
Chapter 7. Service Information

This section contains the general checkout procedures, related service procedures, symptom-to-FRU indexes, and removal and replacement procedures for the 7581 Computer.

Note: This manual and the diagnostic tests are intended to test IBM products only. Non-IBM products can give false errors and invalid system responses during testing. If you remove a non-IBM device and the symptom goes away, the problem is with the device you removed.

Configuration/Setup Utility Program

Before You Begin

The system you are servicing could have a customized configuration (settings other than default settings). Running the Configuration/Setup Utility program can alter those settings. Make a list of the current configuration settings and verify that the same settings are in place when service has been completed.

The Configuration/Setup Utility program is stored in the permanent memory. This program includes settings for the following:

- Devices and I/O Ports
- Date and time
- Security
- Start options
- Advanced setup
- ISA-legacy resources

To run the Configuration/Setup Utility program,

1. Turn off the computer and wait until all in-use lights go off.
2. Turn on the computer.
3. When the Configuration/Setup Utility prompt appears on the screen, press F1.
4. When the Configuration/Setup Utility menu appears, follow the instructions on the screen.
5. When finished, select **System Summary** to verify that all configuration changes have been accepted.

Downloading System Support Programs and BIOS Updates

IBM maintains a Web site with the latest information and programs. This Web site contains device drivers and other system support programs, as well as BIOS and publication updates.

The latest updates are under *Support Information* on the Web at:

<http://www.clearlake.ibm.com/mfg/bocaraton/Services/IC/>

To update BIOS after downloading the update files, go to "Flash (BIOS/VPD) Update Procedure."

Vital Product Data

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

Flash (BIOS/VPD) Update Procedure

Attention

Refer to the information label located inside the system unit cover for any model-specific information.

You need to update the VPD only if the SBC is changed. Otherwise, the Flash update program retains the VPD. To update the VPD, do the following.

1. Turn off the computer.
2. Insert the Flash update diskette into drive A.
3. Turn on the computer.
4. When the Update Utility appears, select your country/keyboard; then press Enter.
5. If the system-unit serial number was previously recorded, the number is displayed with an option to update it. Press **Y** to update the serial number.
6. Type the 7-digit serial number of the system unit you are servicing; then press Enter.
7. Follow the instructions on the screen to complete the Flash (BIOS/VPD) update procedure.

Diagnostic and Test Tools

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

- Power-on self-test (POST)
 - POST beep patterns
 - POST error codes
- Error messages
- Diagnostic program

Power-On Self-Test (POST)

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

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

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

If 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 computer.

Beep and Blink Codes: POST generates patterns of beeps to indicate successful completion of POST or to indicate an error. The error LED provides a visual display of these audible tones by blinking one time for each beep, in case the computer is installed in a noisy environment.

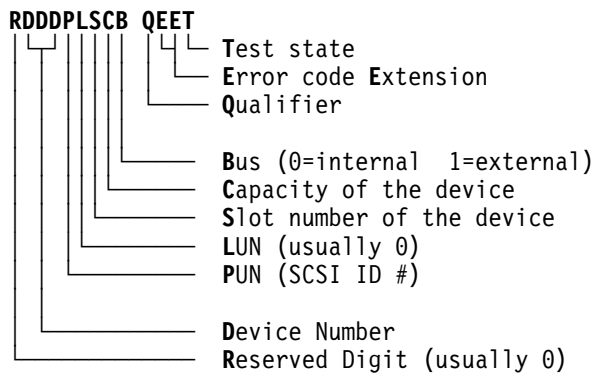
A single beep (or blink) and text appears on the display to indicate the computer completed POST successfully. Any other condition (more than one beep or no beep) indicates the computer detected an error during POST.

POST Error Code Format: This section provides an explanation of the encoded non-SCSI and SCSI POST error codes. Error messages are displayed on the screen as 3, 4, 5, 8, 12, or 13 digits. An “X” in an error message can be any number or letter. The 3 and 4 digit errors are listed in “Numeric Error Codes” on page 7-22. Some digits 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.



Error Messages

There are four types of error messages:

- POST error messages
- POST beep or blink codes
- Diagnostic error messages
- Software-generated messages

Note: Certain errors can produce multiple error messages. If you have more than one error message, follow the recommended action for the first error displayed.

| Error Message | Description |
|-----------------------------------|--|
| POST Error Messages | Displayed when POST finds problems with the hardware or detects a change in the hardware configuration. |
| POST Beep Patterns | Beeps emitted from the speaker if POST finds a problem. One beep indicates POST completed successfully. More than one beep indicates POST found a problem. |
| Diagnostic Error Messages | Displayed when a test program finds a problem with a hardware option. |
| Software-Generated Error Messages | <p>Displayed if a problem or conflict is found by an application program or the operating system. These messages are typically in the form of text, but they can be numeric also.</p> <p>For an explanation of these messages, refer to the information supplied with that software package.</p> |

QAPlus/PRO Diagnostic Program

The QAPlus/PRO diagnostic program shipped on diskette with the system unit provides the primary method for testing the computer. You can use this DOS-based program to test the IBM components of the computer 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 computer, the longer the testing takes. To access QAPlus/PRO, boot the computer with the QAPlus/PRO diskette in the diskette drive.

This test program includes the following features.

| Feature | Description |
|---------------------------|---|
| Advanced Diagnostic Tests | <p>Identifies most problems associated with the following major components:</p> <ul style="list-style-type: none">• Processor card• Hard disk drives• Diskette drives• CD-ROM drives• RAM• Serial and parallel ports• Video (can be the video component on the SBC or a video adapter)• Printer• Keyboard• Mouse <div><p>Testing the USB Ports</p><p>The Advanced Diagnostic program does not display or test the USB ports. The support is entirely in the operating system. If you are having a problem with a USB device, see "USB Ports" on page 7-13.</p></div> |
| Flexible Test Control | <p>Allows you to:</p> <ul style="list-style-type: none">• Run groups of tests in batch <div><p>Attention:</p><p>Do not run the Interrupt Controllers test under System Board Test Group. The test gives the following false messages:</p><p>RT Clock Interrupt: FAILED Interrupt ctrl registers: FAILED</p><p>These devices are tested during system startup.</p></div> <ul style="list-style-type: none">• 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 file (DBF) format• Save all test settings for future use• View System Information• View the server configuration information (for example, you can view the IRQ/DMA assignments, memory usage, and device drivers)• Select System Utilities• Run a low-level format• Format a diskette |

The QAPlus/PRO program provides advanced functions and utilities for users and service or support professionals to troubleshoot even the most difficult problems.

Module Tests Menu: Typically, when you select the Module Tests Menu, all adapters and devices installed in the computer are highlighted on the menu.

Note: The USB ports and devices do not appear on the list and are not tested by the diagnostic program. If you have a problem with a USB device, see “USB Ports” on page 7-13.

- If an adapter or device not installed in the computer is highlighted on the menu, use the procedure in “Undetermined Problem” on page 7-33 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.
 - The SCSI controller failed (on the SBC or SCSI adapter).
 - An unrecognizable adapter is installed.
 - The missing device is defective or 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 the device. If this does not correct the problem, use the procedure in “Undetermined Problem” on page 7-33 to find the problem.

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

Typing the First Letter of a Menu Choice: Throughout the test programs, typing 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.

Pressing the Function Keys: Press 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 with 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 or LUN 2) |
| – | Previous logical unit number |

Command-Line Options: The following command-line options are available when initially starting the diagnostic program from within its directory. Enter **QAPLPRO /XXX**, where **/XXX** represents one of the following commands.

| 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 (some test group labels are: MBD, MEM, VID, HDU, FDU, KBD, COM, and LPT) omits the designated test group from testing. |
| /USERCONFIG=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. See “Scripting” on page 7-8 for a description of scripting. |
| Note: You can use a “–” instead of a “/” as a command-line switch. | |

Viewing the Test Groups: As you move the cursor bar up or down in the Module Tests Menu, the right-hand screen changes to show the attributes, parameters, and the selected tests of the corresponding test group. The “◆” symbol 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 lets you 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 Tests selection under Diagnostics. You also should select appropriate testing parameters and options.

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 4 or 5 different LUNs in the Memory Test Group.

From either the Module Tests Menu or a 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 compressed your drive, the indicated size is the compressed size of the logical drive.

Starting the Diagnostic Program: To start the diagnostic program, do the following.

1. Insert the diagnostic diskette into drive A.
2. Turn on the computer.
3. When the diagnostic **Main Menu** is displayed, select **Diagnostics** and press Enter.
4. Select **Quick Check** and press Enter.
5. Follow the instructions that appear on your screen. If an error is displayed, go to “Symptom-to-FRU Index” on page 7-19.

Module Tests Selection: If the test programs do not find a problem, or you want to perform in-depth testing, the Module Tests selection 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 Tests selection, you can define how many times each test should run and how the test program should log the errors.

To start the Module Tests, do the following.

1. Insert the diagnostic diskette into drive A.
2. Turn on the computer.
3. When the diagnostic **Main Menu** is displayed, select **Diagnostics** and press Enter.
4. Select **Module Tests** from the Diagnostics Menu.
5. Use the up and down arrow keys to move the highlight bar from one selection to the next in the Module Tests Menu.
6. Use the following instructions to select and run tests.

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 selected tests for a test group, do the following.

1. Use the up and down arrow keys to move the cursor to your selection.
2. Press Enter.

A “◆” appears next to your selection.

Running All Selected Modules

To run all selected test modules, do the following.

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

A “◆” appears next to your selection.

Changing Selected Tests in Test Groups

To change selected tests in a test group, do the following.

Attention:

Do not run the Interrupt Controllers test under **System Board Test Group**. The test gives the following false messages:

RT Clock Interrupt: FAILED
Interrupt ctrl registers: FAILED

These devices are tested during system startup.

1. Use the up and down arrow keys 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

Tests indicated by an “*” (red text on color screens) are destructive tests.

4. Press the Spacebar at the highlighted test to toggle between selected (indicated by a “◆”) and not selected.

Note: Typing the first letter of a test does not activate the test, unlike menu operations.

5. Press Enter.

Running an Individual Test

To run an individual test, do the following.

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

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. After the tests have been completed, press Esc to return to the Module Tests 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 stopped. |
| 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. |

General Checkout

Attention

The drive letter assignment in the computer you are servicing could 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.

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 parts, make sure the latest level of BIOS is installed on the computer. A down-level BIOS can cause false errors and unnecessary replacement of the SBC. For more information on how to determine and obtain the latest level BIOS, see "Downloading System Support Programs and BIOS Updates" on page 7-2.
2. If multiple error codes are displayed, diagnose the first error code displayed.
3. If the computer stops with a POST error, go to "Symptom-to-FRU Index" on page 7-19.
4. If the computer stops without displaying an error, go to "Undetermined Problem" on page 7-33.
5. If an installed device is not recognized by the diagnostic program, that device might be defective.

001

- Turn off the computer and all external devices.
- Check all cables and power cords.
- Set all display controls to the middle position.
- Insert the Diagnostic diskette into drive A.
- Turn on all external devices.
- Turn on the computer.
- Check for the following responses:
 1. One or two beeps (depending on the diagnostic version level).
 2. Readable instructions or the Main Menu.

DID YOU RECEIVE THE CORRECT RESPONSES?

Yes No

002

Go to the "Symptom-to-FRU Index" on page 7-19.

003

ARE ALL INSTALLED DEVICES IN THE COMPUTER HIGHLIGHTED ON THE MODULE TEST MENU OR HARDWARE CONFIGURATION REPORT?

