Part Number: MP4002C

9500
Shared Virtual Array

Operation and Recovery

StorageTek
June, 2000

Information contained in this publication is subject to change. In the event of changes, the publication will be revised. Comments concerning its contents should be directed to the address shown below.

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Contents

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Preface

Notices

United States FCC Compliance Statement

The following is the compliance statement from the Federal Communications Commission:

Note: This equipment has been tested and found to comply to the limits for Class A digital devices 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 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 or her own expense.

Some of the cables used to connect peripherals must be shielded and grounded as described in the installation manual. Operation of this equipment with the required cables that are not shielded and correctly grounded may result in interference to radio and TV reception.

Changes or modifications not expressly approved by StorageTek could void the user's authority to operate the equipment.

Industry Canada Compliance Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

Le présent appareil numerique német pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Reglément sur le brouillage radioélectrique édicté par le ministére des Communications du Canada.

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The following is the compliance statement from Japan:

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Note: This equipment is in the Class A category information technology equipment based on the rules of Voluntary Control Council For Interference by Information Technology Equipment (VCCI). When used in a residential area, radio interference may be caused. In this case, user may be required to take appropriate corrective actions.

Consequently, when used in residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers, etc. Read the instructions for correct handling.

Taiwan Warning Label Statement

The following is the warning label statement from Taiwan, R.O.C.:

About This Book

This book provides the operators of the 9500 Shared Virtual Array with information about the Shared Virtual Array (SVA) family of products and how to operate the Shared Virtual Array Subsystem in the mainframe environment.

Who Should Read This Book

The audience for this book includes system console operators, system programmers, and storage administrators.

Do You Have The Complete Manual?

This manual consists of pages 1 through 104.

Note: The last two pages are the reader comment form and its mailer. These pages may not be there if someone sent the comment form to StorageTek.

Trademarks

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Related Documents

The documents listed below comprise the complete SVA 9500 set. See "Viewing and Ordering Documents" (below) to obtain documents through available distribution channels.

Shared Virtual Array (SVA) Subsystem

Documents below are available online, on CD-ROM, and as bound books.

- *9500 Shared Virtual Array Introduction (MP4001B).*

- *9500 Shared Virtual Array Operation and Recovery (MP4002B)*
- *9500 Shared Virtual Array Planning, Implementation and Usage (MP4003B)*
- *9500 Shared Virtual Array Physical Planning (MP4004B)*
- *9500 Shared Virtual Array Reference (MP4005B)*
- *9500 Shared Virtual Array System Assurance (MP4006B)*
- *Peer to Peer Remote Copy Configuration Guide (MP4007A)*

Shared Virtual Array Administrator (SVAA) for OS/390

Documents below are available online and on CD-ROM.

- *SVAA for OS/390 Configuration and Administration (PN 3112905xx)*
- *SVAA for OS/390 Reporting (PN 3112906xx)*
- *SVAA for OS/390 Messages and Codes (PN 3112907xx)*
- *SVAA for OS/390 Installation, Customization, and Maintenance (PN 3112908xx)*

SnapShot for OS/390

Documents below are available online and on CD-ROM.

- *SnapShot for OS/390 User's Guide (PN 3112912xx)*
- *SnapShot for OS/390 Installation, Customization, and Maintenance (PN 3112913xx)*

Shared Virtual Array Administrator (SVAA) for Solaris

Documents below are available online and on CD-ROM.

- *SVAA for Solaris User's Guide (PN 3112909xx)*
- *SVAA for Solaris Messages (PN 3112910xx)*
- *SVAA for Solaris Installation (PN 3112911xx)*
- *SVAA for Solaris Quick Start Guide (PN 3112971xx)*

SnapShot for Solaris

Documents below are available online and on CD-ROM.

- *SnapShot for Solaris User's Guide (PN 3112914xx)*
- *SnapShot for Solaris Quick Start Guide (PN 3112915xx)*

Shared Virtual Array Console (SVAC) for Windows NT

The document below is available online and on CD-ROM.

