities.
3. Select Update Firmware, then press Enter.
4. Follow the instructions on the screen to backup the existing firmware.

Note: Do not turn the computer off until the update is finished.

2.8.8 Error Log

The error log records diagnostic error codes and messages. Routinely check the error log for error codes, or if you suspect an intermittent problem. The error log can viewed from the Utilities program on the System Management Services menu.

2.9 SCSI System Information

The following section contains information about Small Computer System Interface (SCSI) drives, IDs, jumpers, terminators, and switch settings.

Subtopics

2.9.1 SCSI Hard Disk Drives and Devices

The SCSI function is built into the system board. The SCSI subsystem can support a combined total of up to seven internal and external SCSI devices.

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

2.9.2 SCSI Device Information

The diagnostic tests usually identify the failing device, but because of the many dependencies, you can be misled by an error code. It is important to understand that all devices in a SCSI chain depend on the communication path of the SCSI data bus. Certain conditions can cause misleading error codes to appear. For example, a short or open circuit in the SCSI chain.

SCSI bus termination is another difficult to diagnose area. An improperly terminated SCSI bus can create communication problems with the attached devices. Verify that the SCSI bus is properly terminated at the end of both the internal and external cable (if external devices are attached).

2.9.3 Understanding SCSI ID Numbers

Each SCSI device must be assigned, at the time of installation, a unique SCSI identification number (SCSI ID). The SCSI controller and the SCSI devices attached to it are referred to as a SCSI chain. When changing drives, be sure to see "Terminator Function" in topic 2.9.7.

2.9.4 Selecting a SCSI ID

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

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

- The SCSI controller, preset as SCSI ID 7 (highest priority), can be changed in System Management Services.
- A fixed-media read and write device, such as a hard disk drive, should be assigned a high-priority ID such as 6 or 5.

  Note: The default drive is usually SCSI ID 6.

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

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

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

1. Power-off the computer.
2. Insert the System Management Services diskette into drive A.
3. Power-on the computer. The System Management Services menu appears.
4. Select **Manage Configuration.**
   The displayed information includes the SCSI ID for that device.

   If there are no devices connected to the SCSI controller, the menu will show only the location of the SCSI controller and the ID assigned to it.

2.9.5 Setting a SCSI ID

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

Subtopics
2.9.5.1 Setting Rewritable Optical Drive ID
2.9.5.2 SCSI ID Switch Settings
2.9.5.3 SCSI ID Jumper Settings

2.9.5.1 Setting Rewritable Optical Drive ID

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.

PICTURE 6

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	:							

2.9.5.2 SCSI ID Switch Settings

To set the SCSI ID on devices with switches, do the following.

Note: The switches on the device you are servicing might be different from the illustrations below. Switch setting information is usually printed on the circuit board near the switches.

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

PICTURE 7

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

PICTURE 8

Notes:

1. If present, switch 5 is always on, and switch 6 is always off.
2. On external SCSI devices that have a rotary switch to set the SCSI ID, set the switches or jumpers on the FRU device *inside the external cover* to 0 (off) to enable the rotary switch.

2.9.5.3 SCSI ID Jumper Settings

To set the SCSI ID on a hard disk drive or CD-ROM with jumpers, do the following:

1. On devices with a partial circuit board (the circuit board does not cover the entire device), hold the device with the cable connectors away from you. On devices with a full circuit board, hold the device with the cable connectors at the left.

   Locate the SCSI jumper block on the device circuit board. The three jumpers at the left end of the block are the SCSI ID jumpers.

   Note: The jumpers on the device you are servicing might be different from the examples shown (see the information that came with the device).

PICTURE 9

2. Refer to the table below to position the hard disk drive and CD-ROM 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	| | :		

2.9.6 Setting the Motor-Start Jumper

The motor-start jumper is normally the fourth jumper from the left.