Yes No

004

Go to "Module Tests Menu" on page 7-6.

Note: The USB ports and devices do not appear on the list and are not tested by the diagnostic program. If you are having a problem with a USB device, see "USB Ports" on page 7-13.

(continued)

005

Run the Advanced Diagnostic test. If necessary, refer to “Diagnostic and Test Tools” on page 7-3.

- If you receive an error, go to “Symptom-to-FRU Index” on page 7-19.
- If the test stops and you cannot continue, replace the last device tested.
- If the computer has incorrect keyboard responses, go to “Keyboard.”
- If the printer has incorrect responses, go to “Printer” on page 7-15.
- If the display has problems such as jittering, rolling, shifting, or being out of focus, go to “Display” on page 7-18.

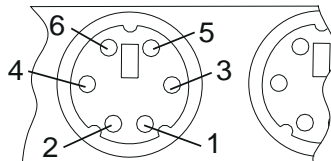
Keyboard

If the keyboard is experiencing problems and a mouse or other pointing device is attached, disconnect it to see if the error symptom goes away. If the symptom goes away, the mouse or pointing device is defective. If the symptom does not go away, perform the following.

001

- Turn off the computer.
- Disconnect the keyboard cable from the system unit.
- Turn on the computer and check the keyboard cable connector on the system unit for the voltages shown. All voltages must be within 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 SBC.

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 SBC.

USB Ports

Before you begin:

- Make sure the USB ports are enabled (see page 4-18).
- Make sure the operating system support is installed (refer to the instructions for your operating system).
- Make sure the device is connected properly and is turned on (if it has external power).

If a USB device is experiencing problems, do the following.

001

ARE OTHER USB DEVICES ATTACHED TO EITHER OF THE TWO PORTS?

Yes No

002

- Attach the failing device to the other port.
- Test the device again.

DO YOU HAVE THE SAME SYMPTOM?

Yes No

003

Reseat the failing cable at the SBC and retest. If the problem remains, replace the following parts until the problem is corrected.

- Cable assembly
- SBC

004

Reinstall the device driver and retest. If the problem remains, replace the following parts until the problem is corrected.

- USB device
 - Cable assembly
 - SBC
-

005

ARE ANY USB DEVICES WORKING PROPERLY?

Yes No

006

- Disconnect all USB devices (including any hubs).
- Reconnect a failing device directly to a USB port.

DO YOU HAVE THE SAME SYMPTOM?

Yes No

007

One of the other USB devices is causing the problem. Reconnect them one at a time until the symptom returns. Then replace that device.

(continued)

008

- Disconnect this device (device 1) and connect another device (device 2).
- Test device 2.

DO YOU HAVE THE SAME SYMPTOM?

Yes No

009

Replace the first device tested (device 1).

010

Replace the cable assembly. If the symptom remains, replace the SBC.

011

- Connect the failing device in place of a device that you know is working.
- Test the device again.

DO YOU HAVE THE SAME SYMPTOM?

Yes No

012

Replace the following parts until the problem is corrected.

- USB hub
- Cable assembly
- SBC

013

Reinstall the device driver. If the problem remains, replace the device.

Printer

If a printer is experiencing problems, make sure the printer is connected properly and is turned on; then 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 part 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 SBC or adapter connected to the printer cable.

Power Supply

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

| Check/Verify | Action |
|--|----------------------|
| 1. Check the following: <ul style="list-style-type: none">• Power cord• On/Off switch connector• Power-supply connectors• Backplane power-supply connectors | Reseat |
| 2. Check the power cord for proper continuity. | Power Cord |
| 3. Check the On/Off switch for continuity. | On/Off Switch |

If these are correct, check the voltages shown in “Backplane Power-Supply Connections” on page 7-17.

Backplane Power-Supply Connections

The backplane of the 7581 Computer has five green LEDs next to the power supply connectors, one for each of the five input voltages from the power supply. If any of these LEDs is not lit, verify the power supply cables are correctly installed on the backplane. If the power supply connections are correct and the previous checks are correct, replace the power supply. Voltages must be checked with the power supply cables connected to the backplane. For power supply voltages, see Figure 7-1

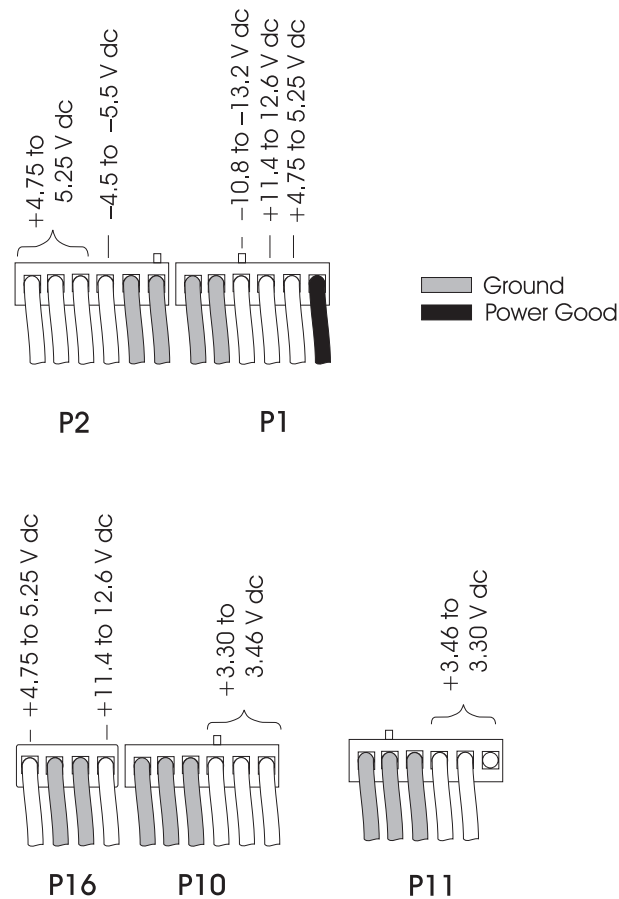


Figure 7-1. Power Supply Voltages

Display

If the screen is rolling, replace the display assembly. If that does not correct the problem, replace the video/graphics accelerator.

If the screen is not rolling, do the following to run the display self-test.

1. Turn off the computer and the display.
2. Disconnect the display signal cable.
3. Turn on the display.
4. Turn the brightness and contrast controls to their maximum setting. The screen should be a uniform white or light gray test color.
5. If you do not see the test color, replace the display. If there is a test color on the screen, replace the video/graphics accelerator.

Note: During the first two or three seconds after the display is turned 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 Problem” on page 7-33.

Symptom-to-FRU Index

The symptom-to-FRU index tables list error symptoms, as well as parts to be replaced and corrective actions to take. The parts and corrective actions are listed in order of decreasing effectiveness in problem solving. Replace the parts or take actions in the order suggested. An X in the tables represent any number from 0 to 9.

Always begin with "General Checkout" on page 7-11. If you are unable to correct the problem using these tables, go to "Undetermined Problem" on page 7-33.

Notes:

1. If you have both an error message and an incorrect pattern of beeps, diagnose the error message first.
2. If you cannot run the diagnostic tests, but did receive a POST error message, diagnose the POST error message.
3. If you did not receive any error message, look for a description of your error symptoms in the first part of this index.
4. Check all power supply voltages before you replace the SBC. (See "Power Supply" on page 7-16.)
5. Check the hard disk drive jumper settings before you replace a hard disk drive. (See "Hard Drive Jumper Settings" on page C-2.)

Important

1. Some errors are indicated with a pattern of beeps. (See "Beep Symptoms" on page 7-20.)
2. The processor is a separate part from the SBC. (See "Removing and Replacing the SBC" on page 7-44.)

Beep Symptoms

The computer produces patterns of beeps to assist in diagnosing many problems. The SBC provides the processor function for the 7581 Computer.

| Beeps | Description |
|-------|--|
| 1-2-X | <ul style="list-style-type: none"> • One beep • A pause (or break) • Two beeps • A pause (or break) • Any number of beeps |
| 4 | Four continuous beeps |

| Beep Symptom | Action |
|--|---|
| 1-1-3 CMOS read/write error. | <ol style="list-style-type: none"> 1. Run Setup. 2. SBC |
| 1-1-4 ROM BIOS check error. | <ol style="list-style-type: none"> 1. SBC |
| 1-2-X DMA error. | <ol style="list-style-type: none"> 1. SBC |
| 1-3-X | <ol style="list-style-type: none"> 1. Memory Module 2. SBC |
| 1-4-4 | <ol style="list-style-type: none"> 1. Keyboard 2. SBC |
| 1-4-X Error detected in first 64 KB of RAM. | <ol style="list-style-type: none"> 1. Memory Module 2. SBC |
| 2-1-1, 2-1-2 | <ol style="list-style-type: none"> 1. Run Setup. 2. SBC |
| 2-1-X Error detected in first 64 KB of RAM. | <ol style="list-style-type: none"> 1. Memory Module 2. SBC |
| 2-2-2 | <ol style="list-style-type: none"> 1. Video Component or Adapter 2. SBC |
| 2-2-X First 64 KB of RAM failed. | <ol style="list-style-type: none"> 1. Memory Module 2. SBC |
| 2-3-X | <ol style="list-style-type: none"> 1. Memory Module 2. SBC |
| 2-4-X | <ol style="list-style-type: none"> 1. Run Setup. 2. Memory Module 3. SBC |
| 3-1-X DMA register failed. | <ol style="list-style-type: none"> 1. SBC |
| 3-2-4 Keyboard controller failed. | <ol style="list-style-type: none"> 1. SBC 2. Keyboard |
| 3-3-4 Screen initialization failed. | <ol style="list-style-type: none"> 1. Video Component or Adapter 2. SBC 3. Display |
| 3-4-1 Screen retrace test detected an error. | <ol style="list-style-type: none"> 1. Video Component or Adapter 2. SBC 3. Display |

| Beep Symptom | Action |
|---|---|
| 3-4-2 POST is searching for Video ROM. | 1. Video Component or Adapter 2. SBC |
| 4 | 1. Video Component or Adapter 2. SBC |
| One long and one short beep during POST. Base 640 KB memory error or shadow RAM error. | 1. Memory Module 2. SBC |
| One long and two or three short beeps during POST. Video error. | 1. Video Component or Adapter 2. SBC |
| Three short beeps during POST. | 1. See "Removing and Replacing the SBC" on page 7-44. 2. SBC |
| Continuous tone and fan LED is lit. | 1. Fan indicated by LED on fan sense board 2. Fan sense board |
| Continuous tone. | 1. SBC |
| Repeating short beeps. | 1. Check for stuck key on keyboard. 2. Keyboard Cable 3. Keyboard 4. SBC |
| All other beep patterns. | 1. SBC |

No Beeps

| Symptom/Error | Action |
|---|---|
| No beep during POST but the computer works correctly. | 1. LED Board 2. LED Cable 3. SBC |
| No beep during POST. | 1. See "Undetermined Problem" on page 7-33. 2. SBC 3. Memory Module 4. Any Adapter or Device 5. Power Cord 6. Power Supply |