- *SVAC for Windows NT Quick Start Guide (PN 3112993xx)*

Viewing and Ordering Documents

Viewing the Documents Online

SVA 9500 documents can be viewed (and printed on your printer - these are PDF files) at the Customer Resource Center website at:

`http://www.support.storagetek.com/wwcss/SilverStream/Pages/pgCRCHome.html`

Click on 'Disk Subsystems', then 'Docs' under the 9500 section.

Note: A password is required. You may obtain the password from a StorageTek marketing representative.

Ordering Documents

SVA 9500 documents are available on CD-ROM, and bound book. Consult a StorageTek marketing representative to order the various manuals relating to the 9500.

CD-ROM

- Customer hardware documents: a CD-ROM of SVA 9500 customer documents is available by requesting the *9500 Customer Documentation, PN MP-9500x*.
- Software documents: a CD-ROM of SVA 9500 software documents is available by requesting *SVA Software Publications, PN 311295301-xx*.

Bound Books

Individual bound books of SVA 9500 documents are available through Software Manufacturing Distribution (SMD); request by document title and/or part number.

Other Documents

The following IBM documents may also assist you in using SVA 9500:

- *Planning For IBM Remote Copy SG24-2595-xx*
- *Remote Copy Administrator's Guide and Reference SC35-0169-xx*

History of Changes

Rev A - Initial release November 1999.

Rev B - First revision, December 1999.

- Minor revisions, and pagination change to reflect the way the PDF files number pages.

Rev C - Second revision, June 2000.

- Added information about the PPRC bridge disconnect.
- Other minor changes and updates.

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Chapter 1 Power Control Operations

This chapter describes the power controls and indicators found in the 9500 Shared Virtual Array subsystem. It provides procedures for turning the unit on or off for normal operation, and for turning the SVA off in an emergency.

Power System Description

The 9500 Shared Virtual Array has two power cords. For true ac redundancy, these cords should connect to two independent power sources that will not fail at the same time. If both unit power cords are connected to different circuits from the same AC source, reliability is enhanced, but true AC redundancy is not realized.

The redundant dc power supplies protect all Shared Virtual Array components, including cache and the physical devices (disk drives).

Redundant battery backup units provide nonvolatile storage with at least 72 hours of protection.

Power Control Panel Controls and Indicators

The Shared Virtual Array has a power control panel recessed into the right front door of the cabinet. The power control panel contains buttons and switches to select power control states, and indicators to show the unit's power status. Figure 1-1 illustrates the Shared Virtual Array's power control panel. Table 1-1 provides a brief functional description of the controls and indicators found on the power control panel.