On drives with seven rows of pins, if the jumper is *removed*, the hard disk drive motor starts instantly at power-on. If the jumper is installed, drives start sequentially.

On all other drives, if the jumper is *installed*, the hard disk drive motor starts instantly at power-on. If the jumper is removed, drives start sequentially.

Note: The motor-start mode is software controlled on devices with a jumper arrangement matching the illustration below. Do not remove the jumper on position 4 .

PICTURE 10

Some drives are shipped with the motor-start jumper set for the hard disk drive motor to start at power-on to reduce initialization 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. Depending on the number of rows of pins (described above) on the drive you are servicing, you might have to *remove or add* one or more motor-start jumpers.

Note: Non-IBM drives use either a jumper or a switch to set the motor-start mode.

2.9.7 Terminator Function

Even though the system can *appear* to be operating correctly with or without terminators installed, it is *not* actually operating correctly. The SCSI Bus can operate at data rates up to 10MB per second. Because of the high speed, the bus must be terminated properly, *at both ends*, with resistors (terminators) or you eventually *will* have problems.

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

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

2.10 Computer Exploded View

PICTURE 11

2.11 System Board Layout

PICTURE 12

Subtopics
2.11.1 System Board

2.11.1 System Board

BT1	Battery
J1	Memory Module Connector 1
J2	Memory Module Connector 5
J3	Internal SCSI Connector
J4	Keyboard Connector
J5	Mouse Connector
J6	Memory Module Connector 4
J7	External SCSI Port
J8	Memory Module Connector 3
J9	Memory Module Connector 2
J11	Memory Module Connector 6
J13	Speaker Connector
J14	L2 Cache or Processor Upgrade Connector
J15	CD-ROM Audio Connector
J17	Reset Connector
J18	Hard Disk Drive LED Connector
J20	PCI Jumper
J21	Processor Cooling Fan Connector
J22	Power-on LED Connector
J30	Serial Port (Ser 1)
J31	Serial Port (Ser 2)
J32	Riser Card Connector
J33	Power Supply Connector
J34	Parallel Cable Connector
J35	Diskette Connector
J36	Microphone Jack
J37	Audio-out Jack
J38	Audio-in Jack
J39	Headphone Jack
U39	PowerPC 601 Processor Socket

2.12 Acronyms, Abbreviations and Terms

Term	Information
ACPA/A	Audio Capture and Playback Adapter
ADP	Automatic Data Processing
AIX	Advanced Interactive Executive
Alt	Alternate
ANSI	American National Standards Institute
ARTIC	A Real Time Interface Coprocessor
ASCII	American National Standard Code for Interface Interchange
AT	Advanced Technology (as in AT Bus)
AVC	Audio Video Connection
bps	Bits Per Second
BPS	Bytes Per Second
BTU	British Thermal Unit
CCS	Common Command Set
CCSB	Common Complete Status Block
CD	Compact Disc
CD-ROM	CD Read Only Memory (stores data/audio)
CE	Customer Engineer or Service Representative
CRC	Cyclic Redundancy Check
CRT	Cathode Ray Tube
CSD	Corrective Service Diskette
CGA	Color Graphics Adapter
CCSB	Configuration Control Sub Board)
CRC	Cyclic Redundancy Check
CRT	Cathode Ray Tube
CSA	Canadian Standards Association
CSD	Corrective Service Diskette
DASD	Direct Access Storage Device (hard disk, diskette)
DAT	Digital Audio Tape
DMA	Direct Memory Access
DRAM	Dynamic Random Access Memory
ECA	Engineering Change Announcement
ECC	Error Correction Code
EGA	Enhanced Graphics Adapter
E/ME/A	Europe/Middle East/Africa
EMI	External Mode Interface
ESD	Electrostatic Discharge