Numeric Error Codes

| Error Code/Explanation | Action |
|---|---|
| 000 SCSI Adapter not enabled. | 1. Verify the adapter Device and Bus Master fields are enabled in the PCI configuration. |
| 08X Check SCSI terminator installation. | 1. SCSI Cable 2. SCSI Terminator 3. SCSI Device 4. SCSI Adapter |
| 101 Interrupt failure. | 1. SBC |
| 102 System timer error. | 1. SBC |
| 106 | 1. SBC |
| 110 Memory parity error. | 1. Memory Module 2. SBC |
| 111 I/O channel parity error. | 1. Reseat all adapters. 2. Any Adapter 3. SBC |
| 114 Adapter ROM error. | 1. Adapter Memory 2. SBC |
| 129 Internal cache test error. | 1. Processor 2. SBC |
| 151 Real-time clock failure. | 1. SBC |
| 161 Bad battery. | 1. Run Setup. 2. Battery (see page E-6) 3. SBC |
| 162 Configuration mismatch. | 1. Run Setup and verify configuration. 2. Was device added, removed, or location changed? If not, suspect that device. 3. Turn on all external devices first, then turn on the computer. 4. Battery (see page E-6) 5. SBC |
| 163 Clock not updating or invalid time set. | 1. Check and reset time and date. 2. Battery (see page E-6) 3. SBC |
| 164 POST detected a base memory or extended memory size mismatch error. | 1. Run Setup and check System Summary menu for memory size change (see "Configuration/Setup Utility Program" on page 7-1). 2. Run the memory diagnostic tests. |
| 175 | 1. SBC |
| 176 | 1. Reinstall the covers. |
| 177 Corrupted Administrator Password. | 1. SBC |
| 178 | 1. SBC 2. Microprocessor |
| 183 | 1. Enter the administrator password. |

| Error Code/Explanation | Action |
|---|---|
| 184 Password removed due to check-sum error. | 1. Define new password. |
| 185 Corrupted boot sequence. | 1. Run Setup and reinstall the boot sequence. |
| 186 | 1. SBC |
| 189 More than three password attempts were made to access the computer. | 1. Turn off the computer and try again. |
| 1XX Not listed previously. | 1. SBC |
| 201, 20X Memory data error. | 1. Memory Module 2. SBC |
| 225 Unsupported memory. | 1. Replace the memory. |
| 229 External cache test error. | 1. SBC |
| 262 POST detected a base memory or extended memory type error. | 1. Run Setup and check the System Summary menu for memory type change (see "Configuration/Setup Utility Program" on page 7-1). 2. Run the memory diagnostic tests. |
| 301 | 1. Keyboard 2. Keyboard Cable 3. Keyboard/Mouse Cable 4. SBC |
| 303 with an 8603 error. | 1. Mouse 2. Keyboard 3. Keyboard Cable 4. Keyboard/Mouse Cable 5. SBC |
| 303 without an 8603 error. | 1. Keyboard 2. Keyboard Cable 3. Keyboard/Mouse Cable 4. SBC |
| 3XX Not listed previously. | 1. Keyboard 2. Keyboard Cable 3. Keyboard/Mouse Cable 4. SBC |
| 5XX | 1. Video Component or Adapter 2. SBC |
| 601 | 1. Diskette Drive A 2. Diskette Drive Cable 3. SBC |
| 602 | 1. Verify Diskette and retry. 2. Diskette |
| 604 and able to run diagnostic. | 1. Run Setup and verify diskette configuration settings. 2. Diskette Drive B 3. Diskette Drive Cable 4. SBC |

| Error Code/Explanation | Action |
|--|--|
| 604 and unable to run diagnostic. | <ol style="list-style-type: none"> 1. Run Setup and verify diskette configuration settings. 2. Diskette Drive A 3. Diskette Drive Cable 4. SBC |
| 605 POST cannot unlock the diskette drive. | <ol style="list-style-type: none"> 1. Diskette Drive 2. Diskette Drive Cable 3. SBC |
| 662 Diskette drive configuration error or wrong diskette drive type. | <ol style="list-style-type: none"> 1. Run Setup and verify diskette configuration settings. |
| 6XX Not listed previously. | <ol style="list-style-type: none"> 1. Diskette Drive 2. SBC 3. External Drive Adapter 4. Diskette Drive Cable 5. Power Supply |
| 962 Parallel port configuration error. | <ol style="list-style-type: none"> 1. Run Setup and verify parallel port configuration. 2. Parallel Adapter 3. SBC |
| 9XX | <ol style="list-style-type: none"> 1. Printer 2. SBC |
| 107X SCSI terminator error. | <ol style="list-style-type: none"> 1. Check SCSI terminator installation. 2. SCSI Cable 3. SCSI Terminator 4. SCSI Device 5. SCSI Adapter |
| 1101 Serial connector error or possible SBC failure. | <ol style="list-style-type: none"> 1. SBC 2. Any Serial Device |
| 11XX Not listed previously. | <ol style="list-style-type: none"> 1. SBC |
| 1692 Boot sequence error. | <ol style="list-style-type: none"> 1. Run FDISK to make sure at least one partition is set active. |
| 1762 Hard disk drive configuration error. | <ol style="list-style-type: none"> 1. Run Setup and verify hard disk drive configuration (see "Configuration/Setup Utility Program" on page 7-1). |
| 1780 (Disk Drive 0) 1781 (Disk Drive 1) 1782 (Disk Drive 2) 1783 (Disk Drive 3) | <ol style="list-style-type: none"> 1. See "Power Supply" on page 7-16. 2. Hard Drive 3. SBC 4. Hard Disk Cable 5. Power Supply |
| 180X PCI configuration or resource error. | <ol style="list-style-type: none"> 1. Run Setup and verify PCI/ISA configuration settings. If necessary, set ISA adapters to "Not available" to allow PCI adapters to configure properly. 2. Remove any suspect ISA adapters. 3. Rerun diagnostics. 4. PCI Adapter |
| 1962 Boot sequence error. | <ol style="list-style-type: none"> 1. Possible hard disk drive problem (see "Hard Drive Boot Error" on page 7-33). |

| Error Code/Explanation | Action |
|--|---|
| 2401, 2402 If screen colors are OK. | <ol style="list-style-type: none"> 1. Video Component or Adapter 2. SBC 3. Display |
| 2410 | <ol style="list-style-type: none"> 1. Video Component or Adapter 2. SBC 3. Display |
| 2462 Video memory configuration error. | <ol style="list-style-type: none"> 1. Check cable connections. 2. Run Setup and verify the video configuration. 3. Video Memory 4. Video Component or Adapter 5. SBC |
| 8601, 8602 | <ol style="list-style-type: none"> 1. Pointing Device (Mouse) 2. Keyboard/Mouse Cable 3. SBC |
| 8603, 8604 | <ol style="list-style-type: none"> 1. SBC 2. Keyboard/Mouse Cable 3. Pointing Device (Mouse) |
| 86XX Not listed previously. | <ol style="list-style-type: none"> 1. Mouse 2. Keyboard/Mouse Cable 3. SBC |

Diagnostic Error Messages

| Error Message/Symptom | Action |
|--|---|
| Address Exceeds the Size of Your Memory An invalid memory address was entered. Diagnostic Tests display this message during the Locate Bad Chips option. | 1. Enter the correct address. 2. Memory Module 3. SBC |
| Arithmetic Functions Failed An error was detected during the CPU Test. | 1. Processor 2. SBC |
| Base Memory Test Failed An error was detected in base memory. | 1. Memory Module 2. SBC |
| Boot Sector Unreadable A boot sector read error was detected on the hard disk drive. | 1. Hard Drive 2. Hard Drive Cable 3. Hard Drive Adapter 4. SBC |
| Bus Noise Test Failed RAM Test detected an error in the memory bus. | 1. Memory Module 2. SBC |
| Butterfly Cylinder Access Test Failed Hard Drive Test detected mismatch between the data read and the data stored on the drive. | 1. Hard Drive 2. Hard Drive Cable 3. Hard Drive Adapter 4. SBC |
| Clock Stopped Real-time clock has stopped working. | 1. Battery (see page E-6) 2. SBC |
| CMOS Clock Test Failed Time and Date Settings for CMOS and DOS do not Match. | 1. Battery (see page E-6) 2. SBC |
| Controller Diagnostic Test Failed An error was detected while testing the Hard Disk Controller (Adapter). | 1. Hard Drive Adapter 2. Hard Drive 3. SBC |
| Cylinder 0 errors Test detected an error reading the first cylinder of the hard disk drive. | 1. Hard Drive 2. Hard Drive Adapter 3. SBC |
| Device is Not Ready Ready the Device... or Press Any Key | 1. Ensure the device is turned on. 2. Replace failing device. 3. Device Adapter 4. SBC |
| Disk Error Encountered Opening Output File Press Any Key To Continue. | 1. Hard Drive 2. Hard Drive Adapter 3. SBC |
| DMA #X Failed Main Components Test detected an error while testing the DMA controller. | 1. SBC |
| DMA Page Register Failed DMA page register error | 1. SBC |
| Drive (x) Media (y) Mismatch FAT ID mismatch with installed drive. | 1. Check diskette and diskette drive capacity. 2. Diskette Drive 3. SBC |
| Error in video buffer. Bad bits. Video memory test error. | 1. Video Component or Adapter 2. SBC 3. Display |

| Error Message/Symptom | Action |
|---|---|
| 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. SBC 3. Processor |
| Extended Memory Test Failed Extended memory error. | 1. Memory Module 2. SBC |
| Floppy Drive Failed Diskette drive(s) failed. | 1. Diskette Drive 2. SBC 3. Diskette Drive Cable |
| General Function Failed Remove one adapter at a time until the symptom goes away. | 1. Any Adapter 2. SBC 3. Processor |
| Hard Drives Failed Hard Drive test error. | 1. Hard Drive 2. Hard Drive Adapter 3. SBC |
| Incorrect DOS version | 1. Ensure you are using DOS version 3.0 or higher. |
| Interrupt ctrl registers: FAILED False message. | Ignore. See "Attention" on page 5-3. |
| Invalid Date Clock/DOS date mismatch. | 1. CMOS Backup Battery (see page E-6) 2. SBC |
| Invalid Time Clock/DOS time mismatch. Back-up clock and DOS time of day settings do not match. | 1. CMOS Backup Battery (see page E-6) 2. SBC |
| Linear Cylinder Access Test Failed Hard disk drive error. | 1. Hard Drive 2. Hard Drive Cable 3. Hard Drive Adapter 4. SBC |
| Logic Function Failed CPU Logic test error. | 1. Processor 2. SBC |
| Loopback Error COM Port Test or Parallel Port error. A wrap plug must be installed to successfully complete these tests. | 1. SBC 2. Wrap Plug |
| Main Components Failed SBC error. | 1. SBC 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. SBC |
| Missing QAPIus/PRO Files(s) One or more diagnostic support files are missing. | 1. Diagnostic Diskette |
| NO LOOPBACK PLUG. Skipping External loopback test No wrap plug installed. | 1. Install the wrap plug on the serial port; then rerun the test. 2. Internal Serial Cable 3. SBC |
| Not ready Printer not on-line or not ready. | 1. Ready Printer 2. Printer 3. Printer Cable 4. SBC |

