7131 Model 405
SSA Multi-Storage Tower

Service Guide
Third Edition (April 1997)

Make sure you are using the proper edition for the level of the product.

Order publications through your IBM representative or the IBM branch serving your locality. If you live in the United States, Puerto Rico, or Guam, you can order publications through the IBM Software Manufacturing Solutions at 800+879-2755. Publications are not stocked at the address given below.

A form for reader comments is provided at the back of this publication. If the form has been removed, you can mail your comments to:

Attn Department 542
IDCLERK
IBM Corporation
3605 Highway 52 N
Rochester, MN 55901-9986 USA

or you can fax your comments to:

United States and Canada: 800+937-3430
Other countries: (+1)+507+253-5192

If you have access to Internet, you can send your comments electronically to IDCLERK@RCHVMW2.VNET.IBM.COM; IBMMAIL, to IBMMAIL(USIB56RZ).

When you send information to IBM, you grant IBM a non-exclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you or restricting your use of it.

Copyright International Business Machines Corporation 1995, 1996, 1997. All rights reserved.

Note to U.S. Government Users — Documentation related to restricted rights — Use, duplication or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.
## Contents

**Notices** .................................................. vii
- Safety and Environmental Notices ........................................ vii
  - Danger Notices ................................................................ vii
  - Caution Notices ................................................................ viii
  - Attention Notices ................................................................ viii
  - Product Recycling ............................................................... viii
  - Product Disposal ................................................................ viii
  - Environmental Design ........................................................... ix
- Electronic Emission Notices ................................................. ix
**Trademarks** ........................................................ x

**About This Guide** .................................................... xi
**Who Should Use This Guide** ........................................... xi
**Related Publications** ..................................................... xii

**Chapter 1. Reference Information** ................................. 1-1
- 7131 Storage Tower .............................................................. 1-1
  - Connector Locations ............................................................. 1-1
  - Power Switch and Power Light ............................................... 1-2
  - Slots ............................................................................. 1-3
  - Disk Drive Module .............................................................. 1-3
  - Dummy Disk Drive Module .................................................... 1-3
  - Disk Drive Module Lights and Latch .................................... 1-4
  - Power Supply .................................................................... 1-5
  - Voltage Selection Switch .................................................... 1-6
  - Line Cord ........................................................................ 1-7
  - Fan ................................................................................ 1-7
  - Internal SSA Cables ........................................................... 1-8
  - Backplane Assembly ........................................................... 1-8
  - 7131 Storage Tower Configurations .................................... 1-9
- 7131 Storage Tower Specifications ....................................... 1-10
  - Physical Specifications .......................................................... 1-10
**Location Code Format** .................................................... 1-11
**SSA Loops and Links** ..................................................... 1-12
  - Disk Drive Module Strings ..................................................... 1-12
  - The SSA Adapter ................................................................. 1-13
  - Pdisks, Hdisks, and Disk Drive Module Identification .............. 1-14
  - Rules for SSA Loops ............................................................ 1-14
  - Loops and Data Paths ............................................................. 1-15
**SSA Service Aids** ........................................................ 1-16
  - The Identify Function .......................................................... 1-16
  - Starting the SSA Service Aids ................................................ 1-17
  - Set Service Mode Service Aid ............................................... 1-18
  - Link Verification Service Aid ............................................... 1-19
  - Configuration Verification Service Aid .................................. 1-20
  - Format Disk Service Aid ....................................................... 1-21
  - Certify Disk Service Aid ....................................................... 1-22
**Service Aid Error Codes** ................................................. 1-28
# Using the Service Aids for SSA-Link Problem Determination

- 1-28

# Finding the Physical Location of a Device

- 1-32
  - Finding the Device When Service Aids Are Available
  - Finding the Device When No Service Aids Are Available

# Microcode Maintenance

- 1-33

# Vital Product Data (VPD)

- 1-34

## Chapter 2. Problem Determination Procedures

- 2-1

### Disk Drive Module Power-On Self-Tests (POSTs)

- 2-1

### Adapter Power-On Self-Tests (POSTs)

- 2-2

### Service Request Numbers (SRNs)

- 2-3
  - The SRN Table
  - Using the SRN Table
  - Software and Microcode Errors
  - FRU Names Used in the SRN Table

### SSA Loop Configurations That Are Not Valid

- 2-10

### Maintenance Analysis Procedures (MAPs)

- 2-11
  - How to Use These MAPs

#### MAP 2010: 7131 Storage Tower–Start

- 2-12

#### MAP 2320: 7131 Storage Tower–SSA Link

- 2-16

#### MAP 2321: 7131 Storage Tower–Internal Link

- 2-22

#### MAP 2323: 7131 Storage Tower–Intermittent Link Error

- 2-24

#### MAP 2410: 7131 Storage Tower–Repair Verification

- 2-26

## Chapter 3. Removal and Replacement Procedures

- 3-1

### Handling ESD-Sensitive Parts

- 3-2

### Front Cover

- 3-3
  - Front Cover Removal
  - Front Cover Replacement

### Top Cover

- 3-4
  - Top Cover Removal
  - Top Cover Replacement

### External SSA Cable

- 3-5
  - External SSA Cable Removal
  - External SSA Cable Replacement

### Line Cord

- 3-7
  - Line Cord Removal
  - Line Cord Replacement

### Internal SSA Cable

- 3-9
  - Internal SSA Cable Removal
  - Internal SSA Cable Replacement

### Dummy Disk Drive Module

- 3-11
  - Dummy Disk Drive Module Removal
  - Dummy Disk Drive Module Replacement

### Disk Drive Module

- 3-12
  - Disk Drive Module Removal
  - Disk Drive Module Replacement

### Backplane Assembly

- 3-16
  - Backplane Removal
  - Backplane Replacement
Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of the intellectual property rights of IBM may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594, U.S.A.

This publication could contain technical inaccuracies or typographical errors.

This publication may refer to products that are announced but not currently available in your country. This publication may also refer to products that have not been announced in your country. IBM makes no commitment to make available any unannounced products referred to herein. The final decision to announce any product is based on IBM’s business and technical judgment.

The drawings and specifications contained herein shall not be reproduced in whole or in part without the written permission of IBM.

IBM has prepared this publication for use by hardware service representatives in the maintenance or repair of the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

Safety and Environmental Notices

Note: The safety information manual shipped with your 7131 SSA Multi-Storage Tower either the External Devices Safety Information, SA26-7003 or the Translated Safety Notices for External Storage Devices, SA26-7197, contains a translation of the safety notices used in this publication. Use the reference numbers in parentheses, for example (RSFTD201), at the end of each danger notice to refer to the translated notice.

Danger Notices

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people.

DANGER

To prevent a possible electrical shock during an electrical storm, do not connect or disconnect cables or station protectors for communications lines, display stations, printers, or telephones. (RSFTD003)
DANGER

To prevent a possible electrical shock from touching two surfaces with different electrical grounds, use one hand, when possible, to connect or disconnect signal cables. (RSFTD004)

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)

DANGER

To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device. (RSFTD203)

DANGER

To prevent a possible electrical shock when installing the device, ensure that the power cord for that device is unplugged before installing signal cables. (RSFTD204)

Caution Notices

A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition.

Attention Notices

An attention notice indicates the possibility of damage to a program, device, system, or data.

Product Recycling

This unit contains recyclable materials. These materials should be recycled where facilities are available and according to local regulations. In some areas IBM will provide a product take-back program that ensures proper handling of the product. Contact your IBM representative for more information.

Product Disposal

This unit may contain batteries. These batteries must be removed and discarded or recycled according to local regulations and where facilities exist. Specific information per battery type will be referenced throughout the manual where applicable.
Environmental Design

The environmental efforts that have gone into the design of this unit signifies IBM's commitment to improve the quality of its products and processes. Some of these activities include elimination of the use of CFCs, development of reusable or recyclable packaging, and reductions in manufacturing wastes.

Electronic Emission Notices

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance statement

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Community Compliance Statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

Germany Only: This product is in conformity with the EN55022 class A emission limits. Products in this class are not allowed to be operated within a residential area without a special permit of local PTT authority (ref. GERMAN EMV Law, Nov.92 and regulation 177/93).
Japanese Voluntary Control Council for Interference (VCCI) Statement

This equipment is Class 1 Equipment (information equipment to be used in commercial and industrial districts) which is in conformance with the standard set by Voluntary Control for Interference by Data Processing Equipment and Electronic Office Machines (VCCI) with an aim to prevent radio interference in commercial and industrial districts.

This equipment could cause interference to radio and television receivers when used in and around residential districts.

Please handle the equipment properly according to the instruction manual.

Korean Government Ministry of Communication (MOC) Statement

Please note that this device has been approved for business purpose with regard to electromagnetic interference. If you find this is not suitable for your use, you may exchange it for a non-business purpose one.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

IBM

Other company, product, and service names, which may be denoted by a double asterisk (**), may be trademarks or service marks of others.
About This Guide

This publication contains information to aid the service representative when installing the 7131 Storage Tower, analyzing problems, or exchanging failing parts. The following information is contained in this publication:

- Descriptions of the location and function of the specific parts of the 7131 Storage Tower.
- Specifications of the 7131 Storage Tower.
- A description of the loops and links used with the SSA adapter.
- A description of the SSA service aids.
- Procedures for analyzing and diagnosing problems with the 7131 Storage Tower.
- Procedures for removing and replacing the parts of the 7131 Storage Tower.
- Procedures for inspecting the 7131 Storage Tower for safety concerns.
- A parts diagram and list.
- Power distribution diagrams and line cord descriptions.

Who Should Use This Guide

This publication is intended for use by service representatives who are trained to repair the 7131 SSA Multi-Storage Tower. Store this guide with your system unit maintenance publications.
Related Publications

For additional information, see:

*7131 SSA Multi-Storage Tower Model 405 User’s Guide, GC26-7096*

The safety information manual shipped with your 7131 SSA Multi-Storage Tower either the *External Devices Safety Information, SA26-7003* or the *Translated Safety Notices for External Storage Devices, SA26-7197.* The safety information manual contains a translation of the safety notices used in this publication in to various languages. Use the reference numbers in parentheses, for example (RSFTD201), at the end of each danger notice to refer to the translated notice.

*Electrical Safety for IBM Customer Engineers, S229-8124*

*Common Diagnostics Information Manual, SA23-2765*

*Adapters, Devices, and Cables Information, SA23-2764*
Chapter 1. Reference Information

This chapter provides information about the connector locations, field replaceable units (FRUs), indicator lights, system configurations, and specifications for the 7131 SSA Multi-Storage Tower.

7131 Storage Tower

Figure 1-1 shows the 7131 SSA Multi-Storage Tower.
Connector Locations

The internal and external connector locations for the 7131 Storage Tower are shown in Figure 1-2.

Figure 1-2. Internal and External Connector Locations

Power Switch and Power Light

The 7131 Storage Tower has one operator control, the power switch, which is a pushbutton switch located on the front panel behind the front cover. See Figure 1-3 on page 1-3.

**Power switch**  A pushbutton switch used to set the power On or Off.

**Power light**  The power light on the control panel is on when the power switch is set to On and the power supply is providing power.
Slots

There are five slots that can contain either disk drive modules or dummy disk drive modules. Slot 1 and slot 5 must always contain a disk drive module. Slots 2, 3, and 4 can contain either disk drive modules or dummy disk drive modules. See Figure 1-3.

Disk Drive Module

The disk drive module allows disk drives to be easily installed into or removed from a slot. The disk drive module is available in 1.1 GB, 2.2 GB, 4.5 GB, and 9.1 GB.

The latch locks the disk drive module into the slot to maintain connection with the backplane. See Figure 1-3. The carrier is locked into the backplane when the latch is in the horizontal position. The disk drive module is unlocked when the latch is pointing down.

Dummy Disk Drive Module

A dummy disk drive module must be installed in a slot that does not contain a disk drive module. This maintains the SSA loop through the 7131 Storage Tower.
Disk Drive Module Lights and Latch

Figure 1-4 on page 1-5 shows the location of the lights and the latch on the disk drive module.

**Power light**  This light (green) is on when dc voltage is present and within the specified limits.

**Ready light**  This light (green) indicates the following conditions:

<table>
<thead>
<tr>
<th>Status of Light</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>The SSA loop is open or inactive on both sides of this disk drive module. Possible causes are:</td>
</tr>
<tr>
<td></td>
<td>The SSA loop is open on both sides of this disk drive module due to missing or disconnected disk drive modules, dummy disk drive modules, or SSA adapters.</td>
</tr>
<tr>
<td></td>
<td>The SSA loop is open on both sides of this disk drive module due to inactive disk drive modules, or SSA adapters.</td>
</tr>
<tr>
<td></td>
<td>An SSA adapter that is in the loop is inactive.</td>
</tr>
<tr>
<td></td>
<td>A power-on self-test (POST) is running on this disk drive module.</td>
</tr>
<tr>
<td>Permanently on</td>
<td>Both SSA links are active, and the disk drive module is ready to accept commands from the using system. The ready light does not show that the motor of the disk drive module is spinning. The module might be waiting for a Motor Start command or might have received a Motor Stop command.</td>
</tr>
<tr>
<td>Slow flash (2 seconds on, 2 seconds off)</td>
<td>Only one SSA link is active.</td>
</tr>
<tr>
<td>Fast flash (5 times per second)</td>
<td>The disk drive module is active with a command in progress.</td>
</tr>
</tbody>
</table>

**Check light**  This light (amber) indicates the following conditions:

<table>
<thead>
<tr>
<th>Status of Light</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Normal operating condition.</td>
</tr>
<tr>
<td>Permanently on</td>
<td>One of the following conditions exists:</td>
</tr>
<tr>
<td></td>
<td>An unrecoverable error that prevents the normal operation of the SSA link has been detected.</td>
</tr>
<tr>
<td></td>
<td>The power-on self-tests (POSTs) are running or have failed. The light comes on as soon as the disk drive module is turned on, and it goes off when the POSTs are complete. If the light remains on for longer than 1 minute after the disk drive module is turned on, the POSTs have failed.</td>
</tr>
<tr>
<td></td>
<td>Neither SSA link is active.</td>
</tr>
<tr>
<td></td>
<td>The disk drive module is in Service Mode, and can be removed from the 7131 Storage Tower.</td>
</tr>
<tr>
<td>Flashing</td>
<td>The check light has been set by a service aid to identify the position of a particular disk drive module.</td>
</tr>
</tbody>
</table>
Power Supply

The power supply is mounted at the top in the back of the 7131 Storage Tower. See Figure 1-5. The power supply in the 7131 Storage Tower is not auto-ranging.
Voltage Selection Switch

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

The voltage selection switch is a two-position switch on the power supply. See Figure 1-6. The two settings are 115 V ac or 230 V ac. The voltage selection switch must be set to match the input voltage at the power source before connecting the line cord. The 7131 Storage Tower will not operate if the voltage selection switch does not match the wall power source. See “7131 Storage Tower Specifications” on page 1-10 for the supported voltage ranges for each switch setting. Power supply damage may occur if the 7131 Storage Tower is connected to the wrong voltage.

Figure 1-6. Voltage Selection Switch
**Line Cord**

The line cord connects directly to the power supply.

**Fan**

Cooling is provided by a fan mounted at the lower back of the 7131 Storage Tower (behind the grill in Figure 1-7).

*Figure 1-7. Rear of the 7131 Storage Tower*
**Internal SSA Cables**

The internal serial storage architecture (SSA) cables are mounted to the rear frame. See Figure 1-8. The internal SSA cables connect the external SSA cables to the backplane assembly.

The 7131 Storage Tower attaches to the host system SSA cabling.

![Figure 1-8. Internal SSA Cable](image)

**Backplane Assembly**

The backplane card assembly is a distribution board that connects the power supply cables and internal SSA cable to the 5 disk drive module slots. See Figure 1-9.

![Figure 1-9. Backplane Assembly](image)
7131 Storage Tower Configurations

The minimum 7131 Storage Tower configuration consists of two disk drive modules. A disk drive module must always be installed in slot 1 and slot 5. See Figure 1-10.

In its minimum configuration, slots 2, 3, and 4 each contain a dummy disk drive module.

In its maximum configuration, all five slots contain disk drive modules. In all configurations, slots 1 and 5 must contain a disk drive module, and slots 2, 3, and 4 must contain a disk drive module or dummy disk drive module in order to complete the SSA loop through the 7131 Storage Tower.

Figure 1-10. 7131 Storage Tower Configuration
7131 Storage Tower Specifications

This section provides the physical specifications for the 7131 Storage Tower and the requirements for its operating environment.

Physical Specifications

When installing more than one 7131 Storage Tower, a clearance of 2.5 cm (1 in.) is required between the 7131 Storage Towers to meet cooling requirements. When installing one 7131 Storage Tower, a clearance of 2.5 cm (1 in.) is required on the hinge side to lift the cover.

Dimensions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>407 mm (16 in.)</td>
</tr>
<tr>
<td>Depth</td>
<td>483 mm (19 in.)</td>
</tr>
<tr>
<td>Width</td>
<td>197 mm (7.75 in.)</td>
</tr>
<tr>
<td>Weight</td>
<td>20 kg (44 lb)</td>
</tr>
</tbody>
</table>

Power

<table>
<thead>
<tr>
<th></th>
<th>115 V ac</th>
<th>230 V ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>kV-A</td>
<td>0.76</td>
<td>0.96</td>
</tr>
<tr>
<td>Range V ac</td>
<td>90–137</td>
<td>180–265</td>
</tr>
<tr>
<td>Frequency</td>
<td>47 to 63 Hz</td>
<td>47 to 63 Hz</td>
</tr>
<tr>
<td>Watts</td>
<td>378</td>
<td>480</td>
</tr>
<tr>
<td>Power factor</td>
<td>0.5 minimum</td>
<td>0.5 minimum</td>
</tr>
<tr>
<td>Maximum altitude</td>
<td>2135 m (7000 ft)</td>
<td>2135 m (7000 ft)</td>
</tr>
</tbody>
</table>

Japan Energy Saving Law Data: The machine type and model is 7131 Model 405. Maximum usable storage capacity is 45.5 GB.

<table>
<thead>
<tr>
<th></th>
<th>115 V ac</th>
<th>230 V ac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watts</td>
<td>378</td>
<td>480</td>
</tr>
<tr>
<td>Watts per MB</td>
<td>.008</td>
<td>.010</td>
</tr>
</tbody>
</table>

Temperature Requirements

Operating 16–32°C (60.8–89.6°F)

Relative Humidity Requirements

Operating 20–80%

Wet Bulb Temperature Requirements

Operating 23°C (73.4°F maximum)

Noise Level

LwAu (idling) 5.6 bels
LwAu (operating with 5 drives) 6.0 bels
Location Code Format

Location codes identify the locations of adapters and devices in the using system and their attached sub-systems and devices. These codes are displayed when the diagnostic programs isolate a problem. For information about the location codes that are used by the using system, see the operator guide for the using system.

A B - C D - E F - G H

Always
Always
Always

P = Physical disk drive module
L = Logical disk drive

Adapter position (number of the slot, 1 through 8, containing the SSA adapter)

System I/O bus identifier

Always
Always

The location code shows only the position of the SSA adapter in the using system and the type of device that is attached. Use a service aid to find the location of the device (disk drive module). For more information, see “SSA Service Aids” on page 1-16.
SSA Loops and Links

The disk drive modules of the 7131 Storage Tower are connected through two SSA links to an SSA adapter that is located in the using system. The disk drive modules, SSA links, and SSA adapter are configured in loops. Each loop provides a data path that starts at one connector of the SSA adapter and passes through a link (SSA cable) to the disk drive modules. The path continues through the disk drive modules, then returns through another link to a second connector on the SSA adapter.