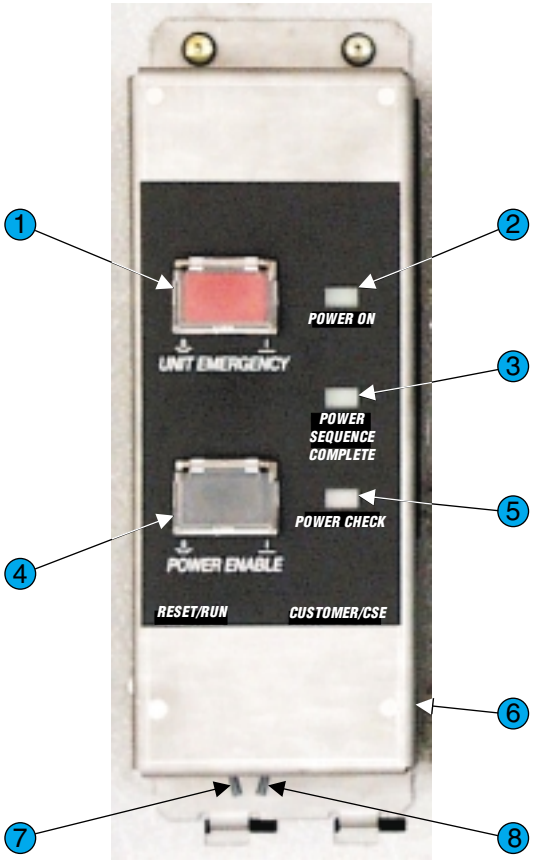

Figure 1-1 Power Control Panel

Table 1-1 Power Control Panel

Figure 1-1 Reference	Switch or Indicator	Function
1	UNIT EMERGENCY Switch (EPO)	Setting switch to ON (1) instantly disables subsystem power beyond PDUs. Setting switch to OFF (0) allows subsystem power to be enabled when POWER ENABLE switch is pressed. A battery backup system protects nonvolatile cache data (NVS) during EPO.
2	POWER ON Indicator	Lights green if 5V DC is present and within spec at C3 motherboard.
3	POWER SEQUENCE COMPLETE Indicator	Microcode-controlled; lights green after subsystem verifies that all power checks completed error-free during ‘power on’ sequence.
4	POWER ENABLE Switch	Setting switch to OFF (0) initiates a controlled power down (CPD) of subsystem. Setting switch to ON (1) enables subsystem power.
5	POWER CHECK Indicator	Microcode-controlled; lights amber if subsystem power checks do not complete error-free during ‘power on’ sequence.
6	ISP Drive LEDs	Light green when ISP drives are active (visible from the right side).
7	RUN/RESET Switch	Resets subsystem after thermal EPO. Switch is accessible only if front doors of unit are unlocked.
8	CSE/CUSTOMER Switch	Determines how subsystem power is reset after EPO. Switch is set by CSE at installation and is accessible only if front doors of unit are unlocked.

Turning On a Shared Virtual Array

To turn on a Shared Virtual Array:

1. Verify that the red UNIT EMERGENCY button on the Controller power control panel is set to ON. Refer to Figure 1-1.
   - A UNIT EMERGENCY button is off when the red button stands out from the frame.
   - A UNIT EMERGENCY button is on when the red button is flush with the frame.

   If necessary, refer to “Resetting a Unit After an Emergency Power Off” to reset the subsystem.
2. Set the POWER ENABLE button on the Controller power control panel to ON (1).
   - The POWER ON indicator on the Controller power control panel illuminates.
   - The Power Sequence Complete indicator on the Controller power control panel illuminates and the subsystem automatically begins an IML procedure.
   - The operator panel displays a series of messages describing the steps in the IML procedure. When the IML procedure is complete, the status field on the operator panel indicates “Full Box IML Complete”.

Turning Off a Shared Virtual Array

To turn off a Shared Virtual Array:

1. At the host console, vary all of the addresses to the Disk Array Controller offline.
2. At the host console, vary all of the channels to the Disk Array Controller offline.
3. Set the POWER ENABLE button on the Controller power control panel to OFF (0).
   - The Power ON indicator on the Controller power control panel goes out.

Emergency Power Off (EPO) Operations

To turn off a Shared Virtual Array Controller in an emergency:

1. Locate the red UNIT EMERGENCY button on the unit’s power control panel.
2. Lift the clear plastic guard, and press the UNIT EMERGENCY button.

Note: The unit powers down is the fastest possible sequence without compromising data integrity, and the Power On indicator goes out.

Resetting a Unit After an Emergency Power Off

Depending on how the CSE/CUSTOMER switch on the unit was set at installation, you may have to call a CSE to reset the subsystem after an Emergency Power Off (EPO). Table 1-2 describes the situations and what to do.