| Error Message/Symptom | Action |
|--|---|
| No 'type-amatic' repeat At least one repeat key must be tested during this test or an error will occur. Typematic test error. | 1. Keyboard 2. Keyboard/Mouse Cable 3. SBC |
| Not used by any standard device IRQ is not currently being used by a non-standard device. | 1. SBC |
| Numeric Proc Failed NPU test error. | 1. Processor 2. SBC |
| Parallel Ports Failed Test Report Summary message. | 1. SBC |
| Pass (N): ** Errors ** Drive (X) Failed Diskette drive read/write test error. | 1. Diskette Drive 2. SBC 3. Diskette Drive Cable |
| Pass (N) Drive Not Ready Diskette drive door is open or defective. | 1. Ensure diskette drive is ready. 2. Diskette Drive 3. SBC 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. SBC 4. Diskette Drive Cable |
| Pass (N): Unknown Media Drive (X) Diskette Drive Test error. | 1. Diskette 2. Diskette Drive 3. SBC 4. Diskette Drive Cable |
| Place Hi-density Media in Drive Media/drive mismatch. | 1. Diskette 2. Diskette Drive 3. SBC 4. Diskette Drive Cable |
| Printer Failed Printer powered-on and ready? | 1. Printer 2. Printer Cable 3. SBC |
| Printer Fault Printer powered-on and ready? | 1. Printer 2. Printer Cable 3. SBC |
| Printer Not Selected Ensure the printer is turned on and ready. | 1. Printer 2. Printer Cable 3. SBC |
| Program or File Not Found Press Any Key Diagnostics cannot find the USER(N).COM file. | 1. Diagnostic Diskette 2. Diskette Drive 3. SBC |
| Program Too Big To Fit In Memory Too many Terminate and Stay Resident programs in memory. | 1. Reboot the computer from the Diagnostic Diskette. |
| QAPLUS/PRO Cannot Be Re-run because of Error in Relocating Program Diagnostics failed to relocate the Diagnostic Test programs so the memory space it resides in was not tested. | 1. Diagnostic Diskette 2. Memory Module 3. SBC |

| Error Message/Symptom | Action |
|--|---|
| RAM Memory Error in Block n. Bad bits n Memory error. | 1. Memory Module 2. SBC |
| RAM Test Failed Memory error. | 1. Memory Module 2. SBC |
| Read error on cylinder n Hard disk drive format error. | 1. Hard Drive 2. Hard Drive Adapter 3. SBC |
| Read Errors Diskette drive read error. | 1. Diskette 2. Diskette Drive 3. SBC 4. Diskette Drive Cable |
| Receive Error Serial Port loopback test error. | 1. Serial Port Cable 2. SBC |
| Refresh Failure Diagnostic Test detected an error while testing the DMA controller's RAM refresh cycle. | 1. Memory Module 2. SBC |
| RT Clock Interrupt: FAILED False message. | Ignore. See "Attention" on page 5-3. |
| Serial Chip Error COM Port error, general. | 1. Serial Port Cable 2. SBC |
| Serial Compare Error COM Port error; information transmitted is not the same as information received. | 1. Serial Port Cable 2. SBC |
| Serial Time-out Error COM Port error; time interval is too long between transmitted and received data. | 1. Serial Port Cable 2. SBC |
| Serious Memory Error—Diags Cannot Continue Memory Test error. | 1. Memory Module 2. SBC |
| Sorry, You Need A Mouse Mouse or mouse driver was not detected. | 1. Mouse 2. SBC |
| System Hangs Go to "Undetermined Problem" on page 7-33. | 1. Any device 2. Any adapter 3. SBC |
| The Address Exceeds the Size of Your Memory An invalid memory address was entered. The Diagnostic 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 the correct address. 2. Memory Module 3. SBC |
| That Number Is Out of Range An invalid bit number was entered. Diagnostic Tests display this message during the Locate Bad Chips option. | 1. Enter the correct number. 2. Memory Module 3. SBC |
| Too Many Errors — Test Aborted Too many errors; the Diagnostic Test cannot continue. | 1. Processor 2. SBC |
| Transmit Error Internal or external serial port loopback test failure. | 1. Serial Port Cable 2. SBC |

| Error Message/Symptom | Action |
|---|---|
| Video Adapter Failed Test Result Summary displayed if "Fail" was at the Quit/Fail/Pass menu of any video test. | 1. Video Component or Adapter 2. SBC 3. Display |
| Write error on cylinder n Hard disk drive write error. | 1. Hard Drive 2. Hard Drive Adapter |
| Write Errors Diskette drive write error. | 1. Diskette 2. Diskette Drive 3. SBC 4. Diskette Drive Cable |
| Write Protected or Unformatted Diskette is write protected or is not formatted. | 1. Insert a non-write-protected, formatted diskette into the diskette drive; then rerun the test. 2. Diskette Drive 3. SBC 4. Diskette Drive Cable |
| You Cannot Delete the Motherboard "Remove Board" option was selected. The Diagnostic Tests display this message during the Locate Bad Chips option. | 1. Make the correct selection. 2. Memory Module 3. SBC 4. Processor |

Miscellaneous Symptoms

| Symptom | Action |
|--|--|
| Changing colors. | 1. Display |
| System unit will not shut off. | 1. See "Power Supply" on page 7-16. 2. Power Switch 3. SBC |
| System unit will not turn on. | 1. See "Power Supply" on page 7-16. 2. Power Switch 3. Power Supply 4. SBC |
| Diskette drive in-use light remains on or does not light when drive is active. | 1. Diskette Drive 2. SBC 3. Diskette Drive Cable |
| Flashing cursor with an otherwise blank display. | 1. SBC 2. Primary Hard Drive 3. Hard Drive Cable |
| Incorrect memory size during POST. | 1. Run the memory tests. 2. Memory Module 3. SBC |
| "Insert a Diskette" icon appears with a known-good diagnostic diskette in the first 3.5-inch diskette drive. | 1. Diskette Drive 2. SBC 3. Diskette Drive Cable 4. Network Adapter |
| Intensity or color varies from left to right of characters and color bars. | 1. Display 2. Video Component or Adapter |
| No power, or fan not running. | 1. See "Power Supply" on page 7-16. |
| Non-system disk or disk error-type message with a known-good diagnostic diskette. | 1. Diskette Drive 2. SBC 3. Diskette Drive Cable |
| Other display symptoms not listed previously (including blank or illegible display). | 1. See "Display" on page 7-18. 2. SBC 3. Display |
| Power-on indicator or hard disk drive in-use light not on, but computer works correctly. | 1. Power Supply 2. SBC 3. LED Cables |
| Printer problems. | 1. See "Printer" on page 7-15. |
| Program loads from the hard disk with a known-good diagnostic diskette in the first 3.5-inch diskette drive. | 1. Run Setup. 2. Diskette Drive 3. Diskette Drive Cable 4. SBC 5. Power Supply |
| Serial or parallel port device failure (port on SBC) | 1. Check external device self-test. 2. External Device 3. Device Cable 4. Device Connector Cable (from SBC) 5. SBC |

| Symptom | Action |
|--|--|
| Serial or parallel port device failure (port on adapter) | <ol style="list-style-type: none"> 1. Check external device self-test. 2. External Device 3. Device Cable 4. Adapter 5. SBC |
| USB port device failure | See "USB Ports" on page 7-13. |
| Some or all keys on the keyboard do not work. | <ol style="list-style-type: none"> 1. Keyboard 2. Keyboard Cable 3. Keyboard/Mouse Cable 4. SBC |
| Battery inaccurate. | <ol style="list-style-type: none"> 1. Battery (see page E-6) 2. SBC |

Hard Drive Boot Error

A hard drive boot error (error codes 1962 and I999030X) can be caused by the following.

| Cause | Actions |
|--|---|
| The start-up drive is not in the boot sequence in the configuration. | Check the configuration and ensure the start-up drive is in the boot sequence. |
| No operating system is installed on the boot drive. | Install 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. <ol style="list-style-type: none">1. Attempt to access and recover (back up) the failing hard drive.2. Using the operating systems programs, format the hard drive. |
| The drive is defective. | Replace the hard drive. |

Undetermined Problem

Check the power supply voltages. See "Power Supply" on page 7-16. If the voltages are correct, return here and continue with the following steps.

1. Turn 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. Any adapters
 - d. Memory modules
To replace memory modules, you must remove the SBC first (see page 7-44).
 - e. Hard drive
 - f. Diskette drive
3. Turn on the computer to re-test it.
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 SBC. See "Removing and Replacing the SBC" on page 7-44.

Removal and Replacement Procedures

This section describes the step-by-step procedures for removing and replacing features and parts in the 7581 Computer. ***These procedures should be performed only by trained service personnel, because performing steps incorrectly could lead to personal injury or damage to the computer.***

Before performing any removal and replacement procedures, be sure to read and understand the information in "Safety Information" on page E-9 and in "Handling Electrostatic-Discharge-Sensitive Devices" on page E-14.

CAUTION:

- **Power must always be switched off before performing any removal or replacement procedures. If possible, electrical power and any backup power source should also be disconnected. To assure that power is turned off and disconnected in the correct order, start every removal and replacement procedure with "Removing Power and Disconnecting Cables" on page 7-35.**
- **Depending on the options installed, the system unit could weigh more than one person can comfortably lift. Do not attempt to lift it by yourself if you think it is too heavy for you.**

Attention

Whenever handling electronic components, use precautions to prevent component damage due to electrostatic discharge. See "Handling Electrostatic-Discharge-Sensitive Devices" on page E-14 for a list of those precautions.

When performing the following procedures, refer to Figure 1-2 on page 1-2 and Figure 1-3 on page 1-3.

Removing Power and Disconnecting Cables

Use the following procedure to remove all power from the system unit before beginning any removal or replacement procedure. If you need to remove the system unit from its mounting, use this procedure before removing the system unit.

1. Remove any data media (diskettes and CDs) from the computer.
2. Turn off the computer and any attached devices.
3. Tag all cables connected to the system unit or record the connections to prevent confusing the cables while they are unplugged.
4. If you have an internal modem, disconnect the telephone line from the wall outlet and then from the system unit.
5. Disconnect all electrical power and any backup power source.
6. Disconnect any other cables connected to the system unit. Where applicable, disconnect the cables at the receptacle end first, and then at the device end.

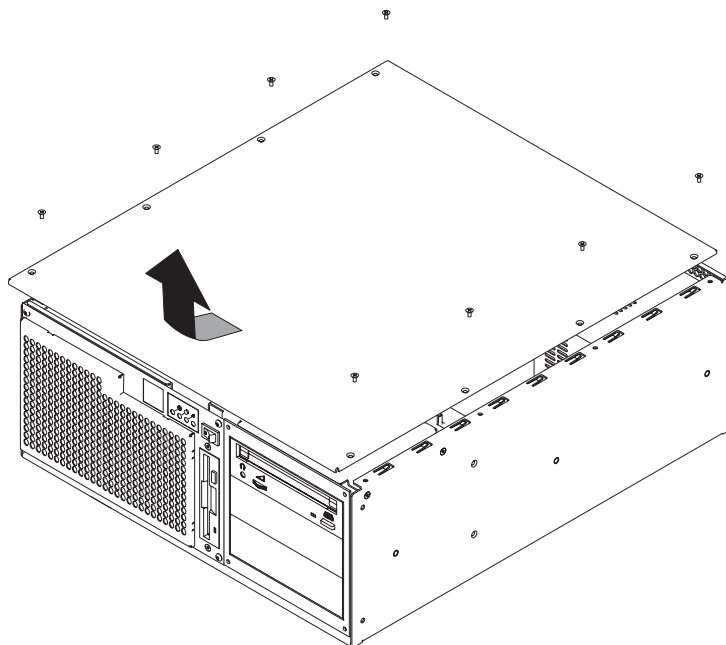
You now are ready to proceed.

- For installations in which the mounting does not impede access, go directly to “Removing the System Unit Cover.”
- For installations in which the mounting does impede access, remove the system unit from its mounting before beginning any removal or replacement procedure. The steps for removing the system unit from its mounting depend on the particular mounting method. See “Installing the Rack-Mount Option” on page 3-18 or “Installing the Floor-Stand Option” on page 3-16 for information.