Disk Drive Module Strings

In the 7131 Storage Tower, the disk drive modules are arranged in a string of 2, 3, 4, or 5 disk drive modules. This string has its own two SSA connectors. This string can be connected through external SSA cables to a pair of connectors on the SSA adapter to make an SSA loop. (The SSA cables provide the SSA links.) A 7131 Storage Tower can also be connected to other 7131 Storage Towers to make bigger loops.

Figure 1-11 shows the relationships between the SSA connectors and the disk drive module string in a 7131 Storage Tower.
The SSA Adapter

The 7131 Storage Tower can be attached to an SSA adapter. See Figure 1-12. The adapter card has four SSA connectors that are arranged in two pairs. Connectors A1 and A2 are one pair; connectors B1 and B2 are the other pair.

The SSA links must be configured as loops. Each loop is connected to a pair of connectors at the SSA adapter card. These connectors must be a valid pair (that is, A1 and A2, or B1 and B2); otherwise, the disk drive modules on the loop are not fully configured, and the diagnostics fail. Operations to all the disk drive modules on a particular loop can continue if that loop breaks at any one point.

Each pair of connectors has a green light that indicates the operational status of its related loop:

<table>
<thead>
<tr>
<th>Status of Light</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Both SSA connectors are inactive. If disk drive modules are connected to these connectors, either those modules are failing, or their SSA links have not been enabled.</td>
</tr>
<tr>
<td>Permanently on</td>
<td>Both SSA links are active (normal operating condition).</td>
</tr>
<tr>
<td>Slow Flash</td>
<td>Only one SSA link is active.</td>
</tr>
</tbody>
</table>

Figure 1-12. SSA Adapter Card
Pdisks, Hdisks, and Disk Drive Module Identification

The physical disk drives (pdisks) in an SSA subsystem can be configured as logical units (LUNs). A LUN is also known as an hdisk, and can consist of one or more physical disk drives. An hdisk in an SSA subsystem might, therefore, consist of one pdisk or several pdisks.

For the 7131 Storage Tower, the configuration software also allocates an identification (hdisk and pdisk number) to each disk drive module during the configuration of the SSA link. The disk drive modules do not have fixed physical addresses.

The configuration software first recognizes the disk drive module by the machine-readable serial number that is written on the disk. Then, it assigns an identification that is related to the position of the disk drive-module in the SSA string. After configuration, the disk drive module always has the same identification. It can be moved to any position on the SSA link, but can always be found by the software.

Service actions are always related to physical disk drives. For this reason, errors that occur on SSA disk drives are always logged against the physical disk drive (pdisk).

The numeric identifier of pdisks, hdisks, and disk drive module slots of the 7131 Storage Tower are not related to each other. For example, pdisk1 is not necessarily installed in slot 1 of the 7131 Storage Tower.

The disk drive module serial number, on the label on the front of the carrier, is also displayed by the service aids. It is the last eight digits of the drives IEEE SSA unique ID, which is stored on the drives electronics card.

Rules for SSA Loops

The following are rules for SSA loops.

- Each SSA loop must be connected to a valid pair of connectors on the SSA adapter (that is, either connectors A1 and A2, or connectors B1 and B2).
- Only one pair of adapter connectors can be connected to a particular SSA loop.
- A maximum of 48 disk drive modules can be connected in a particular SSA loop.
- A maximum of three dummy disk drive modules can be connected next to each other in a particular SSA loop.
- A maximum of two adapter-connector pairs can be connected in a particular SSA loop.
- A using system can have a maximum of two SSA adapters connected in a particular SSA loop.
Loops and Data Paths

All devices that are attached to an SSA adapter card are connected through SSA links. See Figure 1-11 on page 1-12. The SSA links are configured as loops. Data and commands to a particular device pass through all other devices on the link between the adapter and the target device.

Data can travel in either direction around a loop. The adapter can, therefore, access the disk drive modules through two data paths. The using system cannot detect which data path is being used.

If a disk drive module fails, or is turned off, the loop is broken, and one of the data paths to a particular module is no longer available. The disk drive modules on the loop continue to work, but an error is reported to the using system.

Figure 1-13 shows that disk drive module in slot 3 has failed. The disk drive modules in slots 1 and 2 can communicate with the using system only through connector A1 of the SSA adapter. The disk drive modules in slots 4 and 5 can communicate only through connector A2 of the SSA adapter.

If two or more disk drive modules are turned off, fail, or are removed from the loop, some modules might become isolated from the SSA adapter.

Figure 1-14 shows that disk drive modules in slots 2 and 4 have failed. The disk drive module in slot 1 can communicate with the using system only through connector A1 of the SSA adapter. The disk drive module in slot 5 can communicate with the using system only through connector A2 of the SSA adapter. The disk drive module in slot 3 is isolated from the SSA adapter.
SSA Service Aids

SSA service aids reside in the using system and help you service the 7131 Storage Tower. This section describes those service aids, and tells how to use them.

Attention: Do not run the service aids from more than one using system at a time; otherwise, unexpected results might occur.

The SSA service aids are:

- **Set Service Mode**: This service aid enables you to determine the location of a particular disk drive module on the SSA link and to remove that module from the link.
- **Link Verification**: This service aid tells you the operational status of an SSA link.
- **Configuration Verification**: This service aid lets you determine the relationship between physical and logical disk drives.
- **Format Disk**: This service aid formats an SSA disk drive module.
- **Certify Disk**: This service aid verifies that all the data on a disk drive can be read correctly.

Before you use the service aids, ensure that you are familiar with the principles of SSA links and physical disk drives (pdisks). If you are not familiar with these principles, first read “SSA Loops and Links” on page 1-12.

The Identify Function

The identify function can be accessed from any of the service aids.

This function enables you to determine the location of a particular disk drive module that you want to identify but do not want to remove from the 7131 Storage Tower. The identify function causes the check light of the disk drive module to flash for identification (1 second on, 1 second off), but has no effect on the normal operation of the disk drive module. You can use the identify function on any number of disk drive modules at the same time.

Instructions displayed by the service aids tell you when you can select the identify function.

**Note**: You cannot use the identify function on a device that is in reserved status.
Starting the SSA Service Aids

To start the SSA service aids:

1. Start the using-system diagnostics (see the Common Diagnostics Information Manual), and go to DIAGNOSTIC OPERATING INSTRUCTIONS.

2. Follow the instructions to select FUNCTION SELECTION.

3. Select SERVICE AIDS from the Function Select menu.

4. Select SSA SERVICE AIDS from the Service Aids menu.

   The SSA Service Aids menu is displayed.

   SSA SERVICE AIDS
   Move cursor onto selection, then press Enter.

   Set Service Mode
   Link Verification
   Configuration Verification
   Format Disk
   Certify Disk

   F3=Cancel   F1 =Exit

Note: In some configurations of the using-system console:

   Esc and 0 = Exit
   Esc and 3 = Cancel

   In such configurations, however, the displayed instructions for the function keys remain the same as those shown in the screen above.

5. Select the service aid that you require, then go to the relevant instructions in this chapter:

   “Set Service Mode Service Aid” on page 1-18
   “Link Verification Service Aid” on page 1-21
   “Configuration Verification Service Aid” on page 1-24
   “Format Disk Service Aid” on page 1-26
   “Certify Disk Service Aid” on page 1-27
Set Service Mode Service Aid

The Set Service Mode service aid enables you to determine the location of a particular disk drive module and to remove that module from the 7131 Storage Tower. It causes the check light of that disk drive module to come on for identification, and it stops all SSA link activity through the module. Only one disk drive module at a time can be in the service mode.

Before using this service aid, you must make the selected disk drive module unavailable to the using system; otherwise, an error occurs.

SSA disk drive modules can be maintained concurrently; that is, they can be removed, installed, and tested on an SSA link while the other modules on the link continue to work normally. If a disk drive module has its check light on, you can remove that module from the SSA link without taking any special actions.

If a disk drive module does not have its check light on, the SSA link that passes through it might still be active, even though the disk drive module itself might not be working. You must put that module into the service mode before you remove it from the SSA link.

If you leave the Set Service Mode service aid, the service mode is reset.

To use the Set Service Mode service aid:

1. Select SET SERVICE MODE from the SSA Service Aids menu (see “Starting the SSA Service Aids” on page 1-17). A list of physical disk drives (pdisks) is displayed:

<table>
<thead>
<tr>
<th>pdisk</th>
<th>11111111 - 4-P</th>
<th>2 GB SSA F Physical Disk Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>pdisk1</td>
<td>2222222222 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk2</td>
<td>333333333 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk3</td>
<td>444444444 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk4</td>
<td>555555555 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk5</td>
<td>666666666 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk6</td>
<td>777777777 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk7</td>
<td>888888888 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
<tr>
<td>pdisk8</td>
<td>999999999 - 4-P</td>
<td>2 GB SSA F Physical Disk Drive</td>
</tr>
</tbody>
</table>

The columns of information displayed on the screen have the following meanings:

<table>
<thead>
<tr>
<th>pdisk0 through pdisk8</th>
<th>Physical disk drive resource identifiers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11111111 through 99999999</td>
<td>Serial numbers of the physical disk drive modules. The actual serial number of a disk drive module is shown on the front of the disk drive module.</td>
</tr>
<tr>
<td>00-04-P</td>
<td>See “Location Code Format” on page 1-11.</td>
</tr>
<tr>
<td>2 GB SSA F Physical Disk Drive</td>
<td>Descriptions of the disk drive modules.</td>
</tr>
</tbody>
</table>
Select the pdisk that you want to identify or put into Service Mode (for example, pdisk3). The following display appears with details of the disk drive module that you have just selected.

SSA SERVICE AIDS  8 238
SET SERVICE MODE  8 2381
SET SERVICE MODE  8 2382
pdisk3 44444444 - 4-P 2 GB SSA F Physical Disk Drive

Move cursor onto selection, then press Enter.
+ Set or Reset Identify.
   Select this option to set or reset the Identify indicator on the disk drive.
> Set or Reset Service Mode.
   Select this option to set or reset Service Mode on the disk drive.
F3=Cancel  F1 =Exit

Select either the service mode or the identify function. (For this example, assume that you have selected the service mode function.) The list of pdisks is displayed again, and the disk drive module that you selected is marked by a >, which shows that the module is in the service mode.

SSA SERVICE AIDS  8 238
SET SERVICE MODE  8 2381
SET SERVICE MODE  8 2382
pdisk  11111111 - 4-P 2 GB SSA F Physical Disk Drive
pdisk1 22222222 - 4-P 2 GB SSA F Physical Disk Drive
pdisk2 33333333 - 4-P 2 GB SSA F Physical Disk Drive
> pdisk3 44444444 - 4-P 2 GB SSA F Physical Disk Drive
pdisk4 55555555 - 4-P 2 GB SSA F Physical Disk Drive
pdisk5 66666666 - 4-P 2 GB SSA F Physical Disk Drive
pdisk6 77777777 - 4-P 2 GB SSA F Physical Disk Drive
pdisk7 88888888 - 4-P 2 GB SSA F Physical Disk Drive
pdisk8 99999999 - 4-P 2 GB SSA F Physical Disk Drive

F3=Cancel  F1 =Exit

Notes:

a. You can select only one disk drive module at a time.
b. If you select the service mode function, and the selected disk drive module is not in a closed loop (see “SSA Loops and Links” on page 1-12), your selection fails and an error message is displayed. Use the Link Verification service aid to identify any open-link problems before trying to reselect the service mode function.
c. If you select the service mode function, and a file system is mounted on the selected disk drive module, your selection fails. Use the Configuration Verification service aid to determine which hdisk must have its file system unmounted before you can select the service mode function.
d. If the check light of the disk drive module that you have put into the service mode does not come on, and if you are not sure of the location of that module, use the identify function to help you find the disk drive module (see “The Identify Function” on page 1-16).
4 Select a second disk drive module, if required (for example, pdisk5). The following display appears:

```
> pdisk5 66666666 - 4-P 2 GB SSA F Physical Disk Drive
```

Move cursor onto selection, then press Enter.

+ Set or Reset Identify.
   Select this option to set or reset the Identify indicator on the disk drive.

> Set or Reset Service Mode.
   Select this option to set or reset Service Mode on the disk drive.

F3=Cancel  F1 =Exit

5 Select either the service mode or the identify function. If the original disk drive module is to remain in service mode, you can select only the identify function now. (Only one disk drive module at a time can be in the service mode.) The list of pdisks appears again. The pdisk that is in identify mode is identified by a +.

```
> pdisk3 44444444 - 4-P 2 GB SSA F Physical Disk Drive
```

Move cursor onto selection, then press Enter.

```
pdisk 11111111 - 4-P 2 GB SSA F Physical Disk Drive
pdisk1 22222222 - 4-P 2 GB SSA F Physical Disk Drive
pdisk2 33333333 - 4-P 2 GB SSA F Physical Disk Drive
pdisk3 44444444 - 4-P 2 GB SSA F Physical Disk Drive
pdisk4 55555555 - 4-P 2 GB SSA F Physical Disk Drive
pdisk5 66666666 - 4-P 2 GB SSA F Physical Disk Drive
pdisk6 77777777 - 4-P 2 GB SSA F Physical Disk Drive
pdisk7 88888888 - 4-P 2 GB SSA F Physical Disk Drive
pdisk8 99999999 - 4-P 2 GB SSA F Physical Disk Drive

```

F3=Cancel  F1 =Exit

6 Identify other disk drive modules in the same way, if required.
Link Verification Service Aid

The Link Verification service aid helps you determine:

Where an SSA link has been broken
The status of the disk drive modules on that SSA link
The location of a power fault that has been detected by the disk drive modules on that SSA link

To use the Link Verification service aid:

1. Select Link Verification from the SSA Service Aids menu (see “Starting the SSA Service Aids” on page 1-17). The Link Verification adapter menu is displayed:

   SSA SERVICE AIDS 8 238
   LINK VERIFICATION 8 2385
   Move cursor onto selection, then press Enter.
   ssa   - 3 SSA Adapter
   ssa1  - 5 SSA Adapter
   ssa2  - 6 SSA Adapter
   ssa3  - 7 SSA Adapter
   F3=Cancel   F1 =Exit

The columns of information displayed on the screen have the following meanings:

<table>
<thead>
<tr>
<th>SSA Adapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ssa0 through ssa3</td>
<td>Adapter resource identifiers.</td>
</tr>
<tr>
<td>00-03 through 00-07</td>
<td>Adapter location codes. These codes specify the location of the SSA adapter in the using system.</td>
</tr>
<tr>
<td>SSA Adapter</td>
<td>Descriptions of the adapters.</td>
</tr>
</tbody>
</table>

2. Select the adapter that you want to test.
When you have selected an adapter, a list is displayed showing the status of all the disk drive modules that are attached to the adapter:

SSA SERVICE AIDS 8 238
LINK VERIFICATION 8 2385
LINK VERIFICATION 8 2386
SSA Link Verification for:
  ssa1 - 5 SSA Adapter
To set or reset Identify, move cursor onto selection, then press Enter.

<table>
<thead>
<tr>
<th>Physical</th>
<th>Serial#</th>
<th>Adapter Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>pdisk1</td>
<td>11111111</td>
<td>A1 7 Good</td>
</tr>
<tr>
<td>pdisk2</td>
<td>22222222</td>
<td>A2 6 Good</td>
</tr>
<tr>
<td>pdisk3</td>
<td>33333333</td>
<td>B1 5 Good</td>
</tr>
<tr>
<td>pdisk4</td>
<td>44444444</td>
<td>B2 4 Good</td>
</tr>
<tr>
<td>pdisk5</td>
<td>55555555</td>
<td>A1 3 Good</td>
</tr>
<tr>
<td>pdisk6</td>
<td>66666666</td>
<td>B2 2 Good</td>
</tr>
<tr>
<td>pdisk7</td>
<td>77777777</td>
<td>B1 1 Good</td>
</tr>
<tr>
<td>pdisk8</td>
<td>88888888</td>
<td>A1 7 Good</td>
</tr>
<tr>
<td>pdisk9</td>
<td>99999999</td>
<td>A1 9 Good</td>
</tr>
</tbody>
</table>

F3=Cancel F1 =Exit

The columns of information displayed on the screen have the following meanings:

<table>
<thead>
<tr>
<th>pdisk0 through pdisk9</th>
<th>Physical disk drive resource identifiers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11111111 through 99999999</td>
<td>Serial numbers of the physical disk drive modules. The actual serial number of a disk drive module is shown on the front of the disk drive module.</td>
</tr>
<tr>
<td>A1 A2 B1 B2</td>
<td>Adapter connector number (see “The SSA Adapter” on page 1-13).</td>
</tr>
<tr>
<td>Status</td>
<td>Good: The disk drive module is working correctly.</td>
</tr>
<tr>
<td>Failed</td>
<td>The disk drive module has failed.</td>
</tr>
<tr>
<td>Power</td>
<td>The disk drive module has detected a loss of power.</td>
</tr>
<tr>
<td>Reserved</td>
<td>The disk drive module is used by another using system.</td>
</tr>
</tbody>
</table>
An SSA link must be configured in a loop around which data can travel in either direction. The loop is broken if a cable fails or is removed, or if a disk drive module fails. Because each disk drive module on the loop can be accessed from either direction, the broken loop does not prevent access to any data, unless that data is on the failed disk drive module. If the loop is broken between two disk drive modules, the ready lights on those modules flash to show that only one SSA path is active. Also, the Link Verification service aid shows that only one path is available to each disk drive module on the broken loop.

You can find the physical location of any disk drive module on the link by using the identify function (see “The Identify Function” on page 1-16).

**Note:**

If you have just made changes to or have just turned on the 7131 Storage Tower, you might need to wait up to 30 seconds before detailed information about the SSA network becomes available to the service aids.

In the lists of physical disk drives (pdisks) that are displayed by the service aids, you might see:

- Question marks show where an SSA loop is broken. No information is available about any devices that are beyond this point.
- Asterisks indicate an unconfigured device. That device might be:
  - Another SSA adapter that is in the same using system or in a different using system.
  - An SSA device that is in the SSA network, but whose type is not known. Such a condition can occur if, for example, devices are added to the network, but the `cfgmgr` command is not run to configure those devices into the using system.

For example:

```
LINK VERIFICATION  8 2386

SSA Link Verification for:
ssal   - 5   SSA ADAPTER

To set or reset Identify, move cursor onto selection, then press Enter.

<table>
<thead>
<tr>
<th>Physical</th>
<th>Serial#</th>
<th>Adapter Port</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>(TOP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk</td>
<td>11111111</td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>pdisk1</td>
<td>22222222</td>
<td>1</td>
<td>Good</td>
</tr>
<tr>
<td>??????</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk3</td>
<td>44444444</td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>pdisk4</td>
<td>55555555</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>pdisk5</td>
<td>66666666</td>
<td>2</td>
<td>Good</td>
</tr>
<tr>
<td>pdisk6</td>
<td>77777777</td>
<td>1</td>
<td>Good</td>
</tr>
<tr>
<td>pdisk7</td>
<td>88888888</td>
<td>1</td>
<td>Good</td>
</tr>
<tr>
<td>pdisk8</td>
<td>99999999</td>
<td>3</td>
<td>Good</td>
</tr>
<tr>
<td>pdisk9</td>
<td>1</td>
<td>1</td>
<td>Good</td>
</tr>
<tr>
<td>(MORE)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F3=Cancel   F1 =Exit
```

Note that the missing disk drive module (pdisk2) is represented by a line of question marks.