Table 1-2 Resetting Shared Virtual Array After an EPO

Cause of EPO	CSE/Customer Switch Option	How to Reset (power unit on)
Manual EPO	“Customer” reset option	Return the red UNIT EMERGENCY button on the unit’s power control panel to OFF (0).
Manual EPO	“CSE” reset option	Return the red UNIT EMERGENCY button on the unit’s power control panel to OFF (0) and call a service representative to turn on the subsystem.
Thermal EPO	Any position	Return the red UNIT EMERGENCY button on the unit’s power control panel to OFF (0) and call a service representative to turn on the subsystem.

To reset a Shared Virtual Array Controller after an EPO, return the red UNIT EMERGENCY button on its power control panel to OFF (0).

A UNIT EMERGENCY button is off when the red button stands out from the frame.

A UNIT EMERGENCY button is on when the red button is flush with the frame.

Software-Controlled Power Off/Thermal EPO

In certain situations, such as an over temperature condition, the Controller operational software may initiate a software-controlled power off. In this case, a CSE must be called to reset the subsystem.

There are two types of system "power down" procedures, as follows:

- Controlled power down (CPD)--an ISP software function primarily used to reduce power consumption when a system is not in use (e.g. holidays).
- Relocation power shutdown--a total power shutdown done during system relocation, including CPD of all units and turning off all AC inlet and PDU breakers.

Using the 9500 system POWER ENABLE switch:

1. Have the operator vary offline all channels and functional devices between the host(s) and the system.
2. Set the 9500 system POWER ENABLE switch to OFF (O).

   The unit initiates a CPD sequence, which automatically:

- Disables each front-end channel and saves its last state for the next IML.
- Transfers customer data and mapping tables from nonvolatile cache to the arrays.
- Compresses all raw state saves (takes 10 minutes to one hour).
- Logically disconnects CNV cards from the battery backup system

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Chapter 2 Operator Panel Introduction

This chapter describes the Shared Virtual Array operator panel, which provides the human interface to the subsystem. This chapter also describes how to start using the operator panel and how to move around its menus and screens.

Operator Panel Overview

The operator panel allows the operator to configure and control a Shared Virtual Array subsystem. On the Disk Array Control Unit, the operator panel is recessed into the left front door of the Control Unit cabinet.

Keyboard Mastership

The top field on the operator panel display lists the operator panels that are attached to the Shared Virtual Array subsystem and which operator panel is keyboard master. The abbreviations (or acronyms) are as follows:

DACDisk Array Controller Display

DAUDDisk Array Unit Display

IXOFShared Virtual Array Administrator

CSRCCustomer Service Remote Center

The operator panel may be in one of three states: idle, keyboard master, or maintenance.

- In the “idle” state, there is no activity at any of the connected operator panels.
- In the “keyboard master” state, an operator is performing actions at one of the connected operator panels. If the operator allows more than three minutes to pass without performing a function, mastership is lost and the operator panel reverts to the “idle” state.
- In the “maintenance” state, a CSE is performing maintenance actions at one of the connected operator panels. If the CSE allows more than 60 minutes to pass without performing a function, he or she is logged off and the operator panel reverts to the “keyboard master” state.

Mastership is established by pressing any soft-key while the "Subsystem Main Menu (SS01)" screen is displayed; when this occurs, the support facility designates that panel as ’master,’ and all other connected panels as ’slaves.’ To prevent one user from interfering with the activity of another, slave panels display the content of the master panel but cannot perform any functions while the master panel is in use.

After keyboard mastership is forfeited using the **[F3]** (EXIT KEYM) key on the "Subsystem Main Menu (SS01)" screen, any other panel can assume keyboard mastership.

Operator Panel Control

Shared Virtual Array subsystems have two Shared Virtual Array support processors, which form the basis of the subsystem's support facility. The support facility is responsible for managing and administrating the subsystem, including operator panel control.

Shared Virtual Array's two ISPs conform to the subsystem's fault-tolerant design. At any one time, one ISP is the master processor, performing all of the support facility responsibilities. At the same time, the other ISP is in standby mode, accepting checkpoint messages and ready to take over as master as required. When a processor switch occurs, the standby ISP becomes the master and takes over all of the support facilities' responsibilities.