When reassembling the system unit, reverse these steps.

Removing the System Unit Cover

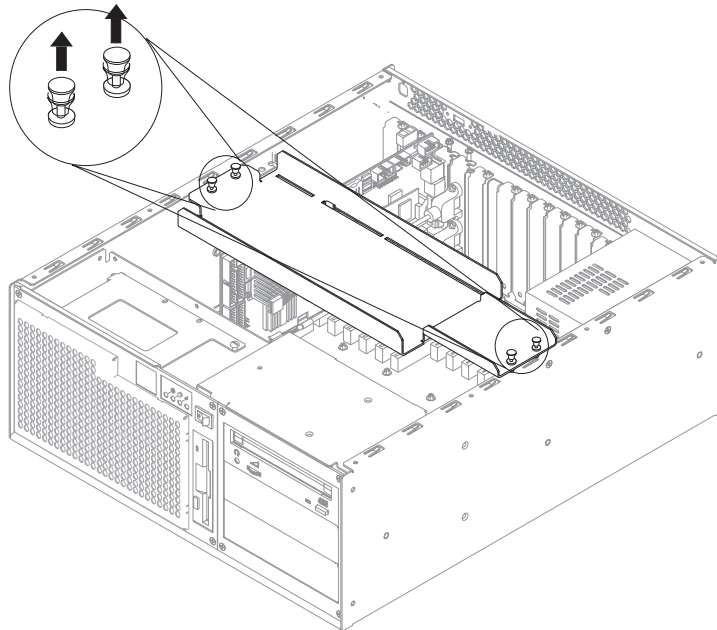
Remove the cover screws. Then slide the cover forward about two inches and lift it off.



Removing and Replacing Adapters

All adapters are removed and replaced in the same manner. Adapters are held in place by card retainers installed in the card hold-down bracket. These retainers are adjusted to the height of the adapters. If you remove an adapter, make sure you reinstall it in the same slot. If you change the position of an adapter or install a different adapter, see “Installing Adapters” on page 3-7 for information on installing the spacers. In addition to the card retainers, longer adapters are held in place by the front guides (shorter adapters do not reach the guides).

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Remove the card hold-down bracket.



4. Remove the retaining screw for the adapter to be removed.
5. Disconnect any cables going to that adapter.
6. Remove the adapter.

When reassembling the system unit, reverse these steps. Be sure that the card retainer properly captures all adapters.

Replacing the Diskette Drive

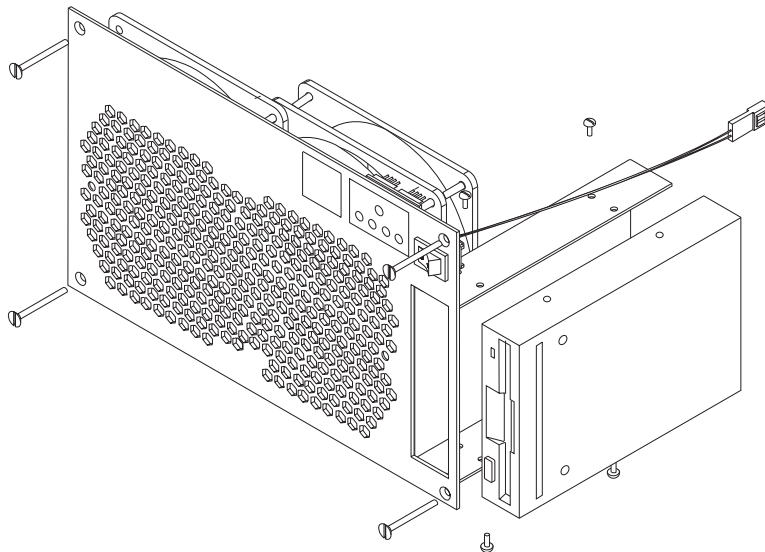
1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Disconnect the following cables.

- Signal and power cables to the diskette drive
- LED cables at the LED board
- On/off switch cable
- Fan power cables

If you have the fan sense feature, disconnect the fan-sense power cable at the power-supply connector and the processor-fan connector at the processor fan.

Note: Make sure that the fan power cables are through the front card guide.

4. Remove the four mounting screws for the front panel. Then remove the front panel from the system unit.



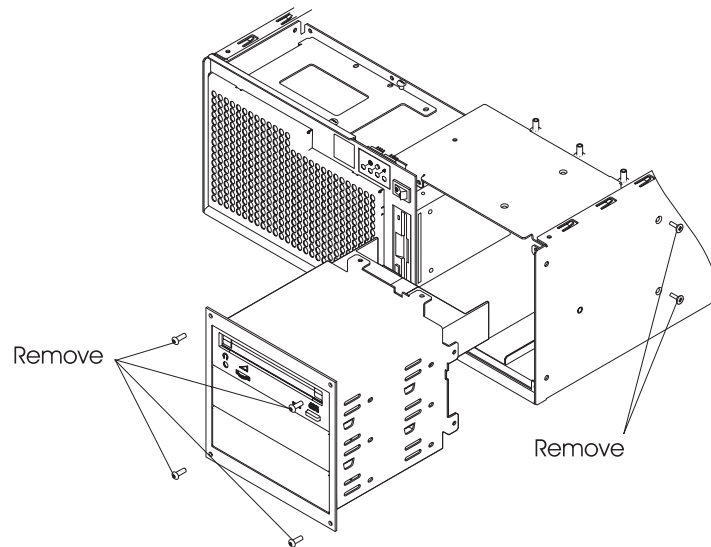
5. Remove the diskette drive from the bracket, then install the new drive in the bracket.

When reassembling the system unit, reverse these steps.

Replacing a Drive in the Drive Cage

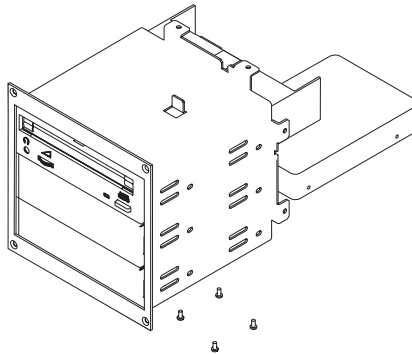
Use these instructions to replace a drive in the drive cage.

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 3-3).
3. Disconnect the signal and power cables to all drives in the drive cage.
4. Remove the cage-retaining screws for the drive cage. Then slide the drive cage forward and out of the system unit.

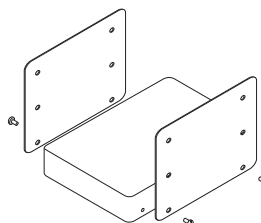


5. If you are replacing a 3.5-inch drive, do the following:

- a. With the drive cage on a clean, static-free work area, remove the screws on the bottom of the drive cage. Then remove the hard drive from the cage (up to three drives could be connected together).

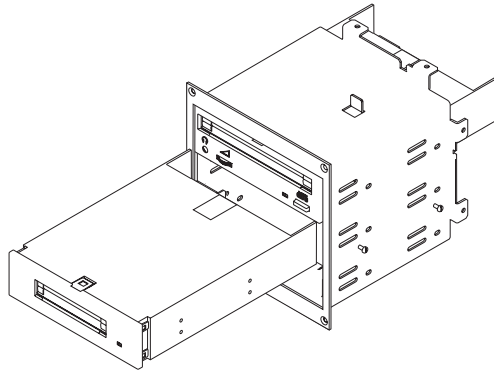


- b. If the drive is attached to the drive-mounting brackets, remove the drive from the mounting bracket.

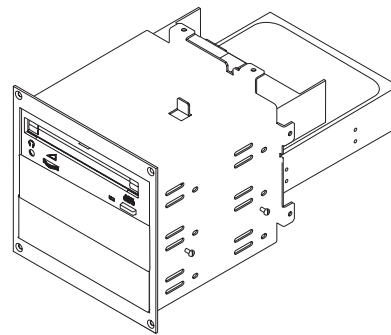


6. If you are replacing a 5.25-inch drive, do the following:

Remove the drive from the drive cage as shown. If required, transfer any mounting hardware to the new drive, with the connectors to the rear of the system unit.



Removable Media Drive



All Other Drives

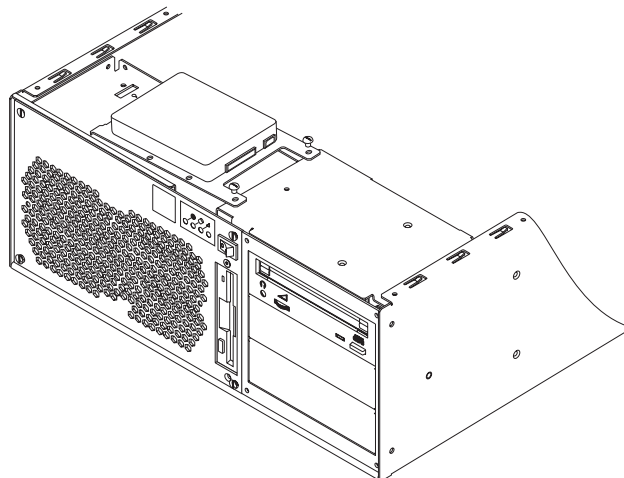
7. Set any jumpers, switches, or terminators on the new drive just as they were set on the old drive.
8. Slide the new drive into position between the brackets with the connector to the rear and install the four mounting screws.

When reassembling the system unit, reverse these steps.

Replacing a Hard Drive in the Alternative Drive Bay

Use the following procedure to replace a hard drive in the alternative drive bay, which is located on the front cross-member of the chassis.

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Disconnect the power and signal cables from the hard disk drive.
4. Remove the two mounting screws and slide the drive toward the drive cage. Then remove the assembly from the chassis and place it on a flat surface.



5. Remove the mounting plate from the drive and install it on the new drive.
6. Set any jumpers, switches, or terminators on the new drive just as they were set on the old drive.

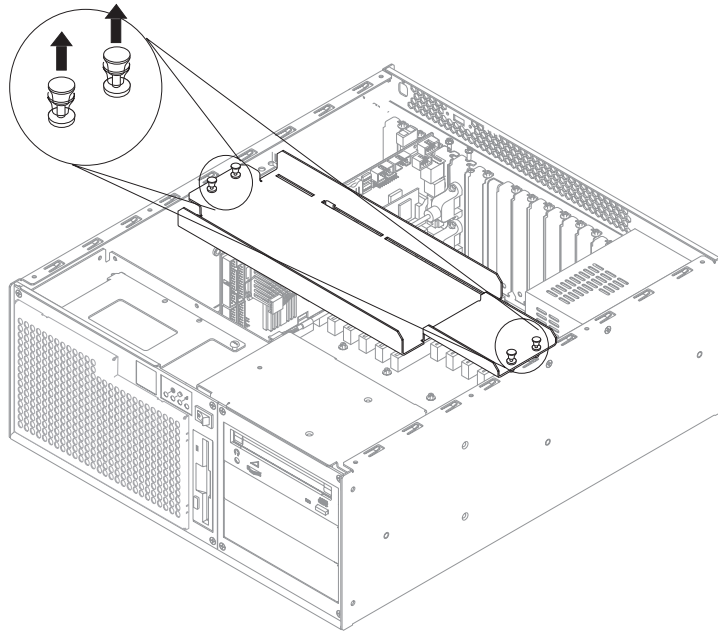
When reassembling the system unit, reverse these steps.