4 When you have solved a problem, press **F3** (Esc and 3 on some consoles) to leave the display; then press Enter to reselect it. The display shows the new status of the SSA links.
## Configuration Verification Service Aid

The Configuration Verification service aid enables you to determine the relationship between SSA logical units (hdisk) and SSA physical disk drives (pdisk). It also displays the connection information and operational status of the disk drives.

**Note:** User applications communicate with the hdisk; error data is logged against the pdisk.

To use the Configuration Verification service aid:

1. Select Configuration Verification from the SSA Service Aids menu to display a list of pdisk and hdisk (see "Starting the SSA Service Aids" on page 1-17).

   
   SSA SERVICE AIDS 8 238
   
   CONFIGURATION VERIFICATION 8 239
   
   Move cursor onto selection, then press Enter.

   
   (TOP)
   
   pdisk 22222222 3-P 2 GB SSA F Physical Disk Drive
   pdisk1 33333333 5-P 2 GB SSA F Physical Disk Drive
   pdisk2 44444444 7-P 2 GB SSA F Physical Disk Drive
   hdisk3 22222222 3-L SSA Logical Disk Drive
   hdisk4 33333333 5-L SSA Logical Disk Drive
   hdisk5 44444444 7-L SSA Logical Disk Drive
   
   (BOTTOM)
   
   F3=Cancel F1 =Exit

2. Select the hdisk or pdisk that you want to test.

   If you select an hdisk, a list of pdisk is displayed:

   
   SSA SERVICE AIDS 8 238
   
   CONFIGURATION VERIFICATION 8 239
   
   CONFIGURATION VERIFICATION 8 2391
   
   hdisk3 22222222 3-L SSA Logical Disk Drive
   
   To set or reset Identify, move cursor onto selection, then press enter.

   
   Physical Serial# Adapter Port SSA_Addr Status
   
   (TOP)
   
   pdisk 22222222 2 A1 5 Good
   - 2 A2 5 Good
   - 3 A1 1 Good
   - 3 A2 Good
   
   (BOTTOM)
   
   F3=Cancel F1 =Exit
If you select a pdisk, a list of hdisks is displayed:

SSA SERVICE AIDS 8 238

CONFIGURATION VERIFICATION 8 239

CONFIGURATION VERIFICATION 8 2392

pdisk 22222222 - 3-P  2 GB SSA F Physical Disk Drive

Move cursor onto selection, then press Enter.

hdisk3 22222222 - 3-L SSA Logical Disk Drive

(BOTTOM)

F3=Cancel  F1 =Exit

Note: If you select the hdisk from this screen, the hdisk configuration is displayed.
Format Disk Service Aid

The Format Disk service aid formats SSA disk drive modules.

**Attention:** Formatting a disk drive module destroys all the data on that module. Use this procedure only when instructed to do so by the service procedures.

To use the Format Disk service aid:

1. Select Format Disk from the SSA Service Aids menu (see “Starting the SSA Service Aids” on page 1-17). A list of pdisks is displayed:

   SSA SERVICE AIDS 8 238
   FORMAT DISK 8 2395

   Move cursor onto selection, then press Enter.

   {TOP}
   pdisk1 11111111 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk1 22222222 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk2 33333333 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk3 44444444 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk4 55555555 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk5 66666666 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk6 77777777 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk7 88888888 - 4-P  2 GB SSA F Physical Disk Drive
   pdisk8 99999999 - 4-P  2 GB SSA F Physical Disk Drive

   {BOTTOM}

   F3=Cancel   F1 =Exit

2. Select the pdisk that you want to format. The following instructions are displayed:

   SSA SERVICE AIDS 8 238
   FORMAT DISK 8 2395

   FORMAT DISK 8 2396

   pdisk1 22222222 - 4-P  2 GB SSA F Physical Disk Drive

   Set or Reset Identify.
   Select this option to set or reset the Identify indicator on the disk drive.
   Format.
   Select this option only if you are sure that you have selected the correct disk drive.
   FORMATTING DESTROYS ALL DATA ON THE DISK DRIVE.

   F3=Cancel   F1 =Exit

3. If you are not sure of the identification (pdisk number) of the disk drive module that you want to format, use the identify function to get a positive physical identification of the module (see “The Identify Function” on page 1-16). You can further ensure that you have selected the correct disk drive module by verifying that the serial number on the front of the disk drive module is the same as the serial number that is displayed on the screen.

4. When you are sure that you have selected the correct disk drive module, select Format.
Certify Disk Service Aid

The Certify Disk service aid verifies that all the data on a disk drive module can be read correctly. Instructions given elsewhere in this book tell you when you need to run this service aid.

To use the Certify Disk service aid:

1. Select Certify Disk from the SSA Service Aids menu (see “Starting the SSA Service Aids” on page 1-17). A list of pdisks is displayed:

   SSA SERVICE AIDS 8 238
   CERTIFY DISK 8 24 4

   Move cursor onto selection, then press Enter.

   (TOP)
   pdisk1 11111111 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk2 22222222 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk3 33333333 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk4 44444444 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk5 55555555 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk6 66666666 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk7 77777777 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk8 88888888 - 4-P 2 GB SSA F Physical Disk Drive
   pdisk9 99999999 - 4-P 2 GB SSA F Physical Disk Drive

   (BOTTOM)
   F3=Cancel   F1 = Exit

2. Select the pdisk that you want to certify. The following instructions are displayed:

   SSA SERVICE AIDS 8 238
   CERTIFY DISK 8 24 4
   CERTIFY DISK 8 24 5

   Move cursor onto selection, then press Enter.

   Set or Reset Identify.
   Select this option to set or reset the Identify indicator on the disk drive.
   Certify.
   Select this option to start the Certify operation.

   F3=Cancel   F1 = Exit

3. If you are not sure of the identification (pdisk number) of the disk drive module that you want to format, use the identify function to get a positive physical identification of the module (see “The Identify Function” on page 1-16). You can further ensure that you have selected the correct disk drive module by verifying that the serial number on the front of the disk drive module is the same as the serial number that is displayed on the screen.

4. When you are sure that you have selected the correct disk drive module, select Certify
Service Aid Error Codes

If the SSA service aids detect an unrecoverable error and are unable to continue, one of the following error codes might occur.

SSA01  Not enough using-system memory is available for this service aid to continue. Take one of the actions described here:

1. This problem might be caused by a failed application program. Ask the user to end any failed application program, then try to run the service aid again.
2. Run diagnostics in the problem determination mode on the system unit. If you find any problems, solve them; then try to run the service aid again.
3. Close down and reboot the using system; then try to run the service aid again.
4. Run diagnostics from diskette or CD-ROM to isolate the problem. If you do not find a problem, the operating system might have failed.

SSA02  An unknown error has occurred. Take one of the actions described here:

1. Run diagnostics in the problem determination mode to the system unit. If you find any problems, solve them; then try to run the service aid again.
2. If diagnostics fail or if the same problem occurs when you try the service aid again, run the diagnostics from diskette or CD-ROM to isolate the problem. If you do not find a problem, the operating system might have failed.

SSA03  The service aid was unable to open an hdisk. This problem might have occurred because a disk drive module has failed or has been removed from the system. Take the actions described here:

1. Use the Configuration Verification service aid (see “Configuration Verification Service Aid” on page 1-24) to determine the location code of the SSA adapter to which the hdisk is attached. (For example, if the location code of the hdisk is 00-03-L, the location code of the SSA adapter is 00-03.)
2. Run the Link Verification service aid (see “Link Verification Service Aid” on page 1-21) to the SSA adapter.
3. If a link failure is indicated by the service aid, go to “MAP 2010: 7131 Storage Tower–Start” on page 2-12.
4. If no link failures are indicated, run the diagnostics in the system verification mode to each pdisk that is attached to the SSA adapter.

Using the Service Aids for SSA-Link Problem Determination

If you have a problem with an SSA link, use the Link Verification service aid (see “Link Verification Service Aid” on page 1-21). The following examples show various loops and the associated information that is displayed by the Link Verification service aid.
Example 1 Normal Loops: In Figure 1-15, eight disk drive modules are connected to connectors A1 and A2 of the SSA adapter. Four disk drive modules are connected to connectors B1 and B2 of the same SSA adapter.

![Diagram of SSA adapter and disk drive modules](image)

**Figure 1-15. Normal Loops**

For this example, the Link Verification service aid displays the following information:

```
LINK VERIFICATION 8 2386
SSA Link Verification for:
ssal - 5 SSA ADAPTER
To set or reset Identify, move cursor onto selection, then press Enter.
Physical Serial# Adapter Port
A1 A2 B1 B2 Status
(TOP)
pdisk nnnnnnn  7  Good
pdisk1 nnnnnnn  1  6  Good
pdisk2 nnnnnnn  2  5  Good
pdisk3 nnnnnnn  3  4  Good
pdisk4 nnnnnnn  4  3  Good
pdisk5 nnnnnnn  5  2  Good
pdisk6 nnnnnnn  6  1  Good
pdisk7 nnnnnnn  7  Good
pdisk8 nnnnnnn  3  Good
pdisk9 nnnnnnn  1  2  Good
(MORE)
```

F3=Cancel  F1 =Exit

**Note:** Scroll the display to see all the connected disk drive modules.
Example 2 Broken Loop (Cable Removed): Each disk drive module normally communicates with the adapter through one data path. Because data can pass around the loop in either direction, however, the adapter automatically reconfigures the loop to enable communication to continue to each disk drive if the loop becomes broken.

In Figure 1-16, eight disk drive modules should be connected to connectors A1 and A2 of the SSA adapter. However, the loop is broken because the SSA cable has been disconnected from connector A2. Four disk drive modules are connected to connectors B1 and B2 of the same SSA adapter. Although the broken loop is reported as an error, all the disk drive modules can still communicate with the using system. The eight disk drive modules can communicate through connector A1 of the SSA adapter. The four disk drive modules can communicate through connectors B1 and B2 of the same SSA adapter (normal loop).

![Figure 1-16. Broken Loop](image)

For this example, the Link Verification service aid displays the following: Note that the column for adapter connector A2 shows no connections.

```
LINK VERIFICATION

SSA Link Verification for:
ssa1 - 5 SSA ADAPTER

To set or reset Identify, move cursor onto selection, then press Enter.

<table>
<thead>
<tr>
<th>Physical</th>
<th>Serial#</th>
<th>Adapter Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A2</td>
<td>B1</td>
</tr>
<tr>
<td>(TOP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk</td>
<td>nnnnnnn</td>
<td>1</td>
</tr>
<tr>
<td>pdisk1</td>
<td>nnnnnnn</td>
<td>2</td>
</tr>
<tr>
<td>pdisk2</td>
<td>nnnnnnn</td>
<td>3</td>
</tr>
<tr>
<td>pdisk3</td>
<td>nnnnnnn</td>
<td>4</td>
</tr>
<tr>
<td>pdisk4</td>
<td>nnnnnnn</td>
<td>5</td>
</tr>
<tr>
<td>pdisk5</td>
<td>nnnnnnn</td>
<td>6</td>
</tr>
<tr>
<td>pdisk6</td>
<td>nnnnnnn</td>
<td>7</td>
</tr>
<tr>
<td>pdisk7</td>
<td>nnnnnnn</td>
<td></td>
</tr>
<tr>
<td>pdisk8</td>
<td>nnnnnnn</td>
<td></td>
</tr>
<tr>
<td>pdisk9</td>
<td>nnnnnnn</td>
<td></td>
</tr>
<tr>
<td>(MORE)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F3=Cancel  F1 =Exit
```
Example 3 Broken Loop (Disk Drive Module Removed): Figure 1-17 shows eight disk drive modules connected to connectors A1 and A2 of the SSA adapter, but the loop is broken because disk drive module in slot 3 has been removed. Four disk drive modules are connected to connectors B1 and B2 of the same SSA adapter.

Although the missing disk drive module is reported as an error, all the remaining disk drive modules can still communicate with the using system. Two disk drive modules can communicate through connector A1 of the SSA adapter. Five disk drive modules can communicate through connector A2 of the SSA adapter. Four disk drive modules can communicate through connectors B1 and B2 of the same SSA adapter (normal loop).

Figure 1-17. Broken Loop (Disk Drive Module Removed)

For this example, the Link Verification service aid displays the following: Note that the missing disk drive module (pdisk2) is represented by a line of question marks.

---

Figure 1-17: Broken Loop (Disk Drive Module Removed)
Finding the Physical Location of a Device

The physical location of a device (for example, a disk drive module or an SSA adapter) cannot be reported directly by the using system because of the way in which the SSA interface works. The address of an SSA device is related to the position of that device on the SSA loop. The address can, therefore, change if the configuration is changed.

Finding the Device When Service Aids Are Available

To help you to find the correct physical disk drive, the SSA service aids include an identify function. This function, when selected, causes the check light of the selected disk drive module to flash. For more details, see “SSA Service Aids” on page 1-16.

Some devices (for example, adapters) do not have check lights. To find such a device, you can either use the identify function to identify devices that are next to the SSA adapter on the SSA link, or use the procedure described in “Finding the Device When No Service Aids Are Available.”

Finding the Device When No Service Aids Are Available

When no service aids are available, you must find the device by using the port (P) and SSA-address (AA) values that are provided by some service request numbers (SRNs). Examples of these SRNs are 43nnn, 44nnn, and 45nnn, where nnn represents the PAA values.

The port (P) value can be a number from 0 to 3, which indicates the port connector on the SSA adapter:

- 0 = Connector A1
- 1 = Connector A2
- 2 = Connector B1
- 3 = Connector B2

The AA value is the decimal SSA-address value. It indicates the position of the device that you are trying to find (counted along the SSA link).

Use the port value to locate the relevant connector on the SSA adapter, then follow the SSA cable to the first disk drive module or adapter in the same SSA loop. Do not include dummy disk drive modules.

The first disk drive module or adapter that you reach represents SSA-address count 0. Continue to follow the SSA link from disk drive module or adapter, increasing the SSA-address count by 1 for each device, until you reach the disk drive module or adapter that is indicated in the SRN.
**Microcode Maintenance**

Updates to the microcode are loaded into the using system from diskettes. If the level of the microcode that is stored in the using system is higher than the level of the microcode that is installed on the SSA adapter or the disk drive modules, the higher-level microcode is automatically downloaded to the adapter and disk drive modules when the using system runs the device configuration method.

For some problems, the service request number (SRN) might ask you to check the microcode package ID before you exchange any field-replaceable units (FRUs). You can determine the package ID for the adapter in either of the following two ways:

On the command line, type the following command and press Enter:

```bash
lsattr -E -l <adapter> -a ucode
```

where *adapter* is the ID of the adapter that you want to check; for example, ssa0.

The response to this command is:

```
ucode 8F97..nn Name of adapter download False
```

where *nn* is the adapter code package ID.

Use the Display or Change Configuration or Vital Product Data (VPD) service aid to display the VPD for the adapter. The first two characters of the ROS Level field contain the adapter code package ID.

To determine the ID of the microcode package that is being used on a disk drive module, use the Display or Change Configuration or Vital Product Data (VPD) service aid to display the VPD for the disk drive module. The first two characters of the ROS Level field contain the ID of the microcode package for the disk drive module.

**Note:** During the configuration of the complete system, all the VPD files in the system are updated *before* any microcode is downloaded from the using system to the 7131 Storage Tower. If the using system later downloads a new level of microcode to the subsystem, the VPD for the adapter or disk drive module will not show the ID of the new microcode package until the next time the configuration manager command (`cfgmgr`) is run.
The vital product data (VPD) for the 7131 Storage Tower and for the SSA adapter can be displayed by using the using-system service aids. This section shows the types of information that are contained in the VPD.

Abbreviations used in this section are:

- **DRAM**  
  Dynamic random-access memory
- **FRU**  
  Field-replaceable unit
- **RAM**  
  Random-access memory
- **ROM**  
  Read-only memory
- **ROS**  
  Read-only storage
- **SSA**  
  Serial storage architecture

### 1.1 GB, 2.2 GB, 4.5 GB, and 9.1 GB SSA Disk Drives

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>Disk drive module part number</td>
</tr>
<tr>
<td>EC level</td>
<td>Disk enclosure engineering change level</td>
</tr>
<tr>
<td>Serial number</td>
<td>Disk enclosure serial number</td>
</tr>
<tr>
<td>Machine type and model</td>
<td>Type and model</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Manufacturer and plant code</td>
</tr>
<tr>
<td>ROS level and ID</td>
<td>ROM and RAM code revision levels</td>
</tr>
<tr>
<td>Device specific Z2</td>
<td>RAM code load part number</td>
</tr>
<tr>
<td>Device specific Z3</td>
<td>Electronics card assembly part number</td>
</tr>
<tr>
<td>Device specific Z4</td>
<td>Disk enclosure date of manufacture</td>
</tr>
</tbody>
</table>

### SSA Adapter

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>Adapter card FRU part number</td>
</tr>
<tr>
<td>Serial number</td>
<td>Adapter card serial number</td>
</tr>
<tr>
<td>Engineering change level</td>
<td>Adapter card engineering change level</td>
</tr>
<tr>
<td>Manufacturing location</td>
<td>Manufacturer and plant code</td>
</tr>
<tr>
<td>ROS level and ID</td>
<td>Version of ROS code loaded on the adapter</td>
</tr>
<tr>
<td>Loadable microcode level</td>
<td>Version of loadable code needed for the satisfactory operation of this card</td>
</tr>
<tr>
<td>Device driver level</td>
<td>Minimum level of device driver needed for this level of card</td>
</tr>
<tr>
<td>Description of function</td>
<td>SSA adapter</td>
</tr>
<tr>
<td>Device specific (Z0)</td>
<td>If the adapter contains additional DRAM modules, Z0 indicates the total DRAM size in megabytes</td>
</tr>
<tr>
<td>Device specific (Z1)</td>
<td>If the adapter contains a pluggable fast-write cache module, Z1 indicates the cache size in megabytes</td>
</tr>
</tbody>
</table>
Chapter 2. Problem Determination Procedures

Problem determination procedures are provided by power-on self-tests (POSTs), service request numbers (SRNs), and maintenance analysis procedures (MAPs). Some of these procedures use the using system service aids that are described in “SSA Service Aids” on page 1-16.

Disk Drive Module Power-On Self-Tests (POSTs)

Attention: Disk drive modules are fragile. Handle them with care. Follow all ESD-sensitive parts procedures when handling disk drive modules. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

The disk drive module POSTs start each time the module is switched on or when a Send Diagnostic command is received from the SSA adapter. They check whether the disk drive module is working correctly. The POSTs also help verify a repair after a FRU has been exchanged.

There are two power-on self-tests: POST-1 and POST-2.

POST-1 runs immediately after the ‘power-on reset’ line goes inactive, and before the disk drive module motor starts. POST-1 includes tests of the:

- Microprocessor
- ROM
- Safety circuits

If POST-1 completes successfully, POST-2 is enabled.

If POST-1 fails, the disk drive module check light stays on, and the disk drive module is not configured into the SSA network.