Shared Virtual Array Security

Multiple levels of access passwords provide a Shared Virtual Array subsystem with security, preventing unauthorized access to Shared Virtual Array maintenance and control functions.

Initial passwords are factory-set and remain in effect until the customer or CSE, as appropriate, modifies them. To modify passwords, refer to "Assigning Passwords and Security Levels."

An operator has five opportunities to type in the correct customer logon password. After five incorrect attempts, the operator panel returns to the Subsystem Main Menu.

The following sections describe the levels of access and the different passwords required for Shared Virtual Array.

Operator Panel Security

Operator panel functions are divided into two levels of functionality. Non-restricted functions, which include viewing operations and enabling and disabling channels, do not require a password. Restricted functions, which include all configuration and drain functions, require a customer logon password. Refer to "Assigning Passwords and Security Levels" for more information on the customer logon password.

CSE/CMC Security

StorageTek CSEs and Customer Service Remote Center (CSRC) engineers may need to access operator panel functions. Shared Virtual Array's normal security system ensures that when performing maintenance and diagnostic functions, StorageTek personnel do not have access to customer data. However, a customer can ensure that an operator is always notified when StorageTek personnel need to access a subsystem. The customer does this by accessing the Customer Configurable Items screen and setting the CSRC connection security level to "high."

When the security level is set to “high,” StorageTek personnel must request the password from the system operator at the host console. The system operator runs IDCAMS, a host-based facility that generates a temporary password, which expires after one hour. The system operator supplies this password to the CSE.

Operator Panel Description

The Shared Virtual Array local operator panel consists of a liquid crystal display (LCD), ten variable function “Soft Keys,” a 16-Key hexadecimal keypad (0 - F), an **[ENTER]** key, and a **[CLEAR]** key. Figure 2-1 illustrates the Shared Virtual Array subsystem operator panel, and Table 2-1 provides a description of the display and function keys found on an operator panel.