Removing and Replacing the Power Supply

CAUTION:

Never remove the cover on the power supply. If you have a problem with the power supply, you must replace the power supply or have it serviced by a qualified technician.

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Release both latches, then remove the card hold-down bracket.



4. Disconnect the following cables
 - Power cables to all drives (diskette, hard disk, CD-ROM)
 - Power cables to the backplane
 - On/off switch cable
5. Remove the four screws that secure the power supply to the rear chassis.
6. Slide the power supply forward slightly and lift it out of the system unit.

When reassembling the system unit, reverse these steps. All connectors from the power supply are keyed and can be attached only one way.

Removing and Replacing a Fan

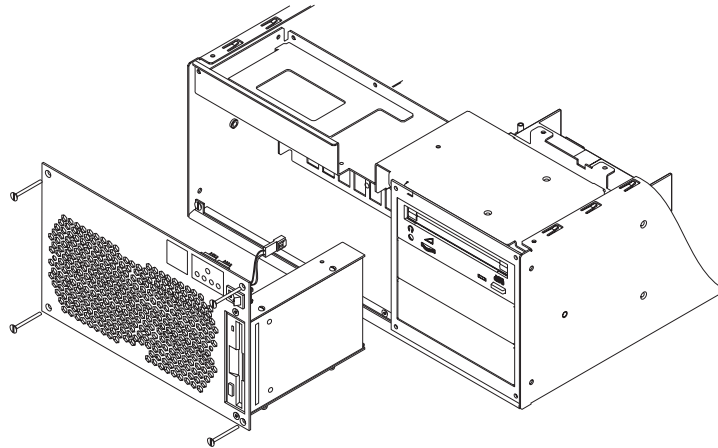
1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Disconnect the following cables.

- Signal and power cables to the diskette drive
- LED cables at the LED board
- On/off switch cable
- Fan power cables

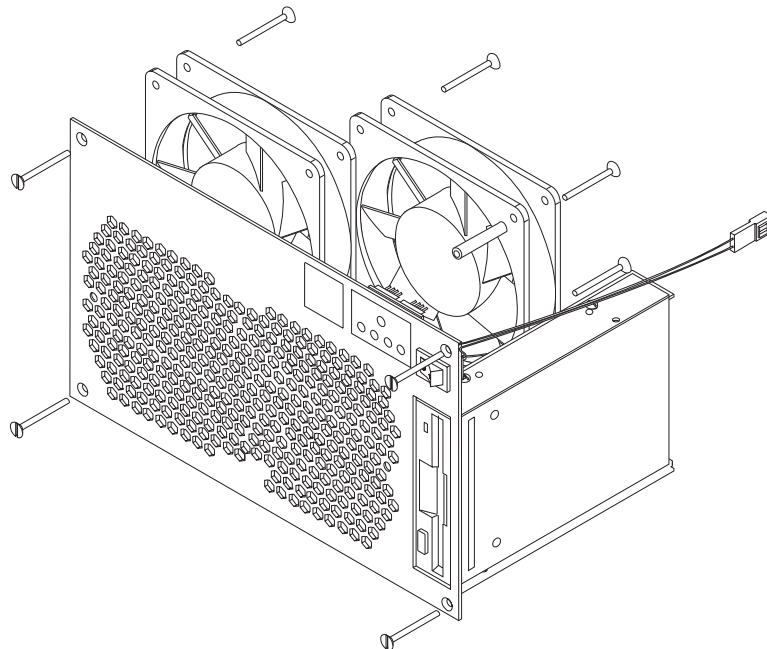
If you have the fan sense feature, disconnect the fan-sense power cable at the power-supply connector and the processor-fan connector at the processor fan.

Note: Make sure that the fan power cables are through the front card guide.

4. Remove the four mounting screws for the front panel. Then remove the front panel from the system unit.



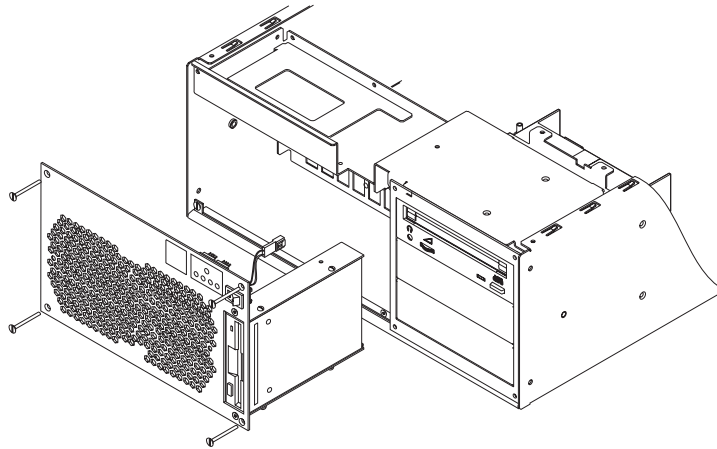
5. Remove the fan mounting screws and install the new fan.



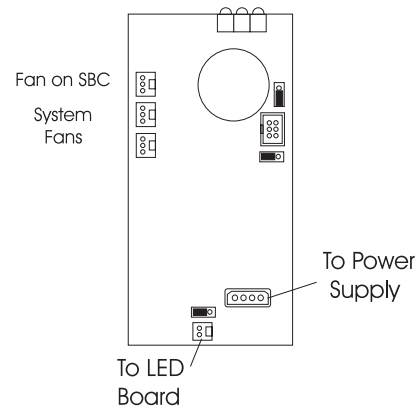
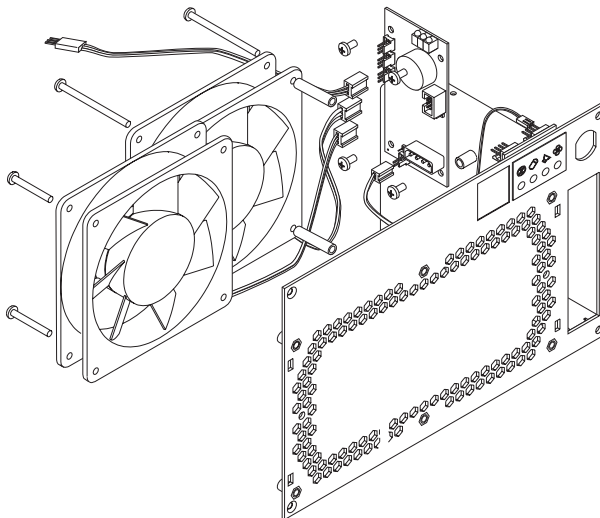
When reassembling the system unit, reverse these steps.

Removing and Replacing the Fan Sense Board

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Disconnect the following cables.
 - Signal and power cables to the diskette drive
 - LED cables at the LED board
 - On/off switch cable
 - Fan-sense power cable at the power supply
 - Processor-fan power cable at the processor
4. Remove the four mounting screws for the front panel. Then remove the front panel from the system unit.



5. Remove the fan mounting screws; then remove the fans.



6. Disconnect all cables from the fan sense board. Set the jumpers on the new board to match the old settings, then replace the board. Reconnect the cables as shown.

When reassembling the system unit, reverse these steps.

Removing and Replacing the LED Assembly

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Disconnect the LED connectors at the LED board.
4. Remove the screw from the LED board and replace the LED board.

When reassembling the system unit, reverse these steps.

Removing and Replacing the Power Switch

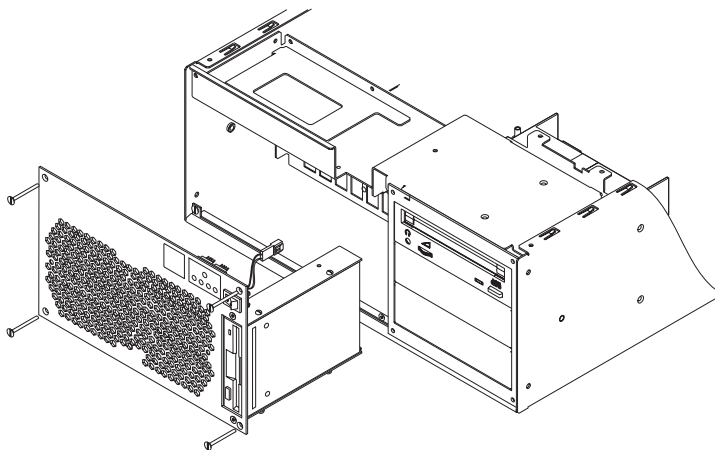
1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Disconnect the following cables.

- Signal and power cables to the diskette drive
- LED cables at the LED board
- On/off switch cable
- Fan power cables

If you have the fan sense feature, disconnect the fan-sense power cable at the power-supply connector and the processor-fan connector at the processor fan.

Note: Make sure that the fan power cables are through the front card guide.

4. Remove the four mounting screws for the front panel. Then remove the front panel from the system unit.



5. Press the retaining clips on each side of the on/off switch and slide the switch out of the front panel.
6. Install the new switch.

When reassembling the system unit, reverse these steps.

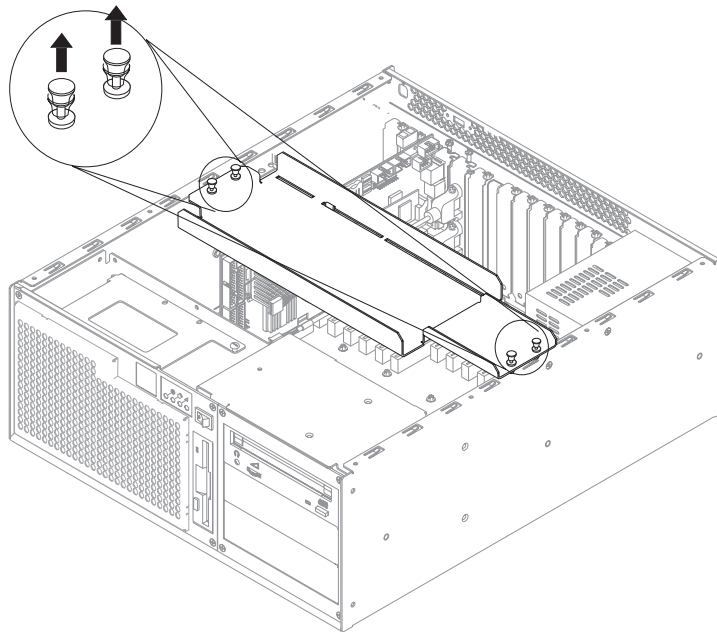
Removing and Replacing the SBC

The SBC FRU consists of the SBC and a thermal pad.

Before You Begin

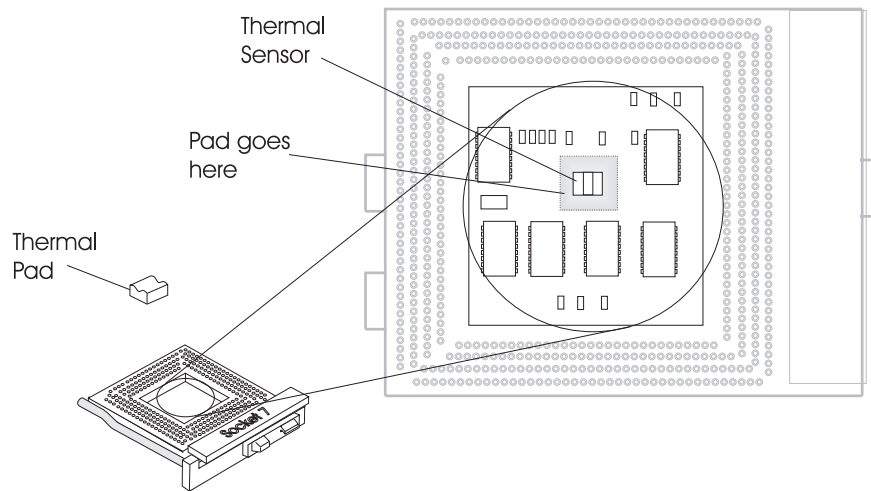
- Make sure the latest level of BIOS is installed on the SBC. A down-level BIOS can cause false errors and unnecessary replacement of the SBC.
- If the new SBC does not correct the problem, reinstall the options on the old SBC, reinstall the old SBC, then replace the processor.