POST-2 runs after the disk drive module motor has started. POST-2 includes tests of:

- Motor control
- Servo control
- Read and write on the diagnostic cylinder (repeated for all heads)
- Error checking and correction (ECC)

If POST-2 completes successfully, the disk drive module is ready for use by the using system.
Adapter Power-On Self-Tests (POSTs)

Two power-on self-tests (POSTs) are resident in the SSA adapter. The tests are POST-1 and POST-2.

POST-1 tests all the functions that are necessary to enable the adapter to communicate with the microprocessor. POST-1 can fail for either of two reasons:

A hardware error has been detected. In such instances, the POST code enters a tight loop, and does not put the identification of the SSA adapter into the programmable option select (POS) registers. If this error occurs, the SSA adapter must be exchanged for a new one.

The flash erasable programmable read-only memory (EPROM) has a check sum that is not valid. This error can be caused if the power fails while microcode is being downloaded. In such instances, the POST checks all the hardware that is needed to download the microcode. If all the hardware is correct, the POST sets the ROS level to zero, puts the identification of the SSA adapter into POS 0-1, and puts error data into the adapter status register.

To recover from this type of error, microcode must be downloaded to the SSA adapter. If the using system can have an initial program load (IPL) without the adapter, the configuration code detects the down-level ROS code and downloads the latest level of code. The configuration code then uses control register bit 7 to reset the adapter and restart POST-1.

If no error is detected during POST-1, the identification of the SSA adapter is put into the POS registers, and POST-2 is started.

POST-2 tests the remaining hardware on the SSA adapter card and tests the other FRUs that are attached to the adapter. If this test fails, an error code is saved and sent to the using-system error log when the error logger becomes available. An internal health check continues to send the error code at regular intervals.
Service Request Numbers (SRNs)

Service request numbers (SRNs) are generated for the 7131 Storage Tower by the system error-log analysis, system configuration code, diagnostics, and customer problem-determination procedures. SRNs help you to identify the cause of a problem, the failing field-replaceable units (FRUs), and the service actions that might be needed to solve the problem.

The SRN Table

Table 2-1 on page 2-5 lists the SRNs and describes the actions you should perform. The table columns are:

- **SRN**: The service reference number
- **FRU list**: The FRU or FRUs that might be causing the problem (see also “FRU Names Used in the SRN Table” on page 2-4)
- **%**: How likely it is (by percentage) that the FRU is causing the problem
- **Problem**: A description of the problem and the action you must take

Abbreviations used in the table are:

- **DMA**: Direct memory access
- **FRU**: Field-replaceable unit
- **IOCC**: Input/output channel controller
- **POS**: Programmable option select (POS registers)
- **POST**: Power-on self-test
- **PAA**: P = adapter port number
  AA = SSA address

See also “Finding the Device When No Service Aids Are Available” on page 1-32.

Using the SRN Table

**Important**: You should have been sent here from “MAP 2010: 7131 Storage Tower–Start.” Do not start problem determination from the SRN table; always go to “MAP 2010: 7131 Storage Tower–Start” on page 2-12 first.

1. Locate the SRN in the table. If you cannot find the SRN, you have a problem with the diagnostics, the microcode, or the documentation. Call your support center for assistance.

2. Read carefully the “Action” you must perform for the problem. *Do not exchange FRUs unless you are instructed to do so.*

3. Normally exchange only one FRU at a time, starting from the top of the FRU list for that SRN. Always use instructions given in Chapter 3, “Removal and Replacement Procedures” when exchanging FRUs; a page reference is given with each FRU in the FRU list. After each FRU is exchanged, go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.
Software and Microcode Errors

Some SRNs indicate that a problem might have been caused by a software error or by a microcode error. If you have one of these SRNs, perform the following actions:

1. Make a note of the contents of the error log for the device that has the problem.

2. Go to the using-system service aids and select Display Vital Product Data to display the VPD of the failing system. Make a note of the VPD for all the SSA adapters and disk drive modules.

3. Report the problem to your support center. The center can tell you whether you have a known problem and can, if necessary, provide you with a correction for the software or microcode.

FRU Names Used in the SRN Table

This section provides a glossary of the FRU names used.

<table>
<thead>
<tr>
<th>FRU Name in Table</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backplane assembly</td>
<td>The disk drive modules, dummy disk drive modules, internal SSA cables, power supply, and fan are connected to the backplane assembly.</td>
</tr>
<tr>
<td>Disk drive module</td>
<td>A disk drive attached to a carrier that plugs into the backplane in the 7131 Storage Tower.</td>
</tr>
<tr>
<td>Dummy Disk drive module</td>
<td>This module must be installed in a slot that does not contain a disk drive module. This completes the SSA loop through the 7131 Storage Tower.</td>
</tr>
<tr>
<td>External SSA cable</td>
<td>A cable that connects the 7131 Storage Tower to an SSA adapter or to another 7131 Storage Tower.</td>
</tr>
<tr>
<td>Fan assembly</td>
<td>A fan that provides cooling in the 7131 Storage Tower.</td>
</tr>
<tr>
<td>Internal SSA cable</td>
<td>Either of two SSA cables in the 7131 Storage Tower. They attach the backplane to the external SSA connectors at the back of the 7131 Storage Tower.</td>
</tr>
<tr>
<td>SSA adapter card</td>
<td>The SSA adapter card, which is located in the using system.</td>
</tr>
<tr>
<td>Disk Drive Carrier</td>
<td>The carriers that hold the disk drive assemblies. This includes the flex card and attached LED cable.</td>
</tr>
<tr>
<td>Table 2-1 (Page 1 of 5). Service Request Numbers</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>SRN</td>
<td>FRU List</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------</td>
</tr>
</tbody>
</table>
| 10101 | **Fan**                              | 80 | **Description:** Disk drive motor stopped. Either the fan or the disk drive module is bad.  
 If this SRN has been received by all disk drive modules in a 7131 Storage Tower, then the fan is bad. Exchange the FRU for a new FRU.  
 If this SRN was received by one disk drive module only, then exchange the disk drive module. |
|       | **Disk drive module**                | 20 |---------|
| 10112 | None                                 | --| **Description:** Format degraded. A format operation has been ended before it has completed.  
 **Action:** Use the Format service aid to format the disk drive module. |
| 1xxxx | **Disk drive module**                | 100| **Description:** Disk drive module error.  
 **Action:** Exchange the FRU for a new FRU.  
 **Note:** In this SRN, an x represents a digit from 0 to F. |
| 20PAA | **Disk drive module**                | 45 | **Description:** An open SSA link has been detected.  
 **Action:** Run the Link Verification service aid to isolate the failure. See “Link Verification Service Aid” on page 1-21. If the SSA service aids are not available:  
 When the failing device is in a 7131 Storage Tower, go to step 31 on page 2-15 in MAP 2010: 7131 Storage Tower–Start.  
 When the failing device is not in a 7131 Storage Tower, go to the service information for that device. |
|       | **SSA adapter card**                 | 45 |---------|
|       | **External SSA Cables**              | 6  |---------|
|       | **Backplane assembly**               | 2  |---------|
|       | **Internal SSA Cable**               | 2  |---------|
| 21PAA | to 29PAA                             | 45 | **Description:** An SSA threshold-exceeded-link error has been detected.  
 **Action:** Run the Link Verification service aid to isolate the failure. See “Link Verification Service Aid” on page 1-21. If the SSA service aids are not available:  
 When the failing device is in a 7131 Storage Tower, go to “MAP 2323: 7131 Storage Tower–Intermittent Link Error” on page 2-24.  
 When the failing device is not in a 7131 Storage Tower, go to the service information for that device. |
| 2A002 | **Disk drive module**                | 50 | **Description:** Async code 02 has been received. A software error has probably occurred.  
 **Action:** Go to “Software and Microcode Errors” on page 2-4 before exchanging any FRUs. |
|       | **SSA adapter card**                 | 50 |---------|
| 2A003 | **Disk drive module**                | 50 | **Description:** Async code 03 has been received. A software error has probably occurred.  
 **Action:** Go to “Software and Microcode Errors” on page 2-4 before exchanging any FRUs. |
|       | **SSA adapter card**                 | 50 |---------|
| 2A004 | **Disk drive module**                | 50 | **Description:** Async code 04 has been received. A software error has probably occurred.  
 **Action:** Go to “Software and Microcode Errors” on page 2-4 before exchanging any FRUs. |
<p>|       | <strong>SSA adapter card</strong>                 | 50 |---------|</p>
<table>
<thead>
<tr>
<th>SRN</th>
<th>FRU List</th>
<th>%</th>
<th>Problem</th>
</tr>
</thead>
</table>
| 2A005| None                      | -- | **Description:** Async code 05 has been received. This code indicates that a disk drive module has detected a loss of power.  
**Action:** Use the Link Verification service aid (see “Link Verification Service Aid” on page 1-21) to determine if any devices are missing from the SSA link.  
If a device is missing, go to “MAP 2010: 7131 Storage Tower—Start” on page 2-12 to isolate the problem.  
If no device is missing, the problem might have been caused by a temporary, or partial, loss of power to the 7131 Storage Tower. |
| 2A006| Disk drive module         | 100| **Description:** Async code 06 has been received. This code indicates that a disk drive module has detected the loss of one of its power inputs.  
**Action:**  
If the failing device is in a 7131 Storage Tower, exchange the disk drive module.  
If the failing device is not in a 7131 Storage Tower, go to the service information for that device. |
| 2A106| Backplane assembly        | 100| **Description:** Async code 06 has been received. This code indicates that multiple disk drive modules have detected the loss of one of their power inputs.  
**Action:**  
If the failing devices are in a 7131 Storage Tower, exchange the backplane.  
If the failing devices are not in a 7131 Storage Tower, go to the service information for those devices. |
| 2A206| Disk drive module         | 100| **Description:** A disk drive module has detected that one of its SSA links has failed the POSTs.  
**Action:**  
1. Use the Link Verification service aid (see “Link Verification Service Aid” on page 1-21) to determine where the SSA link is broken.  
2. Run diagnostics in the system verification mode to the two disk drive modules that are nearest to, and on each side of, the place where the link is broken. The diagnostics show which disk drive module detected the problem. |
| 2FFFF| None                      | -- | **Description:** An async code that is not valid has been received.  
**Action:** Go to “Software and Microcode Errors” on page 2-4. |
| 300C0| Disk drive module         | 100| **Description:** A disk drive module has detected the loss of one of its power inputs.  
**Action:**  
If the failing device is in a 7131 Storage Tower, exchange the disk drive module.  
If the failing device is not in a 7131 Storage Tower, go to the service information for that device. |
| 301C0| Backplane assembly        | 100| **Description:** Multiple disk drive modules have detected the loss of one of their power inputs.  
**Action:**  
If the failing devices are in a 7131 Storage Tower, exchange the backplane.  
If the failing devices are not in a 7131 Storage Tower, go to the service information for those devices. |
<table>
<thead>
<tr>
<th>SRN</th>
<th>FRU List</th>
<th>%</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>303FF</td>
<td>Disk drive module</td>
<td>100</td>
<td>Description: An SCSI status that is not valid has been received.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action: Go to “Software and Microcode Errors” on page 2-4 before exchanging any FRUs.</td>
</tr>
<tr>
<td>40000</td>
<td>SSA adapter card</td>
<td>100</td>
<td>Description: The SSA adapter card has failed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action: Exchange the FRU for a new FRU.</td>
</tr>
<tr>
<td>43PAA</td>
<td>Disk drive module</td>
<td>90</td>
<td>Description: An SSA device on the link is preventing the completion of the link configuration.</td>
</tr>
<tr>
<td></td>
<td>SSA adapter card</td>
<td>10</td>
<td>Action:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the SSA service aids are available, run the Link Verification service aid (see “Link Verification Service Aid” on page 1-21) to determine which device is preventing configuration. (That device is the one beyond the last-configured device on an open SSA link.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the SSA service aids are not available, note the value of PAA in this SRN, and go to “Finding the Physical Location of a Device” on page 1-32.</td>
</tr>
<tr>
<td>44PAA</td>
<td>Disk drive module</td>
<td>100</td>
<td>Description: A disk drive module has failed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the SSA service aids are available, run the Link Verification service aid (see “Link Verification Service Aid” on page 1-21) to find the failing disk drive module. Before you exchange the failing disk drive module, run diagnostics in the system verification mode to that module to determine the cause of the problem.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the SSA service aids are not available, note the value of PAA in this SRN, and go to “Finding the Physical Location of a Device” on page 1-32. Exchange the failing FRU for a new FRU.</td>
</tr>
<tr>
<td>45PAA</td>
<td>Disk drive module</td>
<td>40</td>
<td>Description: The SSA adapter has detected an open SSA link.</td>
</tr>
<tr>
<td></td>
<td>External SSA Cables</td>
<td>40</td>
<td>This problem is caused either by a disk drive module that is failing, or by a disk drive module that has been switched off from another using system on the same SSA link. (That using system has itself been switched off.)</td>
</tr>
<tr>
<td></td>
<td>Backplane assembly</td>
<td>20</td>
<td>Action:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the SSA service aids are available, run the Link Verification service aid (see “Link Verification Service Aid” on page 1-21) to determine which device is preventing configuration. (That device is the one beyond the last-configured device on an open SSA link.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If the SSA service aids are not available, note the value of PAA in this SRN, and go to “Finding the Physical Location of a Device” on page 1-32.</td>
</tr>
<tr>
<td>48000</td>
<td>None</td>
<td></td>
<td>Description: The SSA adapter has detected a link configuration resource that is not valid.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action: See “SSA Loop Configurations That Are Not Valid” on page 2-10.</td>
</tr>
<tr>
<td>50000</td>
<td>SSA adapter card</td>
<td>100</td>
<td>Description: The SSA adapter failed to respond to the device driver.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action: Exchange the FRU for a new FRU.</td>
</tr>
<tr>
<td>50001</td>
<td>SSA adapter card</td>
<td>100</td>
<td>Description: A data parity error has occurred.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action: Exchange the FRU for a new FRU.</td>
</tr>
<tr>
<td>50002</td>
<td>SSA adapter card</td>
<td>100</td>
<td>Description: An SSA adapter direct memory access (DMA) error has occurred.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action: Exchange the FRU for a new FRU.</td>
</tr>
<tr>
<td>SRN</td>
<td>FRU List</td>
<td>Problem</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| 50004 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** A channel check has occurred.  
**Action:** Exchange the FRU for a new FRU. |
| 50005 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** A software error has occurred.  
**Action:** Go to “Software and Microcode Errors” on page 2-4 before exchanging the FRU. |
| 50006 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** A channel check has occurred.  
**Action:** Exchange the FRU for a new FRU. |
| 50007 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** The input/output channel controller (IOCC) detected an internal error.  
**Action:** Exchange the FRU for a new FRU. |
| 50008 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** Unable to read or write the POS registers.  
**Action:** Exchange the FRU for a new FRU. |
| 50010 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** An SSA adapter or device drive protocol error has occurred.  
**Action:** Go to “Software and Microcode Errors” on page 2-4 before exchanging the FRU. |
| 50012 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** The SSA adapter microcode is in a suspended state.  
**Action:** Run diagnostics in System Verification mode to the SSA adapter.  
  If the diagnostics fail, exchange the FRU for a new FRU.  
  If the diagnostics do not fail, go to “Software and Microcode Errors” on page 2-4 before exchanging the FRU. |
| 50100 | None | **Description:** An attempt was made to log an error against a pdisk that is not available to the using system.  
**Action:** This problem has occurred for one of the following reasons:  
  A user has deleted a pdisk from the system configuration.  
  In such an instance, the hdisk that is related to the pdisk continues to operate normally.  
  If the disk drive module tries to log an error, however, this SRN (50100) is produced. Enter the `cfgmgr` command to return the pdisk to the system configuration.  
  A disk drive module has tried to log an error during system configuration.  
  To find the failing disk drive module, run diagnostics to the disk drive modules that are connected to this SSA adapter.  |
| 60000 | SSA adapter card (See the installation and service guide for the using system.) | **Description:** The SSA adapter is missing from the expected configuration.  
**Action:** Verify that the SSA adapter card is installed in the expected slot of the using-system.  
  If it is in the expected slot, exchange the FRU for a new FRU.  
  If it is not in the expected slot, enter the `diag -a` command, and answer the questions that are displayed. |
| 7xxxx | None | **Description:** An SSA disk drive module is missing from the expected configuration of the SSA loop.  
**Action:** The missing disk drive module is not associated with a 7131 Storage Tower. Go to the service information for another device that is in the same SSA loop.  
**Note:** In this SRN, an x represents a digit from 0 to F. |
<table>
<thead>
<tr>
<th>SRN</th>
<th>FRU List</th>
<th>%</th>
<th>Problem</th>
</tr>
</thead>
</table>
| D000  | Disk drive module         | 100| Description: The using system cannot configure the disk drive module. This is probably a software problem.  
Action:  
1. Try again to configure the disk drive module.  
2. If the problem remains, go to “Software and Microcode Errors” on page 2-4 before exchanging the FRU. |
| D0100 | Disk drive module         | 100| Description: Unable to clear a disk drive module reservation.  
Action: Exchange the FRU for a new FRU. |
| D0101 | Disk drive module         | 100| Description: The disk drive module has been reserved since the diagnostics started. The disk drive module is in use.  
Action: Release the disk drive module, and run the diagnostics again. |
| D0200 | Disk drive module         | 100| Description: The disk drive module timed out while the diagnostics were running.  
Action: Rerun the diagnostics. If the problem remains, exchange the FRU for a new FRU. |
| D0300 | Disk drive module         | 100| Description: The disk drive module failed the diagnostic test.  
Action: Exchange the FRU for a new FRU. |
| D0400 | Disk drive module         | 100| Description: The disk drive module is not ready while the diagnostics are running.  
Action: Rerun the diagnostics. If the problem remains, exchange the FRU for a new FRU. |
| D0450 | None                      | –  | Description: A format operation is in progress. The format operation that was started on this disk drive module has not yet finished. A format operation can take up to 30 minutes to run.  
Action: Wait for the format operation to finish before you run the diagnostics again. You can observe the progress of the Format operation by running the Format service aid again on this disk drive module. |
| D0460 | None                      | –  | Description: A format operation has been degraded. The format operation that was started on this disk drive module did not finish. Possibly, the disk drive module was switched off while the format operation was running.  
Action: Run the Format service aid to format this disk drive module. |
| D4000 | SSA adapter card          | 100| Description: The diagnostics cannot configure the SSA adapter.  
Action: Exchange the FRU for a new FRU. |
| D4100 | SSA adapter card          | 100| Description: The diagnostics cannot open the SSA adapter.  
Action: Exchange the FRU for a new FRU. |
| D4300 | SSA adapter card          | 100| Description: The diagnostics have detected an SSA adapter POST failure.  
Action: Exchange the FRU for a new FRU. |
| D44xx | SSA adapter card          | 100| Description: The diagnostics have detected that the SSA adapter has corrupted the microcode, but cannot download a new version of the microcode.  
Action: Exchange the FRU for a new FRU.  
Note: In this SRN, an x represents a digit 0 through F. |
| DFFFF | SSA adapter card          | 100| Description: A command or parameter that has been sent or received is not valid. This problem is caused either by the SSA adapter or by an error in the microcode.  
Action: Go to “Software and Microcode Errors” on page 2-4 before exchanging the FRU. |
SSA Loop Configurations That Are Not Valid

**Note:** This section is related to SRN 48000.

SRN 48000 shows that the SSA loop contains more devices or adapters than are allowed. The following condition exist: the loop contains more than 48 devices.