ESDI	Enhanced Small Device Interface
EWS	Energy Work Station
FCC	Federal Communication Commission
FRU	Field Replaceable Unit (replaceable part)
GB	Gigabyte (1,000,000,000 bytes)
GPIB	General Purpose Interface Bus (IEEE 348)
GSA	General Services Administration
HMM	Hardware Maintenance Manual
HMR	Hardware Maintenance Reference
HMS	Hardware Maintenance Service
Ht	Height
IDE	Integrated Drive Electronics
IC	Integrated Circuit
IEEE	Institute of Electrical and Electronics Engineers
IEC	International Electrotechnical Commission
ISA	Industry Standard Architecture
ISO	International Organization for Standardization
ISDN	Integrated-Services Digital Network
LAN	Local Area Network
LBA	Local Block Address
LED	Light Emitting Diode
LTB	Local Transfer Bus
LUN	Logical Unit Number (as in SCSI)
MAP	Maintenance Analysis Procedure
MB	Megabyte (1,048,576 bytes)
MCGA	Modified Color Graphics Adapter (320 x 200 x 256)
MCA	Micro Channel Architecture (bus structure)
MHz	Mega hertz (millions of cycles per second)
MIDI	Musical Instrument Digital Interface
MM	Multimedia
N/A	Not Available or Not Applicable
NDD	National Distribution Division
NMI	Non-Maskable Interrupt
NSC	National Support Center
NVRAM	Non Volatile Random Access Memory
OEM	Original Equipment Manufacturer
OS/2	Operating System/2

PCI	Peripheral Component Interconnect
PUN	Physical Unit Number (as in SCSI)
RAID	Redundant Array of Inexpensive Disks
RAM	Random Access Memory (read/write)
RGB	Red Green Blue (as in monitors)
ROM	Read Only Memory
SASD	Sequential Access Storage Device (Tape)
SCB	Subsystem Control Block
SRAM	Static Random Access Memory
SCSI	Small Computer Systems Interface
SCSI ID	SCSI Identification Number
SIMM	Single In-line Memory Module
SPD	Software Product Description
SR	Service Representative
T/A	NDD Technical Advisor (See your Marketing Representative)
TDD	Telecommunications Device for the Deaf
UL	Underwriters Laboratory
VCA	Video Capture Adapter
VESA	Video Electronics Standards Association
VGA	Video Graphics Array (640 x 480 x 16)
VPD	Vital Product Data
VRAM	Video Random Access Memory
WORM	Write Once, Read Many Media
Y/C	Luminance/Chrominance Signal (as in Video)

2.13 We Want Your Comments!

We want to know your opinion about this manual (part number 83G7699). Your input will help us to improve our publications.

Please photocopy this survey, complete it, and then fax it to **IBM HMM Survey** at **407-982-9825 (USA)**.

Name

Phone Number

1. Do you like this manual?

   Yes No

   ---

2. What would you like to see added, changed, or deleted in this manual?

   ---

3. What is your service experience level?

   Novice Average Advanced

   ---

4. Which computer systems do you service most?

Thanks in advance for your response!

2.14 Telephone Numbers (U.S.)

Telephone assistance is available by calling the IBM Power Series HelpCenter* at (800)4PC-POWER, (800)472-7693 (Monday-Friday, 9 a.m. to 9 p.m., EST, excluding holidays). The HelpCenter provides both hardware and software support.

Before you place a call to the Support Center, refer to "Problem Determination Tips" in topic 2.15.

2.15 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
- Failure symptom
  - 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 the failure?
- Diagnostics Version Level
  - Type and version level
- Operating system software
  - Type and version level
- Software setup (appropriate to the software)

Important

Systems are considered *identical* only if they:

1. Are the exact machine type and models
2. Have the same adapters, attachments, etc.
3. Have the same configuration options
4. Have the same software versions and levels
5. Have the same System Management Services Diskette (version)
6. Have the same operating system

Comparing the configuration and software set-up between "working and non-working" systems will often lead to problem resolution.

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Subtopics

3.1 Trademarks and Service Marks

3.1 Trademarks and Service Marks

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