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Remove the card hold-down bracket.

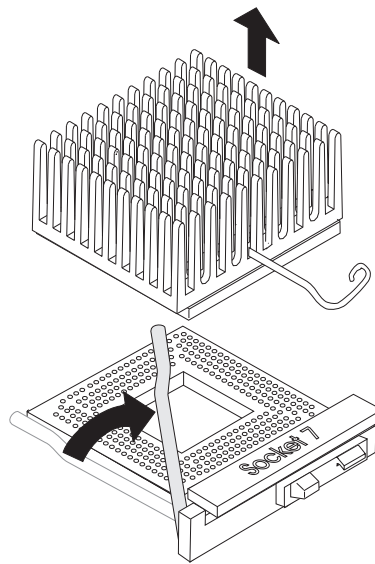


4. Disconnect all cables from the SBC.
5. Remove the screw on the retaining bracket for the SBC.
6. Lift the SBC straight up and out of the system unit.

7. Place the new SBC on a clean, static-free work area. Then remove the protective film from the thermal pad and attach the thermal pad to the thermal sensor as shown.

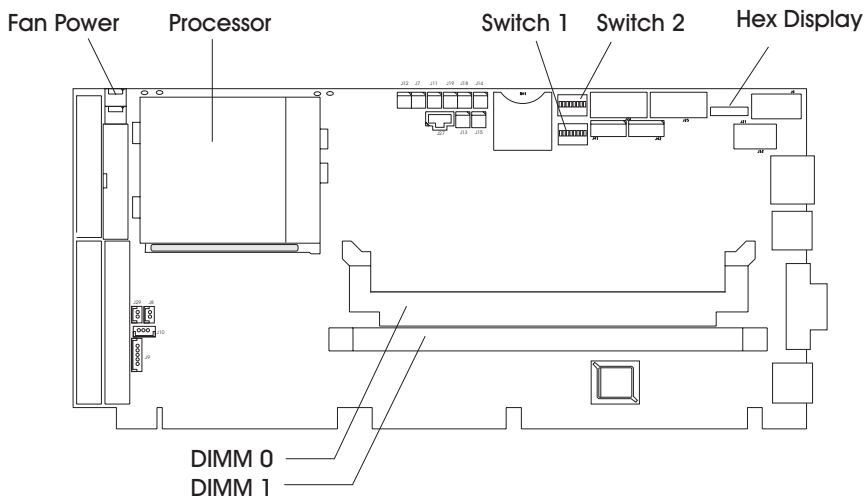


8. Release the heat-sink clip and move the locking lever on the processor socket to the upright position. If the heat sink has a fan attached, disconnect the fan power connector; then remove the processor and heat sink together as shown.

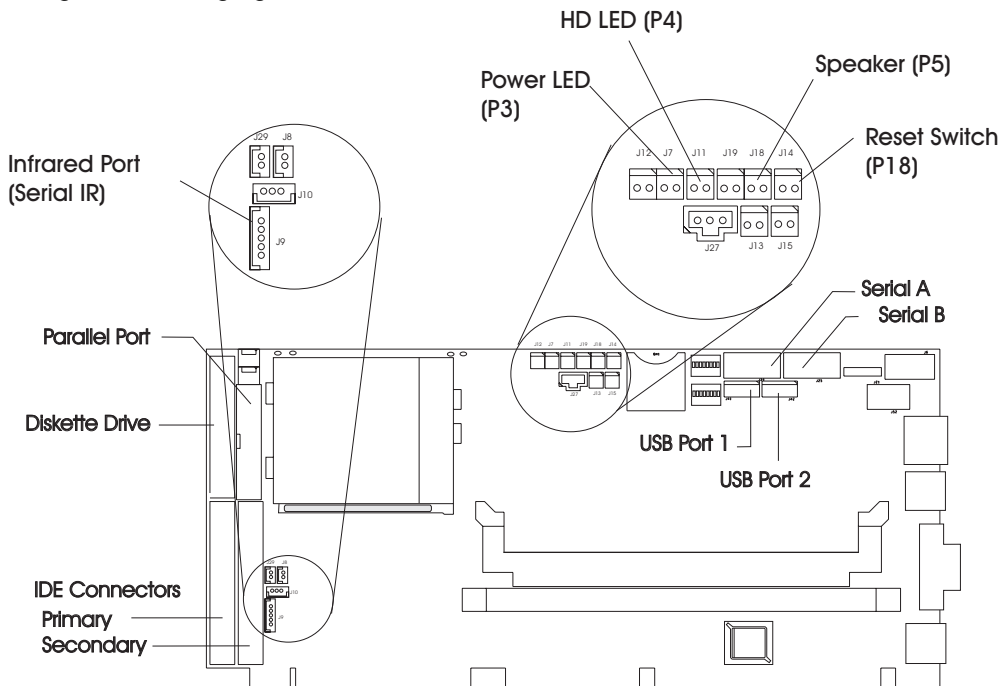


9. Install the processor and heat sink and other options on the new SBC. If the heat sink has a fan attached, connect the fan power connector.

10. Set the configuration switches to the same as those on the SBC you removed. Use the following figure as a check list.



11. Install the new SBC in the system unit. Make sure it is fully seated in the connector.
12. Reinstall the screw in the retaining bracket.
13. Using the following figure, reconnect the cables to the SBC.



14. Reinstall the cover and reconnect all external cables.
15. Use the Flash Update program to construct VPD and, if necessary, update flash. See "Downloading System Support Programs and BIOS Updates," "Vital Product Data," and "Flash (BIOS/VPD) Update Procedure" on page 7-2.

Replacing the Processor

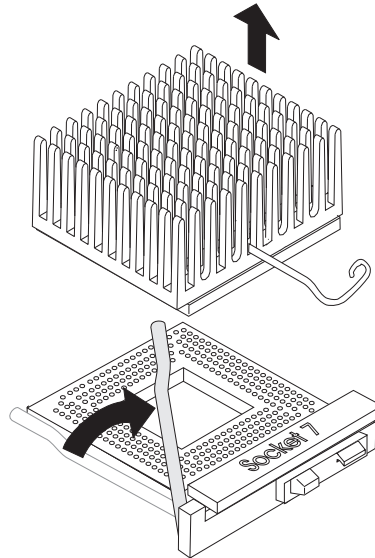
When installing a new processor, you need to make sure there is a good thermal bond between the processor and heat sink. The FRU package comes with the following parts:

- Processor
- Heat sink or heat sink with fan
- Heat-sink clip
- Thermal tape or grease
- Thermal pad

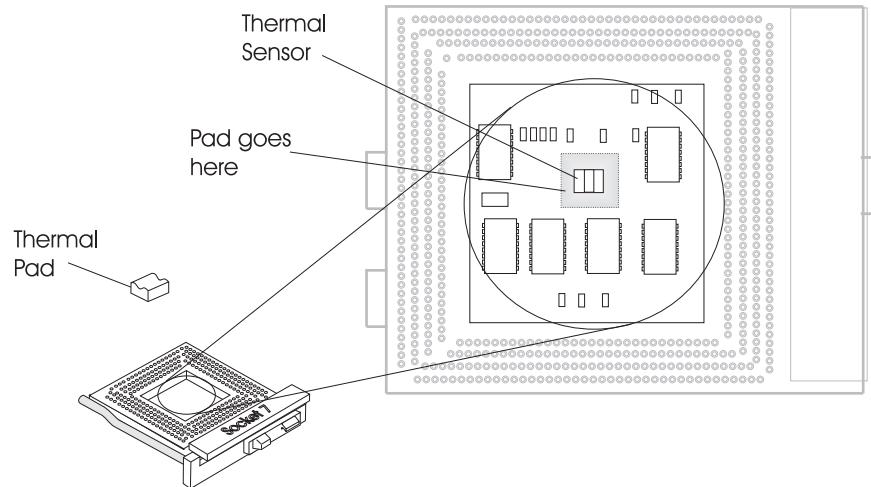
Upgrading the Processor

If you are changing the processor speed or type, refer to “SBC Settings” on page C-7 for information on configuring the SBC to the processor.

1. With the SBC on a clean, static-free work area, release the heat-sink clip and move the locking lever on the processor socket to the upright position. If the heat sink has a fan attached, disconnect the fan power connector; then remove the processor and heat sink together as shown.

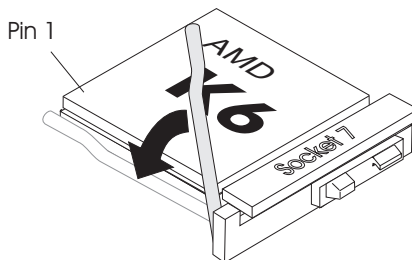


2. Make sure the thermal pad is in place on the SBC. If the thermal pad is not over the thermal sensor, remove the protective film from the new thermal pad (the smaller square shipped with the replacement processor) and attach the pad to the thermal sensor as shown.



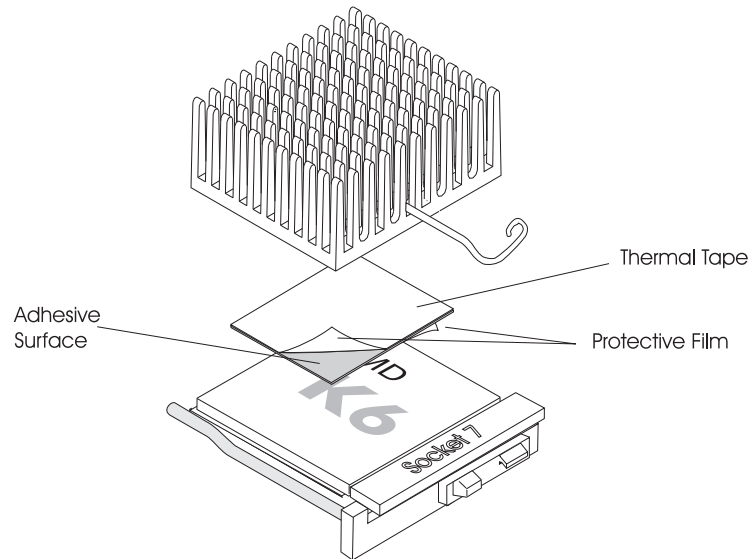
3. Locate pin 1 on the processor (pin 1 is indicated by a cut corner on the chip). Using pin 1 as a reference, align the processor and socket, as shown, and install the new processor in the socket. Then, move the locking lever into the closed position.

Note: If the processor does not fit into the socket easily, check the processor for bent pins.



4. Apply either the thermal tape or thermal grease:

- If you have thermal tape, remove the protective film from the clear side of the thermal tape and attach the thermal tape to the heat sink. Then remove the blue protective film from the other side of the thermal tape.
- If you have thermal grease, apply the grease to the bottom side of the heat sink.