If the SRN occurred when either you or the customer switched on the using system:

1. Switch off the using system.
2. Review the configuration that you are trying to make, and determine why that configuration is not valid.
4. Correct your configuration by reconfiguring the SSA cables or by removing the excess devices or adapters from the loop.
5. Switch on the using system.

If the SRN occurred because additional devices or adapters were added to a working SSA loop:

1. Remove the additional devices or adapters that are causing the problem, and put the loop back into its original, working configuration.
   **Note:** It is important that you perform these actions, because they enable the configuration code to reset itself from the effects of the error.
3. Review the configuration that you are trying to make, and determine why that configuration is not valid.
4. Correct your system to a valid configuration.
Maintenance Analysis Procedures (MAPs)

These maintenance analysis procedures (MAPs) describe how to analyze a continuous failure that has occurred in a 7131 Storage Tower that contains two or more disk drive modules. Failing field-replaceable units (FRUs) of the 7131 Storage Tower can be isolated with these MAPs.

How to Use These MAPs

Attention: Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:

a. Use the system-management task menus of the host system to make the disk drive modules unavailable.

b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive modules unavailable to the host system or to the host systems for each of the paths to the 7131 Storage Tower.

Attention: Unless the using system needs to be switched off for some other reason, do not switch off the power to the using system when servicing the 7131 Storage Tower or the external SSA cable.

To isolate the FRUs in the failing 7131 Storage Tower, perform the actions and answer the questions given in these MAPs.

When instructed to exchange two or more FRUs in sequence:

1 Exchange the first FRU in the list for a new one.

2 Verify that the problem is solved. For some problems, verification means running the diagnostic programs (see the using-system service procedures).

3 If the problem remains:
   a. Reinstall the original FRU.
   b. Exchange the next FRU in the list for a new one.

4 Repeat steps 2 and 3 until either the problem is solved, or all the related FRUs have been exchanged.

5 Perform the next action indicated by the MAP.

See “Power Switch and Power Light” on page 1-2 and “Disk Drive Module Lights and Latch” on page 1-4 for locations and descriptions of the lights and switches.
MAP 2010: 7131 Storage Tower–Start

This MAP is the entry point to the MAPs for the 7131 Storage Tower. If you are not familiar with these MAPs, read “How to Use These MAPs” on page 2-11 first.

You might have been sent here because:

- The system problem determination procedures sent you here.
- Action from an SRN list sent you here.
- A problem occurred during the installation of a 7131 Storage Tower or a disk drive module.
- Another MAP sent you here.
- A customer observed a problem that was not detected by the system problem determination procedures.

Attention: Unless the using system needs to be switched off for some other reason, do not switch off the using system when servicing the 7131 Storage Tower or an SSA link. Power cables and external SSA cables that connect the 7131 Storage Tower to the using system can be disconnected while the using system is running.

Perform the following procedure to analyze the problem:

1. Do you see smoke or smell a burning odor coming from the 7131 Storage Tower?
   - Yes
   - No
   Go to step 5.

2. If the 7131 Storage Tower is switched on, switch it off by pressing the power switch.

3. At the back of the 7131 Storage Tower, disconnect the line cord.

4. Call your support center for assistance.

5. Have you been sent to this MAP from the SRN list in this book?
   - No
   - Yes
   Go to step 12 on page 2-13.

6. Have you been sent to this MAP from the Configuration Verification service aid?
   - Yes
   - No
   Go to step 8 on page 2-13.
One of the following conditions exist. Take the action described.

You have an hdisk that has no associated pdisk.

1) Issue the system `cfgmgr` command.
2) Retry the Configuration Verification service aid.
3) If the problem remains, a software error has probably occurred. Call your support center for assistance.

You have a pdisk that has no associated hdisk.

1) Run diagnostics (using system verification mode) to the pdisk.
   - If you get an SRN, go to Table 2-1 on page 2-5 and follow the actions described.
   - If you do not get an SRN, the disk formatting may be incompatible with the system (the disk was formatted on a different type of using system, that is, not an RS 6000).
     a) Format the pdisk.
     b) Issue the system `cfgmgr` command
     c) Retry the Configuration Verification service aid.
2) If the problem remains, a software error has probably occurred. Call your support center for assistance.

Have the system diagnostics or problem determination procedures given you an SRN for the 7131 Storage Tower?

No  Yes

Go to “Service Request Numbers (SRNs)” on page 2-3.

If the system diagnostics are available, go to step 10.
If the stand-alone diagnostics are available, but the system diagnostics are not available, run them, then go to step 10.
If the system diagnostics and stand-alone diagnostics are not available, go to step 12.

Run the diagnostics in the problem determination mode.

Note: Do not run the advanced diagnostics, because errors are logged on other using systems that share the same loop.

Did the diagnostics give you an SRN for the 7131 Storage Tower?

No  Yes

Go to “Service Request Numbers (SRNs)” on page 2-3.

Does any 7131 Storage Tower have its power light off?

Yes  No

Go to step 18 on page 2-14.
13 Do any disk drive modules in the 7131 Storage Tower have their power light on?
   No      Yes
   Replace the power supply because the power supply light is bad. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

14 Check that the power source is supplying proper voltage.

15 Check that the voltage selection switch on the back of the power supply is set to the proper voltage.

16 Check that the 7131 Storage Tower power is switched on, by pressing the power switch.

17 If the problem is not solved, exchange the power supply for a new power supply. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

18 Does any 7131 Storage Tower have a disk drive module power light off?
   Yes     No
   Go to step 31 on page 2-15.

19 Is there more than one disk drive module with its power lights off in the 7131 Storage Tower?
   Yes     No
   Go to step 23.

20 Disconnect, but do not remove, all of the disk drive modules. Do not disconnect the dummy disk drive modules.

21 Install a disk drive module in slot 1.

22 Go to step 25.

23 Remove the disk drive module that has its power light off. Install a different disk drive module into the same slot. Did the disk drive module power light go on?
   No      Yes
   Replace the original disk drive module. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26.


25 Did the disk drive module power light go on?
   No      Yes
   Go to step 28 on page 2-15.
26 Install a different disk drive module into the same slot.
   Did the disk drive module power light go on?
   Yes   No
   Check the power connection on the backplane. Exchange the backplane.
   Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

27 Exchange the disk drive module that was exchanged in step 19 on page 2-14 or step 28.
   Is this the last disk drive module?
   No   Yes
   Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

28 Install the next disk drive module.
   Did the disk drive module power light go on?
   Yes   No
   Return to step 26.

29 Is this the last disk drive module?
   No   Yes
   No problems were found.

30 Repeat step 28.

31 Are any disk drive module check lights on or flashing?
   Yes   No
   Go to “MAP 2320: 7131 Storage Tower–SSA Link” on page 2-16.

32 Is the check light on continuously?
   Yes   No
   If the check light is flashing, it has been set by a service aid. Check the other using systems to find out which service aid is being used.

33 Is the disk drive module is in the service mode (The service mode might have been set from another using system).
   No   Yes
   Reset the disk drive module when possible.

34 Exchange the disk drive module for a new one. See “Disk Drive Module” on page 3-12.

35 Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.
MAP 2320: 7131 Storage Tower–SSA Link

This MAP helps you to isolate FRUs that are causing an SSA link problem between a 7131 Storage Tower and the SSA adapter, or between a 7131 Storage Tower and other devices. If you are not familiar with the SSA link, read the section “SSA Loops and Links” on page 1-12 before using this MAP. “SSA Loops and Links” explains SSA links, strings, loops, and the meanings of the disk drive module ready lights.

Attention: Unless the using system needs to be switched off for some other reason, do not switch off the using system when servicing the 7131 Storage Tower or an SSA link. Power cables and external SSA cables that connect the 7131 Storage Tower to the using system can be disconnected while the using system is running.

Perform the following procedure to analyze the problem:

1. Are the system service aids available?
   - No
   - Yes
     
     Go to step 8 on page 2-17.

2. Does any disk drive module in a 7131 Storage Tower, or elsewhere in the using system, have its ready light off or flashing (2 seconds on, 2 seconds off)?
   - No
   - Yes
     
     Go to step 6.

3. Observe the lights on the SSA adapters in the using systems.
   - Does any SSA adapter have either, or both, of its lights off or flashing?
     - Yes
     - No

     No trouble found.

4. Is the SSA adapter in a different using system from the one to which the 7131 Storage Tower is connected?
   - No
   - Yes
     
     Go to the using system that contains the SSA adapter, and return to step 1 of this MAP.

5. Exchange the following FRUs in the sequence shown. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair for each FRU exchanged.
   - 1) If present, the external SSA cables that are attached to the connectors on each side of the light that is flashing (or off) on the SSA adapter (see “The SSA Adapter” on page 1-13).
   - 2) The devices at the other end of these external SSA cables. Refer to the user's guide of the other device.
   - 3) The adapter whose light is off or flashing (see the installation and service guide for the using system)

6. Is the disk drive module whose ready light is off or flashing installed in the 7131 Storage Tower?
   - No
   - Yes
     
     Go to step 4 on page 2-22 of “MAP 2321: 7131 Storage Tower–Internal Link.”
7 Go to the service information for that device.

8 Run the Link Verification service aid (see “Link Verification Service Aid” on page 1-21), and select the appropriate SSA adapter from the displayed Link Verification adapter menu.

If the service aid detects pdisks for the adapter you have selected, a list of pdisks is displayed. The diagram shows an example list.

```
LINK VERIFICATION 8 2386
SSA Link Verification for:
ssa1 - 5 SSA ADAPTER

To set or reset Identify, move cursor onto selection, then press Enter.

<table>
<thead>
<tr>
<th>Physical</th>
<th>Serial#</th>
<th>Adapter Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A2</td>
<td>B1</td>
</tr>
<tr>
<td>{TOP}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk  nnnnnnn</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>pdisk1  nnnnnnn</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>pdisk2  nnnnnnn</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>pdisk3  nnnnnnn</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>pdisk4  nnnnnnn</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>pdisk5  nnnnnnn</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>pdisk6  nnnnnnn</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>pdisk7  nnnnnnn</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>pdisk8  nnnnnnn</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>pdisk9  nnnnnnn</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

{MORE}
```

F3=Cancel  F1 =Exit

9 Are any pdisks listed for the selected SSA adapter?

No Yes

Go to step 12 on page 2-18.

10 Continue with step 11 on page 2-18

If the service aid cannot detect any pdisks, a message is displayed.

```
LINK VERIFICATION 8 2385
Move cursor onto selection, then press Enter.

ssa  - 3 SSA Adapter
ssa1 - 5 SSA Adapter
ssa2 - 6 SSA Adapter
ssa3 - 7 SSA Adapter

No 'Available' pdisks have been detected for this adapter.

If pdisks have been added to this adapter run 'cfgmgr' to configure the new devices before re-selecting this option.

If pdisks cannot be configured go to the START page in the Installation and Service Guide.

F3=Cancel  F1 =Exit
```

9 Are any pdisks listed for the selected SSA adapter?

No Yes

Go to step 12 on page 2-18.
One of the following conditions exists. Take the action described.

No physical disks are connected to this SSA adapter:

1) Ensure that the external SSA cables are correctly connected to the 7131 Storage Tower and to the SSA adapter.

2) Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

All the disk drive modules are switched off. Go to “MAP 2010: 7131 Storage Tower–Start” on page 2-12.

The SSA adapter is failing:

1) Exchange the SSA adapter for a new one (see the installation and service guide for the using system).

2) Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

Observe the Status column on the screen. If the status of any pdisk is failed, that pdisk is failing. In the example shown here, pdisk4 is failing.

Is only one pdisk failing?

Yes No

Go to step 17 on page 2-19.

Use the identify function (as instructed on the screen) to find the failing pdisk. See “Finding the Physical Location of a Device” on page 1-32 if you need more information about finding the disk drive module.

Exchange the disk drive module for a new one (see “Disk Drive Module” on page 3-12).

Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.
17 More than one pdisk is failing.
   Use the Identify function to locate all of the failing pdisks. For more information, see “Finding the Physical Location of a Device” on page 1-32.

18 If all disk drive modules identified are in the same 7131 Storage Tower, then the fan is bad. Exchange the fan.

19 Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

20 Observe the list of pdisks on the screen. A row of question marks (??????) shows that a link in one of the loops is broken. If two rows of question marks are displayed, two links are broken, one in each loop. In the example shown here, pdisk2 is missing.

```
F3=Cancel  F1 =Exit
```

21 Is a link broken between two pdisks?
   Yes  No
   Go to step 25 on page 2-20.

22 Use the identify function (as instructed on the screen) to find the pdisks that are on each side of the broken link. See “Finding the Physical Location of a Device” on page 1-32 if you need more information about finding the disk drive module.

23 Is either of the disk drive modules in the 7131 Storage Tower?
   No  Yes
   Go to “MAP 2321: 7131 Storage Tower–Internal Link” on page 2-22.
24 If the failing device is not in a 7131 Storage Tower, go to the service information for that device.

25 Observe the list of pdisks on the screen. A row of question marks (?????) indicates that a configured pdisk is not present for a particular SSA address. A row of asterisks (*****) indicates an unconfigured device.

26 Is a link broken between a pdisk and an unconfigured device?
   Yes  No
   Go to step 31 on page 2-21.

27 Use the Identify function (as instructed on the screen) to find the pdisk that is next to the broken link.

28 Is the pdisk in a 7131 Storage Tower?
   No  Yes
   Go to "MAP 2321: 7131 Storage Tower–Internal Link" on page 2-22.

29 Find the unconfigured device by following the cable.

30 Exchange the following FRUs in the sequence shown. Go to "MAP 2410: 7131 Storage Tower–Repair Verification" on page 2-26 to verify the repair for each FRU exchanged.

   1) Disk drive module. If the failing device is not in a 7131 Storage Tower, go to the service information for that device.

   2) The appropriate external SSA cable.

   3) Unconfigured device.
31 Observe the adapter port columns on the screen. In the example, the column that represents the A2 connector of the SSA adapter is blank. The link is, therefore, broken between connector A2 and the pdisks.

**Physical Serial#** **Adapter Port**

<table>
<thead>
<tr>
<th></th>
<th>A1</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>pdisk</td>
<td>nnnnnnnn</td>
<td>1</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk2</td>
<td>nnnnnnnn</td>
<td>2</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk3</td>
<td>nnnnnnnn</td>
<td>3</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk4</td>
<td>nnnnnnnn</td>
<td>4</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk5</td>
<td>nnnnnnnn</td>
<td>5</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk6</td>
<td>nnnnnnnn</td>
<td>6</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk7</td>
<td>nnnnnnnn</td>
<td>7</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk8</td>
<td>nnnnnnnn</td>
<td>3</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pdisk9</td>
<td>nnnnnnnn</td>
<td>1</td>
<td>Good</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MORE**

32 **Is the link broken between the selected SSA adapter and a pdisk?**

- **No**
  - Go to step 36.
- **Yes**
  - Go to step 36.

33 The link is broken between two unconfigured devices.

Find one of the unconfigured devices (probably an SSA adapter), which can be identified by its flashing light.

34 To further isolate the problem, run the service aids on the using system in which that device is installed.

35 Go to step 1 on page 2-16 of this MAP.

36 Exchange the following FRUs in the sequence shown. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair for each FRU exchanged.

At the using-system:

1) The appropriate external SSA cable

   If the external SSA cable is attached to a 7131 Storage Tower, also exchange:
   - Disk drive modules or dummy disk drive modules (see “Disk Drive Module” on page 3-12).
   - Internal SSA cable (see “Internal SSA Cable” on page 3-9).

2) The SSA adapter (see the installation and service guide for the using system).
MAP 2321: 7131 Storage Tower–Internal Link

This MAP helps you to isolate FRUs that are causing an internal SSA link problem in a 7131 Storage Tower. If you are not familiar with the SSA link, read the section “SSA Loops and Links” on page 1-12 before using this MAP. “SSA Loops and Links” explains SSA links, strings, loops, and the meanings of the disk drive module ready lights.

Attention: Unless the using system needs to be switched off for some other reason, do not switch off the using system when servicing the 7131 Storage Tower or an SSA link. Power cables and external SSA cables that connect the 7131 Storage Tower to the using system can be disconnected while the using system is running.

Note: In this MAP, some steps refer to the slot numbers of the disk drive modules in the 7131 Storage Tower. The slots are sequential, starting with slot 1 in the bottom through slot 5 in the top.

Perform the following procedure to analyze the problem:

1. In “MAP 2320: 7131 Storage Tower–SSA Link,” the identify function was used to find one or more pdisks. On each pdisk that you selected, the ready light, check light, or both lights should be flashing. You can refer to either light to identify the position of the disk drive module.

   Does any disk drive module have all three of its lights switched off?

   Yes  No

   Go to step 4.

2. Exchange the disk drive module that has all lights off.

3. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair.

4. Observe the disk drive modules, and check whether the ready lights, check lights, or both lights are flashing on two disk drive modules that are in the same 7131 Storage Tower (see “Disk Drive Module Strings” on page 1-12).

   Note: If lights are flashing on more than two disk drive modules that are in the same 7131 Storage Tower, work with two modules at a time. The modules must be sequential. For example, if lights are flashing on modules 1, 4, and 5, work with modules 1 and 4, or 4 and 5. Do not work with modules 1 and 5. If the problem remains, return to this step, and work with the modules whose lights are still flashing.

   Do two or more disk drive modules that are in the same 7131 Storage Tower have their ready lights, check lights, or both lights flashing?

   Yes  No

   Go to step 6 on page 2-23.

5. Exchange the following FRUs in the sequence shown. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair for each FRU exchanged.

   1) Either of the two disk drive modules (see “Disk Drive Module” on page 3-12).
   2) The other of the two disk drive modules.
   3) Dummy disk drive modules (if present between the two disk drive modules).
   4) The backplane assembly (see “Backplane Assembly” on page 3-16).
6 Does disk drive module in slot 5 (top) have its ready light, check light, or both lights flashing?
   Yes  No
   Go to step 8.

7 Exchange the following FRUs in the sequence shown. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair for each FRU exchanged.
   1) The upper external SSA cable (see “External SSA Cable” on page 3-5).
   2) The disk drive modules in slot 5 (top) (see “Disk Drive Module” on page 3-12).
   3) The upper internal SSA cable (see “Internal SSA Cable” on page 3-9).
   4) The backplane assembly (see “Backplane Assembly” on page 3-16).

8 Does disk drive module in slot 1 (bottom) have its ready light, check light, or both lights flashing?
   Yes  No
   Go to “MAP 2010: 7131 Storage Tower–Start” on page 2-12.

9 Exchange the following FRUs in the sequence shown. Go to “MAP 2410: 7131 Storage Tower–Repair Verification” on page 2-26 to verify the repair for each FRU exchanged.
   1) The lower external SSA cable (see “External SSA Cable” on page 3-5).
   2) The disk drive modules in slot 1 (bottom) (see “Disk Drive Module” on page 3-12).
   3) The lower internal SSA cable.
   4) The backplane assembly (see “Backplane Assembly” on page 3-16).
This MAP helps you to isolate FRUs that are causing an intermittent SSA link problem. You are here because you have a service request number (SRN) from 21000 through 29000.

If you are not familiar with the SSA link, read the section “SSA Loops and Links” on page 1-12 before using this MAP. “SSA Loops and Links” explains SSA links, strings, loops, and the meanings of the disk drive module ready lights.