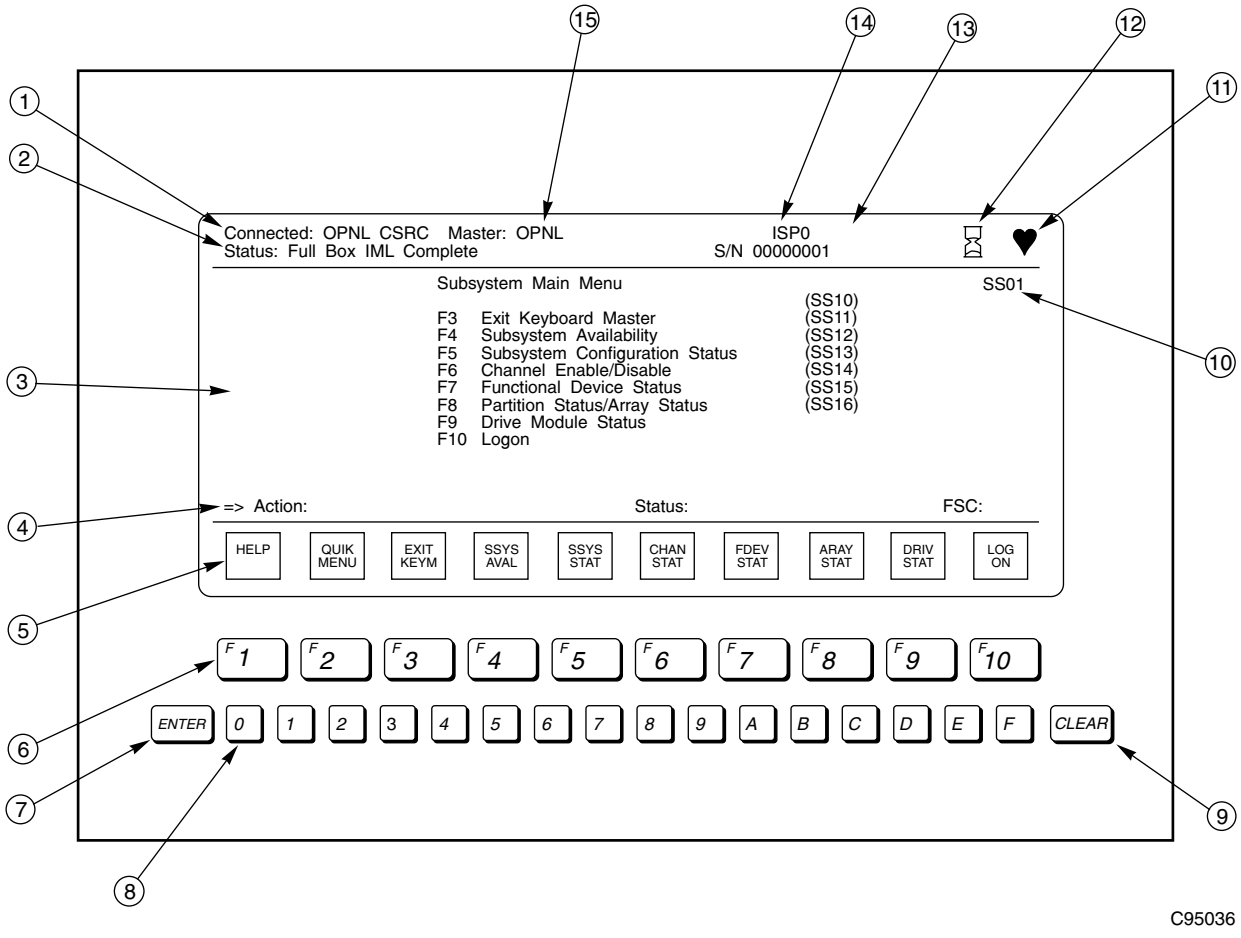


Figure 2-1 Operator Panel Controls and Indicators

Table 2-1 Operator Panel Controls and Indicators

Figure 2-1 Reference	Control or Indicator	Function
1	“Connected” Field	Lists all of the operator panels that are connected to the subsystem. **DACD** Local panel for 9500 system **CSRC** Remote panel for Field Support Center
2	System “Status” Field	Indicates system status (normal, over temperature, power failure, power check, etc.); displays messages during IML.
3	Application/Input Field	Displays status information; allows users to access screens and functions, change configuration data, etc.
4	“Action/Status/FSC” Fields	**Action** - Describes current function being performed by the support facility **Status** - Describes the status of the current function being performed. **FSC** - Fault symptom code; indicates successful (FSC=None) or less than successful (FSC=XXXX) completion of an operation. (Where XXXX is a hexadecimal fault symptom code that indicates a failed operation.)
5	Function Key Guide Field	Provides abbreviated descriptions of soft-key functions available for current screen.
6	[F1]-[F10] Function Keys	Activate selected functions as listed on the current screen. Refer to “ on page 25”
7	[ENTER] Key	Moves the cursor to the next field, or in some cases, sends operator-keyed information to the Shared Virtual Array support processor.
8	0-9 and A-F Data Entry Keys	Allow users to enter hexadecimal information at the current screen (if prompted).
9	[CLEAR] Key	Deletes user-keyed information from current screen.
10	Screen Title/ID Field	Functional title of a screen, plus its unique alphanumeric identifier for the screen (for example, the ID for the Subsystem Main Menu is SS01).
11	“Heartbeat Field”	Expands and contracts continuously to indicate that the ISP is functional; the pulse=30 beats/minute.
12	“Hourglass Field”	Indicates that the ISP is performing a requested (user-keyed) command.
13	“Serial” # Field	Indicates the unit serial number (000xxxxx).
14	“ISP” Field	Indicates which ISP (ISP-0 or ISP-1) is the master. The master ISP controls the operator panel displays.