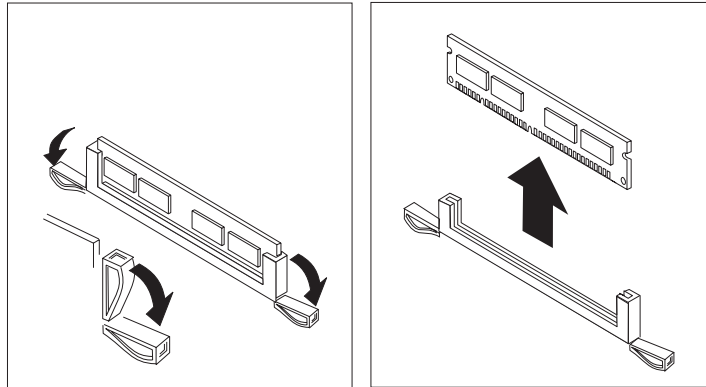


5. Install the heat sink and heat sink clip. Make sure that the clip is fully seated on both sides. If the heat sink has a fan attached, connect the fan power connector.
6. Reinstall the SBC and run the diagnostic tests.

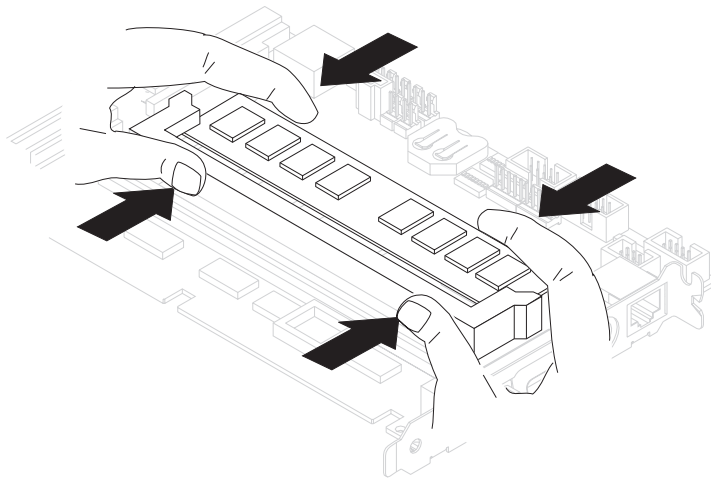
Replacing Memory in Bank 0

If you are replacing memory in Bank 1 (the lower connector), go to “Replacing Memory in Bank 1” on page 7-51.

1. With the SBC on a clean, static-free work area, push outward against the release levers at both ends of the DIMM connector. The DIMM will rise about 0.25 inch.



2. Lift the DIMM out of the connector.
3. Align the centering notches on the new DIMM with the keys in the connector (the keys are in the center slot of the connector). Then insert the DIMM into the connector and squeeze the DIMM into the connector as shown. The release levers will close when the DIMM is fully seated in the connector.

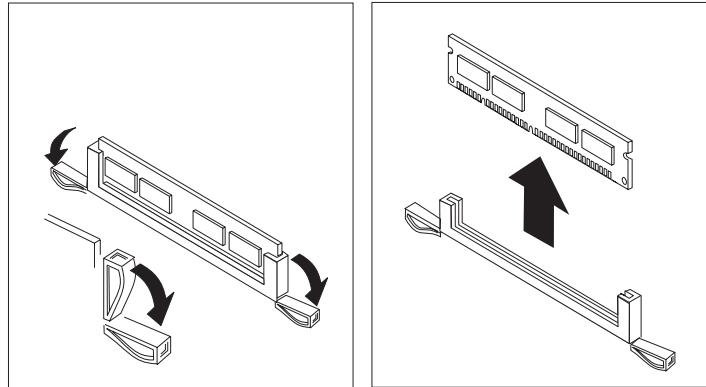


4. Reinstall the SBC and run the diagnostic tests.

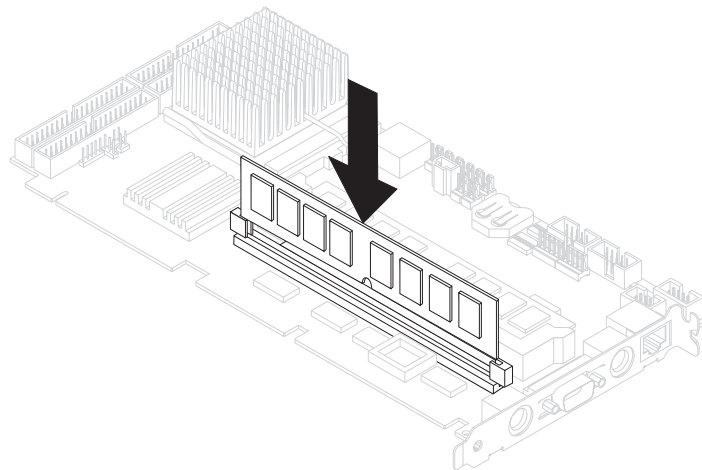
Replacing Memory in Bank 1

If you are replacing memory in Bank 0 (the upper connector), go to “Replacing Memory in Bank 0” on page 7-50.

1. With the SBC on a clean, static-free work area, push outward against the release levers at both ends of the DIMM connector. The DIMM will rise about 0.25 inch.



2. Lift the DIMM out of the connector.
3. Align the centering notches on the new DIMM with the keys in the connector (the keys are in the center slot of the connector). Then insert the DIMM into the connector and press the DIMM into the connector as shown. The release levers will close when the DIMM is fully seated in the connector.

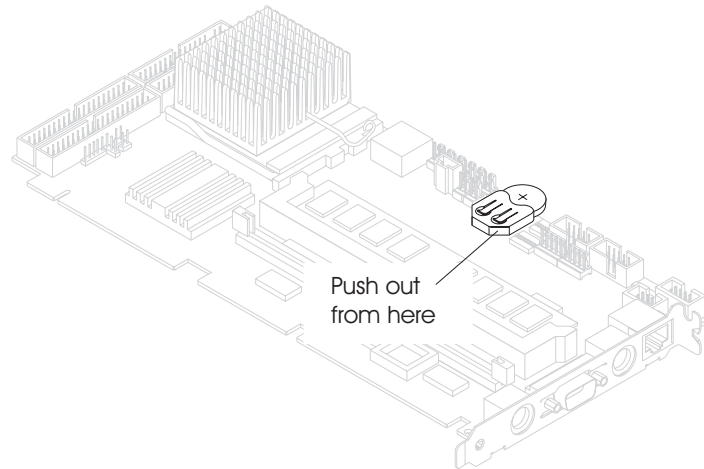


4. Reinstall the SBC and run the diagnostic tests.

Replacing the Backup Battery

When replacing the battery, use only the approved part (see page 8-2 for the correct part number). Use the following procedure to change the battery.

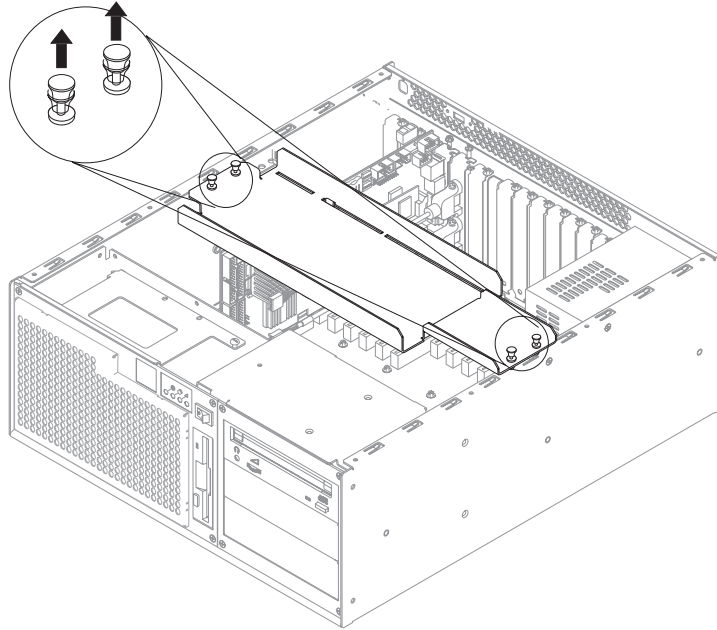
1. With the SBC on a clean, static-free work area, push the battery out of the battery clip.



2. Insert the new battery into the clip.
3. Reinstall the SBC, covers, and all external cables you disconnected.
4. Run Setup to restore system configuration.

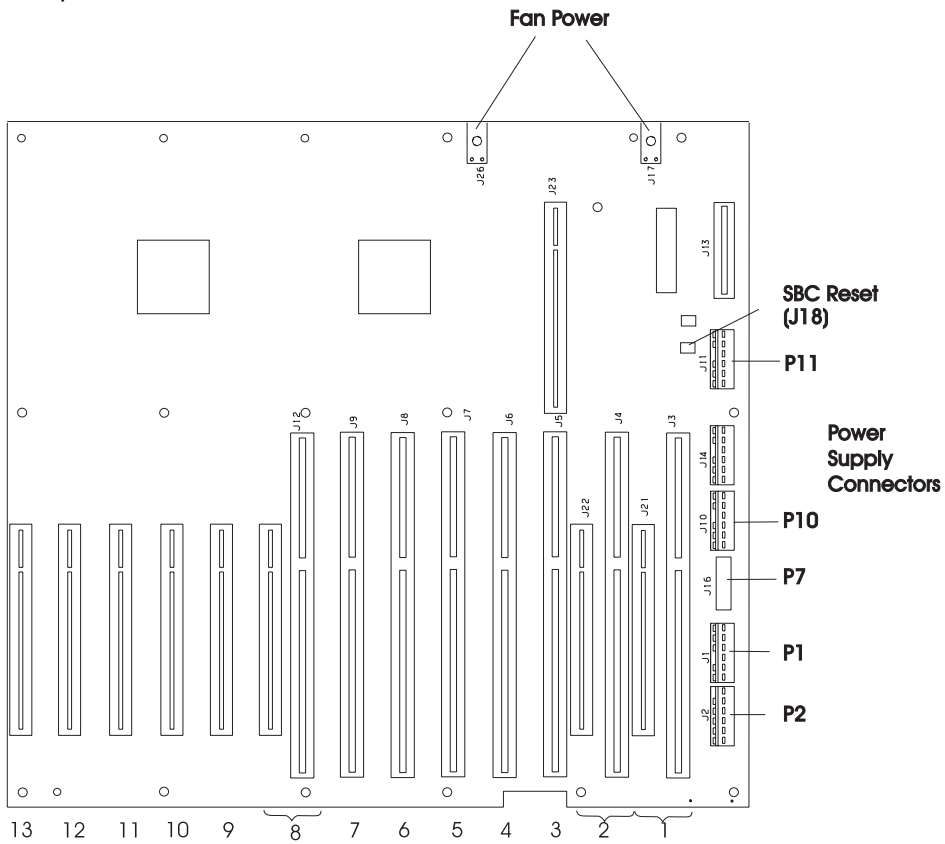
Removing and Replacing the Backplane

1. Remove power from the computer and disconnect all cables (refer to page 7-35).
2. Remove the cover (refer to page 7-35).
3. Remove the card hold-down bracket.



4. Remove all adapters and the SBC from the backplane.
5. Disconnect the cables that plug into the backplane (connectors J1, J2, J10, J11, J16, J17, J18, and J26).

6. Remove the screws securing the backplane to the system unit; then remove the backplane. The backplane has 17 screws.



7. When reassembling the system unit, reverse these steps.