Attention: Unless the using system needs to be switched off for some other reason, do not switch off the using system when servicing the 7131 Storage Tower or an SSA link. Power cables and external SSA cables that connect the 7131 Storage Tower to the using system can be disconnected while the using system is running.

1 Run the Link Verification service aid to the SSA adapter for which this error has been logged (see “Link Verification Service Aid” on page 1-21). A list of pdisks, similar to the following example, is displayed.

```
LINK VERIFICATION 8 2386
SSA Link Verification for:
ssa -  4  SSA ADAPTER
To set or reset Identify, move cursor onto selection, then press Enter.

Physical Serial# Adapter Port  A1  A2  B1  B2  Status
{TOP}
pdisk1  5AEA8  89   3  Good
pdisk2  5AEA  35  1  2  Good
pdisk3  5AEA1  1  2  1  Good
pdisk4  5AEA172  3  Good
{BOTTOM}
F3=Cancel  F1 =Exit
```

Note: On the Link Verification screen, each adapter port is identified by the number of its related connector on the adapter card:

- Adapter port 0 is identified as A1
- Adapter port 1 is identified as A2
- Adapter port 2 is identified as B1
- Adapter port 3 is identified as B2

SRNs from 21000 to 29000 include the adapter port number (0–3).

2 Observe the SRN that sent you to this MAP. It is in the series 21PAA through 29PAA (where P is the number of the SSA adapter port, and AA is the SSA address of the device).

Note the value of PAA in the SRN. For example:

- If the SRN is 24002, PAA = 002.
- If the SRN is 24104, PAA = 104.
The following examples use the Link Verification screen displayed on page 2-24 to illustrate how to identify the adapter port and the physical device that is represented by PAA in the SRN. This information is required to isolate the possible FRUs causing the intermittent failures.

**Note:** If the SSA address (AA) in the SRN is higher than the highest SSA address that is displayed for the adapter port (P), then that address is the address of the SSA adapter.

**EXAMPLE 1 SRN = 24002 (24PAA)**

P = 0 indicates the device is connected to adapter port 0 (shown as A1 on the example screen).

AA = 02 indicates the device has an SSA address of 02 (shown as 2 on the example screen). In this example, that device is pdisk3.

SRN 24002 indicates the problem is occurring in the SSA link between the pdisk3 (AA = 02), and the device on the same adapter port (P = 0), whose SSA address has a value of one less than AA (AA minus 1).

In this example, SRN 24002 identified pdisk3 (AA = 02). The address of the other device on the link equals 01 (02 minus 1). SSA address 01 is the address of pdisk2.

Therefore, SRN 24002 indicates that the link errors were detected between pdisk2 and pdisk3.

**EXAMPLE 2 SRN = 24104 (24PAA)**

P = 1 indicates the device is connected to adapter port 1 (shown as A2 on the example screen).

AA = 04 indicates the device has an SSA address of 04. Address 04 is higher than the highest address that is displayed for adapter port 1. Therefore, the device in this example is the SSA adapter.

SRN 24104 indicates the problem is occurring in the SSA link between the SSA adapter (AA = 04), and the device on the same adapter port (P = 1), whose SSA address has a value of one less than AA (AA minus 1).

In this example, SRN 24104 identified the SSA adapter (AA = 04). The address of the other device on the link equals 03 (04 minus 1). SSA address 03 is the address of pdisk1.

Therefore, SRN 24104 indicates that the link errors were detected between SSA adapter port A2 and pdisk1.

**Exchange the following FRUs in the sequence shown. Go to “MAP 2410: 7131 Storage Tower—Repair Verification” on page 2-26 to verify the repair for each FRU exchanged.**

1) One of the two devices that are identified by the SRN. (If the device is a pdisk, see “Disk Drive Module” on page 3-12; if the device is an adapter, see the installation and service guide for the using system.

2) The other of the two devices.

3) The backplane (see “Backplane Assembly” on page 3-16).

4) The external SSA cable.
MAP 2410: 7131 Storage Tower–Repair Verification

This MAP helps you to verify a repair after a FRU has been exchanged for a new one.

Attention: Unless the using system needs to be switched off for some other reason, do not switch off the using system when servicing the 7131 Storage Tower or an SSA link. Power cables and external SSA cables that connect the 7131 Storage Tower to the using system can be disconnected while the using system is running.

Before you arrived at this MAP, you exchanged one or more FRUs. Some of those FRUs have power lights (for example, the disk drive modules and the power supply). Check whether the power lights are on.

Do all the FRUs you have exchanged have their power lights on (where applicable)?

Yes No

Exchange the FRU that has a power light that is off, and then go to step 1.

1 Are all disk drive module check lights off?

Yes No

Go to “MAP 2010: 7131 Storage Tower–Start.”

2 Run the diagnostics in the system verification mode to the device that reported the problem.

Notes:

a. Do not run the advanced diagnostics; otherwise, errors are logged on other using systems that share the same loop.

b. If you have just exchanged a disk drive module or an SSA adapter, you might need to run the cfgmgr command to restore the device to the system configuration.

If the original problem was not reported by a device, run the diagnostics to each SSA adapter in the using system.

3 Run the Product Topology service aid.

Note: If you do not run this service aid, the diagnostics might create an SRN for a problem that has already been solved.
Chapter 3. Removal and Replacement Procedures

This chapter contains procedures for removing, replacing, and installing 7131 Storage Tower field replaceable units (FRUs).

Refer to “Safety and Environmental Notices” on page vii before removing and replacing any FRUs.

Refer to “Handling ESD-Sensitive Parts” on page 3-2 before you work with any logic cards or cables that are connected to FRUs that are sensitive to electrostatic discharge (ESD).

CAUTION:
The weight of this part or unit is between 18 and 32 kilograms (39.7 and 70.5 pounds). It takes two persons to safely lift this part or unit. (RSFTC204)

If it is necessary to move the 7131 Storage Tower, ensure that two people are available to move it.

Handling ESD-Sensitive Parts .......................................................... 3-2
Front Cover .......................................................... 3-3
Top Cover .......................................................... 3-4
External SSA Cable .......................................................... 3-5
Line Cord .......................................................... 3-7
Internal SSA Cable ......................................................... 3-9
Dummy Disk Drive Module .................................................. 3-11
Disk Drive Module .......................................................... 3-12
Backplane Assembly .......................................................... 3-16
Power Supply and Power Switch ........................................... 3-18
Control Panel .......................................................... 3-20
Fan .......................................................... 3-22
Handling ESD-Sensitive Parts

**Attention:** The disk drive modules and the backplane are sensitive to electrostatic discharge. They are wrapped in ESD-sensitive bags to prevent damage. Handle the ESD-sensitive parts carefully to prevent permanent damage.

Take the following precautions:

1. Do not remove the ESD-sensitive part from the ESD-sensitive bag until you are ready to install it. See Figure 3-1.

2. Just before touching the ESD-sensitive part, discharge any static electricity in your body by touching the metal frame of the machine. If possible, keep one hand on the frame when you are installing or exchanging an ESD-sensitive part.

3. Do not put any ESD-sensitive parts on the machine cover or on a metal table because large metal objects can become discharge paths if they are not grounded. If you must set aside an ESD-sensitive part, first put it into the special ESD bag.

4. Be very careful when you work with ESD-sensitive parts in cold weather. Low humidity and heating increase static electricity.

5. When either end of a SSA cable is not connected to a device, the pins on the external SSA cable are exposed and must not be touched.

![Figure 3-1. ESD-Sensitive Part in Antistatic Bag](image-url)
Front Cover

This procedure describes how to remove and replace the front cover.

Front Cover Removal

1. Open the front cover beyond a 90° angle. See Figure 3-2.
2. Hold the top and bottom of the cover, and lift it straight up to remove it.

Front Cover Replacement

1. Align the top of the cover (at a 90° angle) with the hinges, and press it down.
2. Close the front cover.
Top Cover

This procedure describes how to remove and replace the top cover.

Top Cover Removal

1. Open the front cover. See Figure 3-2 on page 3-3.
2. At the back of the 7131 Storage Tower, remove the four screws that fasten the top cover to the 7131 Storage Tower. See Figure 3-3.
3. Lift and remove the top cover from the 7131 Storage Tower.

Figure 3-3. Top Cover

Top Cover Replacement

1. Put the top cover on the 7131 Storage Tower.
2. Install and tighten the four screws to fasten the top cover to the 7131 Storage Tower.
3. Close the front cover.
External SSA Cable

This procedure describes how to remove and replace the external SSA cable.

External SSA Cable Removal

1 **DANGER**

   To prevent a possible electrical shock during an electrical storm, do not connect or disconnect cables or station protectors for communications lines, display stations, printers, or telephones. *(RSFTD003)*

   **DANGER**

   To prevent a possible electrical shock from touching two surfaces with different electrical grounds, use one hand, when possible, to connect or disconnect signal cables. *(RSFTD004)*

2 Loosen the two retention screws on the external SSA cable connector on the 7131 Storage Tower. and disconnect the external SSA cable from the rear of the 7131 Storage Tower. See Figure 3-4.

3 Loosen the two retention screws on the external SSA cable connector on the host system. and disconnect the external SSA cable from the host system.

![Figure 3-4. External SSA Cable](image-url)
External SSA Cable Replacement

1 DANGER

To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device. (RSFTD203)

DANGER

To prevent a possible electrical shock when installing the device, ensure that the power cord for that device is unplugged before installing signal cables. (RSFTD204)

2 Connect the new external SSA cable to the back of the 7131 Storage Tower.

3 Tighten the two retention screws to the external SSA cable.

4 Connect the external SSA cable to the host system.

5 Tighten the two retention screws to the host system.

Figure 3-5. External SSA Cable
Line Cord

This procedure describes how to remove and replace the line cord.

Line Cord Removal

1 Open the front cover. See Figure 3-2 on page 3-3.

2 Attention: Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:
   a. Use the system-management task menus of the host system to make the disk drive modules unavailable.
   b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive modules unavailable to the host system or to the host systems for each of the paths to the 7131 Storage Tower.

3 Set the power switch to Off.

4 Disconnect the line cord from the power source and from the 7131 Storage Tower. See Figure 3-6.

Figure 3-6. Line Cord on 7131 Storage Tower
Line Cord Replacement

1 Connect the line cord to the 7131 Storage Tower.

2 DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)

3 Connect the line cord to the power source.

4 Set the power switch to on.

5 Close the front cover.

Figure 3-7. Line Cord on 7131 Storage Tower
Internal SSA Cable

Attention: Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

This procedure describes how to remove and replace the internal SSA cable.

Internal SSA Cable Removal

1. Open the front cover. See Figure 3-2 on page 3-3.

2. **Attention:** Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:
   a. Use the system-management task menus of the host system to make the disk drive modules unavailable.
   b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive modules unavailable to the host system or to the host systems for each of the paths to the 7131 Storage Tower.

3. Set the power switch to Off, if it is On.

4. Disconnect the line cord from the power source.

5. Loosen the two retention screws on the external SSA cable. See Figure 3-8

6. Disconnect the external SSA cable.

7. Remove the top cover from the 7131 Storage Tower. See Figure 3-3 on page 3-4.

8. Disconnect the SSA cable from the backplane. See Figure 3-8.

9. Remove the two screws from the bracket that holds the SSA cable to the rear of the 7131.

![Figure 3-8. Internal SSA Cable](image-url)
Internal SSA Cable Replacement

1. Connect the SSA cable as follows:
   a. Install and tighten the 2 screws on the SSA cable bracket on the back of the 7131 Storage Tower.
   b. Connect the SSA cable connectors to the backplane.

2. Put the top cover on the 7131 Storage Tower.

3. Install and tighten the four screws to fasten the top cover to the 7131 Storage Tower.

4. Connect the external SSA cable to the back of the 7131 Storage Tower.

5. Tighten the two retention screws on the external SSA cable.

6. **DANGER**

   An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer’s responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.  

   (RSFTD201)

7. Connect the line cord to the power source.

8. Set the power switch to on.

9. Close the front cover.
Dummy Disk Drive Module

This procedure describes how to remove and replace a dummy disk drive module. A dummy disk drive module must be installed in any slot that does not contain a disk drive module to complete the SSA loop through the 7131 Storage Tower.

**Note:** Dummy disk drive modules should never be used in slot 1 or slot 5.

**Dummy Disk Drive Module Removal**

1. Open the front cover. See Figure 3-10.
2. Move the latch down on the dummy disk drive module.
3. Pull the dummy disk drive module out, keeping it straight to prevent damage.

![Figure 3-10. Disk Drive Modules in the 7131 Storage Tower](image)

**Dummy Disk Drive Module Replacement**

1. Move the latch down on the dummy disk drive module, then slide it into the slot.
2. Press the dummy disk drive module firmly to seat it to the backplane.
3. Move the latch up on the dummy disk drive module.
4. Close the front cover.
Disk Drive Module

Attention: Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

This procedure describes how to remove and replace a disk drive module when the power to both the host system and the 7131 Storage Tower is on or when the power to the 7131 Storage Tower is either On or Off. The disk drive module is installed in any of the five slots. See Figure 3-11.

Disk Drive Module Removal

1 Open the front cover.

2 Attention: The following procedure can cause a system fault unless you first make the disk drive module unavailable to the using system. To do this:
   a. Use the system-management task menus of the using system to make the disk drive module unavailable.
   b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive module unavailable to the using system or to the using systems for each of the paths to the 7131 Storage Tower.

3 Open the front cover.

---

Figure 3-11. Disk Drive Modules in the 7131 Storage Tower
If you are here because of a disk drive failure, then attempt to resolve the problem by reseating the disk drive module. Move the latch down on the disk drive module and slide it out slightly and then firmly seat it on the backplane.

If reseating the disk drive module resolves the problem, then return the 7131 Storage Tower to the customer and verify proper operation.

If reseating the disk drive module does not resolve the problem, then continue with step 5 to remove the disk drive.

5 Pull the disk drive module out, keeping it straight to prevent damage.

6 If you are not removing the hard-disk drive from the carrier, continue with step 7.
   If you are removing the hard-disk drive from the carrier: See Figure 3-12.
   a. Remove the four screws.
   b. Disconnect the cable from the hard-disk drive.

7 Place the disk drive module or disk drive on the ESD mat.

8 Place the disk drive module in an antistatic bag if you are going to reuse it.

9 Attention: Any slot without a disk drive module must contain a dummy disk drive module to provide continuity of the SSA loop.

10 Close the front cover.
Disk Drive Module Replacement

Attention: Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

1 If you did not remove the disk drive from the carrier, continue with 2.

   If you removed the disk drive from the carrier, put new disk drive on the carrier. See Figure 3-13.
   a. Connect the cable to the disk drive.
   b. Install and tighten the 4 screws.

   ![Hard-Disk Drive](image)

2 Move the latch down on the disk drive module, then slide it into the slot.

3 Press the disk drive module firmly to seat it on the backplane.

4 Move the latch up on the disk drive module.

5 Verify that the front of all the disk drive modules are aligned.

6 Verify that the ready light to the disk drive module is on; light is steady, not flashing (Figure 3-14 on page 3-15).
   a. If the ready light is not steady, then attempt to resolve the problem by reseating the disk drive module. Move the latch down on the disk drive module and slide it out slightly and then firmly seat it on the backplane.
   b. If the ready light is not steady after reseating the disk drive module, then go to “MAP 2010: 7131 Storage Tower–Start” on page 2-12 to analyze the fault.
7 If the check light on the disk drive module is on steady (Figure 3-14), the disk drive module is in service mode. Take the disk drive module out of service mode (reset the service mode).

8 Configure the device on the host system if necessary, refer to your host system publications for additional information.

9 Close the front cover.

Figure 3-14. Disk Drive Modules in the 7131 Storage Tower
Backplane Assembly

Attention: Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

This procedure describes how to remove and replace the backplane.

Backplane Removal

1. Remove the front cover. See Figure 3-2 on page 3-3.

2. Attention: Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:
   a. Use the system-management task menus of the host system to make the disk drive modules unavailable.
   b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive modules unavailable to the host system or to the host systems for each of the paths to the 7131 Storage Tower.

3. Set the power switch to Off, if it is On.

4. Disconnect the line cord from the power source.

5. Remove the top cover from the 7131 Storage Tower. See Figure 3-3 on page 3-4.

6. Disconnect the power supply cables (2), the SSA cables (2), and the fan power cable from the backplane (see Figure 3-15 on page 3-17).

7. Move the latch down on each disk drive module or dummy disk drive module.

8. Pull each disk drive module out, keeping it straight to prevent damage (note the slot position of each disk drive and/or dummy disk drive module, as they will be reinstalled in the same slot positions later in this procedure). See Figure 3-11 on page 3-12.

9. Place each disk drive module on the ESD mat to prevent damage.

10. Place each dummy disk drive module in a safe place to prevent damage.

11. Remove the eight screws securing the 5 pack enclosure to the chassis (see Figure 3-15 on page 3-17).

12. Pull the 5 pack enclosure out the front of the 7131 Storage Tower.

13. Remove the eight screws securing the Backplane card to the rear of the 5 pack enclosure.
Backplane Replacement

1 Use the eight screws removed earlier to secure the new Backplane card to the 5 pack enclosure.

2 Install the new 5 pack enclosure in the 7131 Storage Tower.
   **Note:** Ensure the 5 pack enclosure is installed with the correct end up (the bottom is marked with the word *bottom*).

3 Secure the 5 pack enclosure to the chassis using the eight screws removed earlier.

4 Install each disk drive module or dummy disk drive module into the same slot position from which it was removed earlier in this procedure. Keep the disk drive module or dummy disk drive module straight when inserting to prevent damage (slots 1 and 5 must contain a disk drive module).

5 Press each disk drive module and/or dummy disk drive module firmly in place to seat it on the backplane before attempting to move the latch up on each assembly to lock it in place.

6 Connect the power supply cables (2), the SSA cables (2), and the fan power cable to the backplane (see Figure 3-15).

7 Install the top cover on the 7131 Storage Tower (see Figure 3-3 on page 3-4).

8 **DANGER**

   An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer’s responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. *(RSFTD201)*

9 Connect the line cord to the power source.

10 Set the power switch to on.

11 Replace the front cover (see Figure 3-2 on page 3-3).

Figure 3-15. Backplane Assembly
**Power Supply and Power Switch**

**Attention:** Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

**Attention:** Do not attempt to open the covers of the power supply. Power supplies are not serviceable and are to be replaced as a unit.

This procedure describes how to remove and replace the power supply and power switch.

### Power Supply and Power Switch Removal

1. Open the front cover. See Figure 3-2 on page 3-3.

2. **Attention:** Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:
   a. Use the system-management task menus of the host system to make the disk drive modules unavailable.
   b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive modules unavailable to the host system or to the host systems for each of the paths to the 7131 Storage Tower.

3. Set the power switch to Off, if it is On.

4. Disconnect the line cord from the 7131 Storage Tower.

5. Remove the top cover from the 7131 Storage Tower. See Figure 3-3 on page 3-4.

6. Disconnect the power supply cables from the backplane. See Figure 3-16 on page 3-19.

7. Disconnect the power supply connector attached to the cable with the single black wire providing frame ground.

8. Disconnect the LED cable from the control panel. See Figure 3-16 on page 3-19 and Figure 3-17 on page 3-20.

9. Remove the two screws holding the power switch to the chassis. See Figure 3-16 on page 3-19.

10. Remove the cable ties (3) from the power supply cable and power cable.

11. Hold the power supply, and remove the four screws and their washers.

### Power Supply and Power Switch Replacement

1. Align the power supply with the four holes on the chassis, and install and tighten the four screws with their washers.

2. Install and tighten the two screws on the power switch to fasten the power switch to the chassis (ensure the terminals are facing up).
Connect the LED cable to the control panel (ensure the track is facing up).

4 Connect the power supply cables (2) to the backplane.

5 Connect the power supply connector P5 to the cable with the single black wire providing frame ground.

6 Secure the power cable and the power supply cable with cable ties. Cut the excess from cable ties (3).

7 Install and secure the top cover with the four screws. See Figure 3-3 on page 3-4.

8 Move the voltage selection switch to the correct voltage setting for your power source.
   **Attention:** Do not connect the line cord until the voltage selection switch is correctly set because the power supply could be damaged.

9 **DANGER**

   An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer’s responsibility to ensure that the outlet is correctly wired and grounded to prevent an **electrical shock.** *(RSFTO201)*

10 Connect the line cord to the power source.

11 Set the power switch to on.

12 Close the front cover.
Control Panel

**Attention:** Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

This procedure describes how to remove and replace the control panel.

**Control Panel Removal**

1. Open the front cover. See Figure 3-2 on page 3-3.

2. **Attention:** Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:
   a. Use the system-management task menus of the host system to make the disk drive modules unavailable.
   b. If the 7131 Storage Tower is connected to more than one adapter, make the disk drive modules unavailable to the host system or to the host systems for each of the paths to the 7131 Storage Tower.

3. Set the power switch to Off, if it is On.

4. Disconnect the line cord from the power source.

5. Remove the top cover from the 7131 Storage Tower. See Figure 3-3 on page 3-4.

6. Disconnect the LED cable from the control panel. See Figure 3-17.

7. Remove the control panel by pressing the four retention clips inward while pulling the panel out.

8. If one or more blank panels were installed, remove them from the control panel.
Control Panel Replacement

Attention: Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

1. If one or more blank panels were removed, press them on the new control panel until they snap in place.

2. Connect the LED cable to the control panel (ensure the track is facing up).

3. Place the control panel on the chassis, and press until it snaps into place.

4. Put the top cover on the 7131 Storage Tower.

5. Install and tighten the four screws to fasten the top cover to the 7131 Storage Tower.

6. DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer’s responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)

7. Connect the line cord to the power source.

8. Set the power switch to on.

9. Close the front cover.
Fan

Attention: Follow all ESD-sensitive parts procedures while performing this procedure. For ESD information, see “Handling ESD-Sensitive Parts” on page 3-2.

Fan Removal

1 Open the front cover. See Figure 3-2 on page 3-3.

2 Attention: Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules unavailable to the host system. To do this:

   Use the system-management task menus of the host system to make the disk drive modules unavailable. If the 7131 is connected to more than one adapter, make the disk drive modules unavailable to the host system or host systems for each of the paths to the 7131.

3 Set the power switch to Off, if it is On.

4 Disconnect the line cord from the power source.

5 Remove the top cover from the 7131 Storage Tower. See Figure 3-3 on page 3-4.

6 Disconnect the fan cable from the backplane. See Figure 3-19 on page 3-23.

7 To remove the fan, support the fan with one hand:

   If the fan is mounted with the black rubber isolators, then pull each of the four black rubber isolators through the holes on the chassis to remove the fan (refer to Figure 3-19 on page 3-23).

   If the fan is mounted with screws, then remove the four screws mounting the fan to the chassis (refer to Figure 3-20 on page 3-23).

Fan Replacement

1 Align the fan with the four holes on the chassis ensuring that the fan cable exit is located at the bottom left of the fan as shown in figures.

2 To install the fan, support the fan with one hand:

   If the fan is mounted with the black rubber isolators, then pull each of the four black rubber isolators through the holes on the chassis to correctly seat the fan (refer to Figure 3-19 on page 3-23).

   If the fan is mounted with screws, then install the four screws mounting the fan to the chassis (refer to Figure 3-20 on page 3-23).

3 Connect the fan cable to the backplane.

4 Install the top cover on the 7131 Storage Tower. See Figure 3-3 on page 3-4.

5 DANGER

   An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer’s responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)
6 Connect the line cord to the power source.
7 Set the power switch to On and close the front cover.
8 Verify that the fan is operating.
Chapter 4. Safety Inspection

Use the safety inspection procedures to verify the safe condition of a 7131 SSA Multi-Storage Tower. Do not service a 7131 Storage Tower with unsafe conditions.

For safety checks when setting up or relocating, refer to 7131 SSA Multi-Storage Tower Model 405 User’s Guide.

Unsafe Conditions

When first assembled, each 7131 Storage Tower has safety equipment installed to protect the operators and service personnel from injury. This inspection checklist ensures that all safety equipment and safety labels are installed on the 7131 Storage Tower.

Perform a safety inspection:

- When IBM receives a request for a service agreement for a 7131 Storage Tower.
- As part of an alteration-and-attachments review on any 7131 Storage Tower that is on lease, under a service agreement, or on a per-call service.

Special Tools

Always use an analog meter, never a digital meter, to perform the ground check of the customer’s outlet. A digital meter can give the wrong readings if ground current is present.
External Machine Check

Perform the following external machine check.

- Verify that all external covers are present and are not damaged.
- Ensure that all latches and hinges are in good operating condition.
- Check the 7131 Storage Tower for loose or broken feet.
- Correct any problems that you find.
- Continue with “Remove AC Power.”

Remove AC Power

Perform the following steps to remove ac power.

1. Open the front cover. See Figure 4-1.

2. **Attention:** Switching off the power to the 7131 Storage Tower can cause a system fault unless you first make the disk drive modules within the 7131 Storage Tower unavailable to the host system. To do this:
   - Use the system-management task menus of the host system to make the disk drive modules unavailable.
   - If the SSA loop is connected to a host system through more than one set of &adaptbox. (an expanded configuration), make the disk drive modules unavailable to the host system for each of the paths to the &tempst..

3. Set the power switch to off, if it is on. The green light goes off.
4 DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (RSFTD201)

5 Disconnect the line cord from the 7131 Storage Tower. See Figure 4-2.

6 Disconnect the line cord from the power source.

7 Continue with “Internal Machine Check” on page 4-4.

Figure 4-2. Line Cord
Internal Machine Check

Perform the internal machine check.

1. Check for any non-IBM changes that may have been made to the 7131 Storage Tower. If any are present, obtain the Non-IBM Alteration Attachment Survey form, number R009, from the IBM branch office. Complete the form and return it to the branch office.

2. At the back of the 7131 Storage Tower, remove the four screws that fasten the top cover to the 7131 Storage Tower. See Figure 4-3.

3. Lift and remove the top cover from the 7131 Storage Tower.

4. Check inside the 7131 Storage Tower for any obvious unsafe conditions, such as metal particles, water or other fluids, or marks of overheating, fire, or smoke damage.

5. Check for any obvious mechanical problems, such as loose components,

6. Inspect the power supply and check that the fasteners screws, or rivets in the cover of the power supply unit have not been removed or disturbed.

7. Verify that the four power supply mounting screws are tight. See Figure 4-4 on page 4-5. The mounting screws connect the power supply frame ground to the 7131 Storage Tower frame ground.
8 Verify that the voltage shown on the power supply label and on the voltage selection switch matches the voltage of the power source. See Figure 4-6 on page 4-7.

9 Check any exposed cables and connectors for wear, cracks, or pinching.

10 Check the line cord to ensure that
   a. A third-wire ground connector is in good condition. Use a ground tester to check that the third-wire ground continuity is 0.1 ohm or less between the external ground pin and the 7131 Storage Tower frame ground.
   b. The insulation is good (not damaged or worn).

11 Check for any obvious nonstandard changes. Use good judgment about the safety of any such changes.

12 Continue with “Safety Label Check” on page 4-6.
Safety Label Check

Perform the following safety label check.

1. Verify that all safety labels shown in the following steps are installed on the 7131 Storage Tower. If any safety labels are missing, order and install them.

2. Verify that the power supply label is installed on the power supply. See Figure 4-5.

![Power Safety Label](image)

Note: Top cover is off

Figure 4-5. Power Supply Label (Top View)
3 Verify that the weight label is installed on the 7131 Storage Tower. See Figure 4-6.

![Image of Weight Label (Back View)](B5068295)

**Figure 4-6. Weight Label (Back View)**

4 Continue with “Complete the Machine Safety Check.”

**Complete the Machine Safety Check**

1 Put the top cover on the 7131 Storage Tower. See Figure 4-3 on page 4-4.

2 Install and tighten the four screws to fasten the top cover to the 7131 Storage Tower.

3 **DANGER**

   An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. *(RSFTD201)*

4 Connect the line cord to the customer's outlet.

This completes the visual mechanical safety inspection procedure with the power off.
Chapter 5. Parts Diagrams and Parts List

This chapter provides a parts diagram and parts list required to service the 7131 Storage Tower.

How To Use This Parts Listing

AR  (As Required) in the Units column indicates that the quantity is not the same for all machines.

NP  (Non-Procurable) in the Part Number column indicates that the part is non-procurable and that the individual parts or the next higher assembly should be ordered.

NR  (Not Recommended) in the Units column indicates that the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.

NS  (Not Shown) in the Asm- Index column indicates that the part is either not shown or not referenced in the illustration.

R   (Restricted) in the Units column indicates that the part has a restricted availability.

Indenture

The indenture is marked by a series of dots located before the parts description. The indenture indicates the relationship of a part to the next higher assembly. For example:

<table>
<thead>
<tr>
<th>Indenture</th>
<th>Relationship of Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>(No dot)</td>
<td>MAIN ASSEMBLY</td>
</tr>
<tr>
<td>(One dot)</td>
<td>Detail parts of a main assembly</td>
</tr>
<tr>
<td>(One dot)</td>
<td>Sub assembly of the main assembly</td>
</tr>
<tr>
<td>(Two dots)</td>
<td>Detail part of a one-dot sub assembly</td>
</tr>
<tr>
<td>(Two dots)</td>
<td>Sub assembly of a one-dot sub assembly</td>
</tr>
<tr>
<td>(Three dots)</td>
<td>Detail part of a two-dot sub assembly</td>
</tr>
</tbody>
</table>

Example of Parts Listing

<table>
<thead>
<tr>
<th>Asm-Index</th>
<th>Part Number</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-</td>
<td>2512667</td>
<td>1</td>
<td>Cover Asm, Rear, Red</td>
</tr>
<tr>
<td></td>
<td>2513714</td>
<td>1</td>
<td>Cover Asm, Rear, White</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>For Next Higher Asm, see Assembly 1-2.</td>
</tr>
<tr>
<td>-1</td>
<td>5373637</td>
<td>1</td>
<td>Seal, Top</td>
</tr>
<tr>
<td>-2</td>
<td>5356429</td>
<td>2</td>
<td>Clip, Retaining</td>
</tr>
<tr>
<td>-3</td>
<td>1847630</td>
<td>1</td>
<td>Finger Stock Asm</td>
</tr>
<tr>
<td>-4</td>
<td>1847602</td>
<td>NR</td>
<td>Channel, Finger Stock</td>
</tr>
<tr>
<td>-5</td>
<td>5373639</td>
<td>AR</td>
<td>Seal, Bottom</td>
</tr>
<tr>
<td>-6</td>
<td>5356429</td>
<td>2</td>
<td>Clip, Retaining</td>
</tr>
<tr>
<td>-7</td>
<td>NP</td>
<td>1</td>
<td>Cover, Rear, Without Paint</td>
</tr>
<tr>
<td>-5</td>
<td>0416629</td>
<td>R</td>
<td>Screw, Panel</td>
</tr>
<tr>
<td>Asm-Index</td>
<td>Part Number</td>
<td>Units</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>27H1020</td>
<td>1</td>
<td>Logo</td>
</tr>
<tr>
<td>2</td>
<td>26H9206</td>
<td>1</td>
<td>Front Cover Assembly</td>
</tr>
<tr>
<td>3</td>
<td>06H2187</td>
<td>2</td>
<td>Blank Panel</td>
</tr>
<tr>
<td>4</td>
<td>26H9191</td>
<td>1</td>
<td>Control Panel Assembly</td>
</tr>
<tr>
<td>5</td>
<td>27H1044</td>
<td>2</td>
<td>SSA Cable Assembly</td>
</tr>
<tr>
<td>5A</td>
<td>34H8186</td>
<td>4</td>
<td>Screw, SSA Cable Assembly</td>
</tr>
<tr>
<td>9</td>
<td>05H4680</td>
<td>1</td>
<td>Top Cover Assembly</td>
</tr>
<tr>
<td>9A</td>
<td>27H2338</td>
<td>4</td>
<td>Screw, M3 x 6 (Top Cover)</td>
</tr>
<tr>
<td>10</td>
<td>99F7896</td>
<td>AR</td>
<td>1.1 GB Disk Drive Module</td>
</tr>
<tr>
<td>10</td>
<td>99F7897</td>
<td>AR</td>
<td>2.2 GB Disk Drive Module</td>
</tr>
<tr>
<td>10</td>
<td>99F7898</td>
<td>AR</td>
<td>4.5 GB Disk Drive Module</td>
</tr>
<tr>
<td>10</td>
<td>21H8734</td>
<td>AR</td>
<td>9.1 GB Disk Drive Module</td>
</tr>
<tr>
<td>10A</td>
<td>1147429</td>
<td>4</td>
<td>Screw, Disk Drive Module</td>
</tr>
<tr>
<td>10B</td>
<td>27H1047</td>
<td>1</td>
<td>SSA Carrier Assembly</td>
</tr>
<tr>
<td>13</td>
<td>27H1023</td>
<td>AR</td>
<td>Dummy Disk Drive Module</td>
</tr>
<tr>
<td>14</td>
<td>21H8757</td>
<td>NR</td>
<td>Enclosure, 5 Pack</td>
</tr>
<tr>
<td>14A</td>
<td>27H0840</td>
<td>8</td>
<td>Screws, 5 Pack Enclosure mounting</td>
</tr>
<tr>
<td>14B</td>
<td>34H8190</td>
<td>1</td>
<td>Card, Backplane</td>
</tr>
<tr>
<td>14C</td>
<td>34H8186</td>
<td>8</td>
<td>Screws, Backplane mounting</td>
</tr>
<tr>
<td>15</td>
<td>21H8740</td>
<td>1</td>
<td>Fan Assembly, (Mounting Screws Included)</td>
</tr>
<tr>
<td>16</td>
<td>21H8725</td>
<td>4</td>
<td>Screw, Fan Mounting</td>
</tr>
<tr>
<td>17</td>
<td>07H8985</td>
<td>2</td>
<td>1.0 m External SSA Cable</td>
</tr>
<tr>
<td>17</td>
<td>32H1465</td>
<td>2</td>
<td>2.5 m External SSA Cable</td>
</tr>
<tr>
<td>17</td>
<td>88G6404</td>
<td>2</td>
<td>5.0 m External SSA Cable</td>
</tr>
<tr>
<td>17</td>
<td>32H1466</td>
<td>2</td>
<td>10.0 m External SSA Cable</td>
</tr>
<tr>
<td>17</td>
<td>88G6406</td>
<td>2</td>
<td>25.0 m External SSA Cable</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>1</td>
<td>See Appendix A, “Line Cords” on page A-1.</td>
</tr>
<tr>
<td>19</td>
<td>26H9205</td>
<td>1</td>
<td>Power Supply</td>
</tr>
<tr>
<td>19A</td>
<td>34H8186</td>
<td>4</td>
<td>Screws, Power Supply</td>
</tr>
<tr>
<td>19B</td>
<td>34H8186</td>
<td>2</td>
<td>Screws, Power Switch</td>
</tr>
<tr>
<td>19C</td>
<td>1159519</td>
<td>3</td>
<td>Cable Tie, PS</td>
</tr>
<tr>
<td>22</td>
<td>21H8746</td>
<td>1</td>
<td>Latch</td>
</tr>
<tr>
<td>24</td>
<td>26H9234</td>
<td>4</td>
<td>Feet</td>
</tr>
<tr>
<td>24A</td>
<td>49G5445</td>
<td>4</td>
<td>Screws, Feet</td>
</tr>
<tr>
<td>25</td>
<td>21H8762</td>
<td>1</td>
<td>Cable, Power Supply Frame Ground</td>
</tr>
</tbody>
</table>
Chapter 6. Power Distribution Diagrams

The following illustrations are the ground diagrams for the 7131 Storage Tower.

7131 Storage Tower Ground Diagram

Figure 6-1. 7131 Storage Tower Ground Diagram—Backplane to Fan
Figure 6-2. 7131 Storage Tower Ground Diagram—Power Supply to Backplane

Note: On 7131 Storage Towers shipped after December 13, 1996 (S/N 09211 or greater) one of the unused power supply connectors (P5) has a pigtail connector (P/N 21H8762) inserted into it that is used to provide an additional chassis ground for the power supply.
Appendix A. Line Cords

To avoid electrical shock, a line cord with a grounded attachment plug is provided. Use only properly grounded outlets.

Line cords used in the United States and Canada are listed by Underwriter's Laboratories (UL**) and certified by the Canadian Standards Association (CSA). These line cords consist of:

- Electrical line cords, type SVT or SJT
- Attachment plugs complying with National Electrical Manufacturers Association (NEMA) 5-15P.

For 115 V operation, use a UL-listed cable set consisting of a minimum 18 AWG, type SVT or SJT 3 conductor cable that is a maximum of 15 feet in length, and a parallel blade, grounding-type attachment plug rated at 15 A, 125 V.

For 230 V operation in the United States, use a UL-listed cable set consisting of a minimum 18 AWG, type SVT or SJT 3 conductor cable that is a maximum of 15 feet in length, and a tandem blade, grounding-type attachment plug rated at 15 A, 250 V.

Appliance couplets complying with International Electrotechnical Commission (IEC) Standard 320, Sheet C13

Line cords used in other countries consist of:

- Electrical line cord, type HD21
- Attachment plugs approved by the appropriate testing organization for the specific countries where they are used

For units set at 230 V (outside of the United States), use a cable set consisting of a minimum 18 AWG cable and a grounding-type attachment plug rated at 15A, 250 V. The cable set should have the appropriate safety approvals for the country in which the equipment will be installed and should be marked "HAR".

Table A-1 on page A-2 lists the line cord part number, the country where the line cord can be used, and an index number to be matched with the receptacle illustrations shown in Figure A-1 on page A-3. Contact your local service representative if your 7131 Storage Tower disk drive line cord does not match this information.
<table>
<thead>
<tr>
<th>Feature Code</th>
<th>Part Number</th>
<th>Specifications and Country</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>9800</td>
<td>6952300</td>
<td>2.7-m (9 ft) line cord, United States and Canada; 110 V to 127 V at 60 Hz Antilles, Balarrus, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States, 110 V</td>
<td>1</td>
</tr>
<tr>
<td>9820</td>
<td>13F9979</td>
<td>2.9-m (9 ft) line cord, France, 220 V to 240 V at 50 Hz Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep, Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritian, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe</td>
<td>2</td>
</tr>
<tr>
<td>9821</td>
<td>13F9997</td>
<td>2.7-m (9 ft) line cord, Denmark, 220 V to 250 V at 60 Hz</td>
<td>3</td>
</tr>
<tr>
<td>9825</td>
<td>14F0033</td>
<td>2.7-m (9 ft) line cord, United Kingdom, 220 V to 240 V at 60 Hz Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Dubai, Fiji, Ghana, Hong Kong, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia</td>
<td>4</td>
</tr>
<tr>
<td>9827</td>
<td>14F0087</td>
<td>2.7-m (9 ft) line cord, Israel, 230 V to 240 V at 50 Hz</td>
<td>5</td>
</tr>
<tr>
<td>9828</td>
<td>14F0051</td>
<td>2.7-m (9 ft) line cord, Switzerland, 200 V to 220 V at 50 Hz Liechtenstein, Switzerland</td>
<td>6</td>
</tr>
<tr>
<td>9829</td>
<td>14F0015</td>
<td>2.7-m (9 ft) line cord, South Africa, 220 V to 240 V at 50 Hz Bangladesh, Burma, Pakistan, South Africa, Sri Lanka</td>
<td>7</td>
</tr>
<tr>
<td>9830</td>
<td>14F0069</td>
<td>2.7-m (9 ft) line cord, Italy, 200 V to 250 V at 50 Hz Chile, Ethiopia, Italy, Libya, Somalia</td>
<td>8</td>
</tr>
<tr>
<td>9831</td>
<td>13F9940</td>
<td>2.7-m (9 ft) line cord, Australia, 200 V to 240 V at 50 Hz Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Western Samoa</td>
<td>9</td>
</tr>
<tr>
<td>9834</td>
<td>6952291</td>
<td>2.7-m (9 ft) line cord, Uruguay, 200 V to 220 V at 50 Hz</td>
<td>10</td>
</tr>
<tr>
<td>9933</td>
<td>1838574</td>
<td>2.7-m (9 ft) line cord, United States and Canada, 220 V to 240 V at 60 Hz Antilles, Balarrus, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States: 220 V</td>
<td>11</td>
</tr>
<tr>
<td>9986</td>
<td>6952301</td>
<td>1.8-m, (6 ft) line cord, United States and Canada, 115 V to 127 V at 60 Hz</td>
<td>12</td>
</tr>
</tbody>
</table>
Figure A-1. Receptacles
Index

Numerics
1 to 5, slots 3-12
1.1 GB, 2.2 GB, 4.5 GB, and 9.1 GB SSA disk drives 1-34
115 V ac power requirements 1-10
12 V power connector 1-2
230 V ac power requirements 1-10
5 V power connector 1-2
7131 Storage Tower
  backplane assembly 3-16
  configurations 1-9
  connected to more than one adapter 3-12
  connector locations 1-2
  control panel 3-20
  cooling 1-7
  disk drive module 1-3
  disk drive module, dummy 1-3
  external SSA cable 3-5
  fan 1-7
  ground diagrams 4-4, 6-1
  lights and latch on disk drive module 1-4
  line cord 3-7
  power
    requirements 1-10
    supply and power switch 3-18
    switch and light 1-2
  requirements 1-10
  slots 1-3
  specifications 1-10
  SSA
    internal cable 1-8, 3-9
    Multi-Storage Tower 1-1
  top cover 3-4
  vital product data (VPD) 1-34
  voltage selection switch 1-6

A
about this guide xi
ac power
  removal of 4-2
  requirements 1-10
active
  disk drive module 1-4
  SSA link 1-13
adapter
  code package ID 1-33
  description of 1-34
  finding the physical location 1-32
  port number 2-24
  POSTs (power-on self-tests) 2-2
adapter (continued)
  SSA 1-13
    port connector 1-32
  vital product data (VPD) 1-34
aids, diagnostic
  adapter POSTs (power-on self-tests) 2-2
  disk drive module POSTs (power-on self-tests) 2-1
  SRNs (service request numbers) 2-3, 2-4
aids, service
  Certify Disk 1-27
  Configuration Verification 1-24
  Format Disk 1-26
  Link Verification 1-21
  Set Service Mode 1-18
  starting 1-17
  unavailable 1-32
  vital product data (VPD) 1-34
Alteration Attachment Survey form 4-4
altitude 1-10
amber check light 1-4
analog meter 4-1
assembly, backplane
  replacement of 3-16
attachment plugs A-1
audience xi

B
backplane assembly
  description of 1-8
  ground diagram, to fan 6-1
  replacement of 3-16
beginning the service aids 1-17
bigger loops 1-12
blank panel 3-20
board, distribution 1-8
broken loop
  cable removed 1-30
  disk drive module removed 1-31
bulb, wet, temperature requirements 1-10
burning smell 2-12

cable
  connector, using system 1-2
  external SSA cable, replacement of 3-5
  internal SSA 1-8, 3-9
  LED 3-21
  on hard-disk drive 3-13
  cache module, fast-write 1-34
Canadian Standards Association (CSA)  A-1
card, SSA adapter  1-13
carrier  
disk drive, removal of  3-13
  locked  1-3
cfgmgr command  2-13
changes, non-IBM  4-4
check  
  external machine  4-2
  internal machine  4-4
  light  1-4
  safety  4-7
  safety label  4-6
clearance, minimum  1-10
clips, retention  3-20
codes, location  1-11
commands  
  cfgmgr  1-33, 2-13
  diag -a  2-8
  lsattr -E -l adapter -a ucode  1-33
  motor stop  1-4
  send diagnostic  2-1
communications statement ix
compliance statement, radio frequency energy ix
condition, unsafe  4-1
configuration  
  7131 Storage Tower  1-9
  complete system  1-33
  invalid SSA loop  2-10
  manager command  1-33
Configuration Verification service aid  1-24
connector  
  locations  1-2
  port, on SSA adapter  1-32
  using system  1-2
continuity, third-wire ground  4-5
continuous failure  2-11
control panel, replacement of  3-20
cooling  
  7131 Storage Tower  1-7
  requirements  1-10
cord, line, replacement of  3-7
country matrix, line cord  A-1
cover  
  front, replacement of  3-3
  top, replacement of  3-4
CSA (Canadian Standards Association)  A-1
current, ground  4-1

data path  1-12, 1-15, 1-30
data, vital product  1-34
dc voltage  1-4
definition of FRU names used in the SRN table  2-4
depth  1-10
device configuration method  1-33
device driver level  1-34
diag -a command  2-8
diagnostic aids  
  adapter POSTs (power-on-self-tests)  2-2
  disk drive module POSTs (power-on-self-tests)  2-1
  SRNs (service request numbers)  2-3, 2-4
diagram  
  frame ground  4-4
  ground, backplane to fan  6-1
  ground, power supply to backplane  6-2
  logic  6-1
diagram, parts  5-2
digital meter  4-1
dimensions  1-10
disk  
  certify, service aid  1-27
  format, service aid  1-26
  formatting, incompatible with the system  2-13
disk drive module  
  1.1 GB, 2.2 GB, 4.5 GB, and 9.1 GB  1-34
  broken loop  1-30, 1-31
  connector  1-2
  description of  1-3
  dummy module  1-3
  finding the physical location  1-32
  Format Disk service aid  1-26
  identification  1-14
  latch  3-13
  lights and latch  1-4
  missing  1-23
  POSTs (power-on-self-tests)  2-1
  replacement of  3-12
  serial number  1-14
  strings  1-12
  unavailable  3-12
  unavailable to the using system  1-18
  unconfigured  2-20
disk drive removal from carrier  3-13
distribution board  1-8
DRAM (dynamic random-access memory)  1-34
dummy disk drive module, replacement of  3-11
dynamic random-access memory (DRAM)  1-34

E
electrical shock  A-1
electronic emission notices ix
electrostatic discharge (ESD)  3-2
empty slot  1-3
entry point, MAPs  2-12
environment, operating  1-10
EPROM (programmable read-only memory)  2-2
error  
  link, intermittent  2-24
error (continued)
  microcode and software  2-4
  unrecoverable  1-4, 1-28
ESD (electrostatic discharge)
  mat  3-13
  sensitive parts  3-2
exposed  3-2
  cables  4-5
  pin on external SSA cable  3-2
external
  connector locations  1-2
  ground pin  4-5
  machine check  4-2
  SSA cable, replacement of  3-5

F
failed
  application program  1-28
  status  1-22
failure
  continuous  2-11
  link  1-28
fan
  connector  1-2
  description of  1-7
  replacement of  3-22
fast-flash light  1-4
fast-write cache module  1-34
fault, system  3-12
FCC (see Federal Communications Commission)
Federal Communications Commission (FCC)
  statement  ix
field replaceable unit
  See FRU
finding the physical location of a device  1-32
flashing light
  check  1-4
  green  3-14
form, non-IBM Alteration Attachment Survey  4-4
Format Disk service aid  1-26
format, location code  1-11
fragility of disk drive modules  2-1
frame, ground diagram  4-4
front cover, replacement of  3-3
FRU
  names used in the SRN table  2-4
  replacement of
    backplane assembly  3-16
    control panel  3-20
    disk drive module  3-12
    dummy disk drive module  3-11
    external SSA cable  3-5
    fan  3-22
    front cover  3-3
    internal SSA cable  3-9
    line cord  3-7
    power supply and power switch  3-18
    top cover  3-4
  used in the SRN table  2-4
Function Select menu  1-17
function, identify  1-16, 1-32

G
glossary of FRU names used in the SRN table  2-4
good status  1-22
green light
  flashing  3-14
  on connectors  1-13
  on disk drive module  1-4
ground
  current  4-1
  diagram
    backplane to fan  6-1
    power supply to backplane  6-2
    frame  4-4
tester  4-5
grounded attachment plug  A-1
grounding screw holes  3-19

H
hard-disk drive cable  3-13
hdisk (LUN)  1-14
height  1-10
how to use MAPs  2-11
humidity requirements  1-10

I
ID, adapter code package  1-33
identification, pdisks, hdisk, and disk drive
  module  1-14
identify function  1-16, 1-19, 1-32
IEC (International Electrotechnical Commission)  A-1
inactive
  SSA connector  1-13
  SSA links  1-4
information
  reference  1-1
  SSA network  1-23
inspection, safety  4-1
intermittent link error  2-24
internal
  connector locations  1-2
  link  2-22
machine check
  complete safety check  4-7
  procedure  4-4
  safety label check  4-6
internal (continued)
  SSA cable  1-8
International Electrotechnical Commission (IEC)  A-1
invalid SSA loop configurations  2-10
isolators, rubber  3-22

J
Japan energy saving law data  1-10

L
label
  power supply  4-6
  weight  4-7
latch on disk drive module  1-3, 1-4, 3-13
LED cable  3-18, 3-21
level
  device driver  1-34
  noise  1-10
light
  check  1-4
  flashing, green  3-14
  on connectors  1-13
  on disk drive module  1-4
  power  1-2
line cord
  country matrix  A-1
  location of  1-7
  replacement of  3-7
  used in other countries  A-1
link
  active  1-13
  broken
    between two pdisks  2-19
    pdisk and unconfigured device  2-20
    SSA adapter and pdisk  2-21
  failure  1-28
  intermittent error, MAP 2323  2-24
  internal, MAP 2321  2-22
  repair verification, MAP 2410  2-26
  SSA, MAP 2320  2-16
Link Verification service aid  1-21
location
  code format  1-11
  connector  1-2
  disk drive modules  1-1
  physical, of a device  1-32
locked carrier  1-3
logic diagrams  6-1
logical units (LUN)  1-14
loop
  bigger  1-12
  broken  1-30
  configurations, SSA, invalid  2-10
  data paths, description of  1-15
loop (continued)
  links  1-12
  SSA, rules  1-14
lsattr -E -i adapter -a ucode command  1-33
LUN (logical units)  1-14

M
machine check
  external  4-2
  internal  4-4
  safety  4-7
maintenance analysis procedures (MAPs)  2-11
maintenance, microcode  1-33
manufacturer and plant code  1-34
MAPs (maintenance analysis procedures)
  intermittent link error  2-24
  internal link  2-22
  repair verification  2-26
  SSA link  2-16
  starting  2-12
  using  2-11
maximum configuration  1-9
menus
  Certify Disk service aid  1-27
  Configuration Verification service aid  1-24
  Format Disk service aid  1-26
  Function Select  1-17
  Link Verification service aid  1-21
  Set Service Mode service aid  1-18
  SSA Service Aids  1-17
meter, analog  4-1
microcode
  maintenance  1-33
  software errors  2-4
minimum
  clearance  1-10
  configuration  1-9
missing disk drive module  1-23
mode, set service  1-18
module, disk drive
  1.1 GB, 2.2 GB, 4.5 GB, and 9.1 GB  1-34
  broken loop  1-30, 1-31
  connector  1-2
  description of  1-3
  dummy module  1-3
  finding the physical location  1-32
  Format Disk service aid  1-26
  identification  1-14
  latch  3-13
  lights and latch  1-4
  location of  1-1
  missing  1-23
  power-on self-tests (POSTs)  2-1
  replacement of  3-12, 3-13
  serial number  1-14
module, disk drive (continued)
   strings 1-12
   unavailable to the using system 1-18, 3-12
module, fast-write cache 1-34
motor stop command 1-4
mounting screws 4-4

N
   names used in the SRN table 2-4
   National Electrical Manufacturers Association (NEMA) A-1
   NEMA (National Electrical Manufacturers Association) A-1
   network information, SSA 1-23
   noise level 1-10
   Non-IBM Alteration Attachment Survey form 4-4
   notices, electronic emission ix
   notices, safety vii
   numbers, service request
      description of 2-3
      software and microcode errors 2-4
      table 2-5

O
   operating environment 1-10

P
   panel, control, replacement of 3-20
   parts
      ESD 3-2
   parts diagram 5-2
   paths, data
      broken loop 1-30
      description of 1-15
   pdisk
      broken link 2-19
      failing 2-18
      identification 1-14
      link broken, unconfigured device 2-20
      SSA adapter 2-17
      with no associated hdisk 2-13
   permanently on check light 1-4
   physical
      disk drives (pdisks) 1-14, 1-18
      location of a device 1-32
      specifications 1-10
   pin
      exposed on external SSA cable 3-2
      external ground 4-5
      plant code and manufacturer 1-34
   plug, grounded A-1
   pluggable fast-write cache module 1-34
   port
      (P) value 1-32
      adapter 2-24
      connector on SSA adapter 1-32
   POS (programmable option select) 2-2
   POSTs (power-on self-tests) 1-4, 2-1
   power
      light 1-2
      light, disk drive module 1-4
      power supply and switch 1-2, 3-18
      removal of 4-2
      requirements 1-10
      self-test 1-4
      source 3-17, 4-3, 4-5
      status 1-22
      supply 1-5
      supply label 4-6
      supply to backplane ground diagram 6-2
   power-on self-tests (POSTs) 2-1, 2-2
   precautions, ESD 3-2
   problem determination
      POSTs, adapter 2-2
      POSTs, disk drive module 2-1
      SRNs (service request numbers) 2-3
      using service aids 1-28
   programmable option select (POS) 2-2
   programmable read-only memory (EPROM) 2-2
   publications related to this service guide xii
   pushbutton switch 1-2

R
   radio-frequency energy compliance statement ix
   RAM (random-access memory) 1-34
   Random-access memory (RAM) 1-34
   read-only memory (ROM) 1-34
   Read-only storage (ROS) 1-34
   ready light, disk drive module 1-4
   receptacles A-2
   reference information 1-1
   related publications xii
   relative humidity requirements 1-10
   removing ac power 4-2
   repair verification 2-26
   reseating the disk drive module 3-13
   reserved status 1-16, 1-22
   retention clips 3-20
   ROM (read-only memory) 1-34
   ROS (read-only storage) 1-33, 1-34
   rubber isolators 3-22
   rules for SSA loops 1-14

S
   safety
      label check 4-6, 4-7
safety inspection
  complete the machine check 4-7
  external machine check 4-2
  internal machine check 4-4
  removal of ac power 4-2
  safety label check 4-6, 4-7
  unsafe conditions 4-1
  when to perform 4-1
safety notices vii
screw, mounting 4-4
select, function menu 1-17
send diagnostic command 2-1
sensitive parts, ESD 3-2
serial number 1-14
service aids
  available 1-32
  Certify Disk 1-27
  Configuration Verification 1-24
  Format Disk 1-26
  link failure 1-28
  Link Verification 1-21
  Set Service Mode 1-18
starting SSA 1-17
unavailable 1-32
vital product data (VPD) 1-34
service request numbers (SRNs)
  description of 2-3
  software and microcode errors 2-4
  table 2-5
Set Service Mode service aid 1-18
shock, electrical A-1
slots 1-3, 3-12
slow-flash light 1-4
smoke 2-12
software and microcode errors 2-4
source, power 3-17
special tools 4-1
specifications 1-10
SRNs (service request numbers) 2-3, 2-4, 2-5
SSA (serial storage architecture) (continued)
  service aids (continued)
    Configuration Verification 1-24
    error codes 1-28
    finding the physical location of a device 1-32
    Format Disk 1-26
    identify function 1-16
    Link Verification 1-21
    Set Service Mode 1-18
starting 1-17
SSA-address (AA) value 1-32
starting
  MAPs 2-12
  service aids 1-17
starwasher 4-4
statement
  Federal Communications Commission ix
static sensitive parts 3-2
status of lights 1-4
strings, disk drive module 1-12
supply, power 1-5, 3-18
switch
  power 1-2, 3-18
  pushbutton 1-2
  voltage selection 1-6, 3-19
system fault 3-12
T
  table
    country matrix A-1
    line cord A-1
service request numbers (SRNs) 2-5
temperature requirements 1-10
tester, ground 4-5
third-wire ground continuity 4-5
tools 4-1
top cover, replacement of 3-4
trademarks x
translation of safety notices vii

U
UL (Underwriter’s Laboratories) A-1
UL-listed cable A-1
unavailable disk drive module 3-12
unavailable service aids 1-32
unconfigured device 2-20
Underwriter’s Laboratories (UL) A-1
unlocked disk drive module 1-3
unrecoverable error 1-4, 1-28
unsafe conditions 4-1
using
  MAPs 2-11
  service aids 1-17
  SRN table 2-3
using (continued)
  system, cable connector  1-2

V
value, port (P)  1-32
verification
  configuration, service aid  1-24
  link, service aid  1-21
  repair  2-26
  serial number  1-26, 1-27
vital product data (VPD)  1-34
voltage
  dc  1-4
  range  1-10
  selection switch  1-6, 3-19
VPD, vital product data  1-34

W
weight
  7131 Storage Tower  1-10
  label  4-7
wet bulb temperature requirements  1-10
width  1-10
wiring diagram
  ground, backplane to fan  6-1
  ground, power supply to backplane  6-2
wrong reading  4-1
Reader Comments—We’d Like to Hear from You!

7131 Model 405
SSA Multi-Storage Tower
Service Guide
Publication No. SY27-7510-02

Overall, how would you rate this manual?

<table>
<thead>
<tr>
<th></th>
<th>Very Satisfied</th>
<th>Satisfied</th>
<th>Dissatisfied</th>
<th>Very Dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How satisfied are you that the information in this manual is:

- Accurate
- Complete
- Easy to find
- Easy to understand
- Well organized
- Applicable to your tasks

THANK YOU!

Please tell us how we can improve this manual:

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

May we contact you to discuss your responses? __ Yes __ No
Phone: (____) ___________ Fax: (____) ___________ Internet: ___________

To return this form:
  Mail it
  Fax it
    United States and Canada: 800*937-3430
    Other countries: (+1)*507*253-5192
  Hand it to your IBM representative.

Note that IBM may use or distribute the responses to this form without obligation.
Spine information:

IBM 7131 Model 405 SSA Multi-Storage Tower Service Guide