Table 2-1 Operator Panel Controls and Indicators

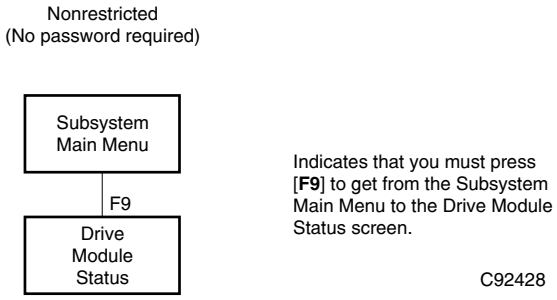
Figure 2-1 Reference	Control or Indicator	Function
15	“Master” Field	Indicates which connected operator panel is keyboard master.

Moving Around the Operator Panel Screens

The operator panel screens are arranged into two levels: nonrestricted and restricted, which are separated by a logon menu (“Subsystem Main Menu Tree” on page 24). Nonrestricted screens are accessible directly from the Subsystem Main Menu without a password. Restricted screens require that the operator type in a logon password in order to gain access to the Customer Main Menu. Nonrestricted functions include enabling and disabling channels and viewing the status of the subsystem configuration and operations. All other functions are restricted functions.

Note: In Shared Virtual Array terminology, a menu is an operator panel display that lists selections; a screen is an operator panel display into which you can type information and perform functions.

Because the path to a screen may involve several menus, the path is displayed graphically. For example:



Subsystem Main Menu Tree

Figure 2-2 shows the arrangement of screens available through the SUBSYSTEM MAIN MENU.

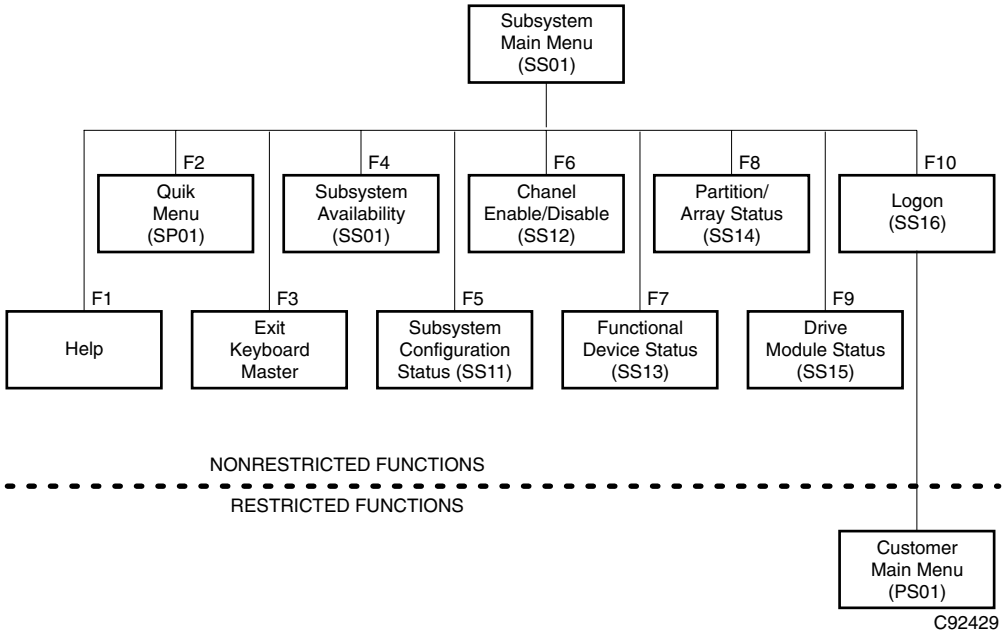


Figure 2-2 Subsystem Main Menu Tree

Customer Main Menu Tree

Figure 2-3 shows the arrangement of the screens available through the CUSTOMER MAIN MENU.

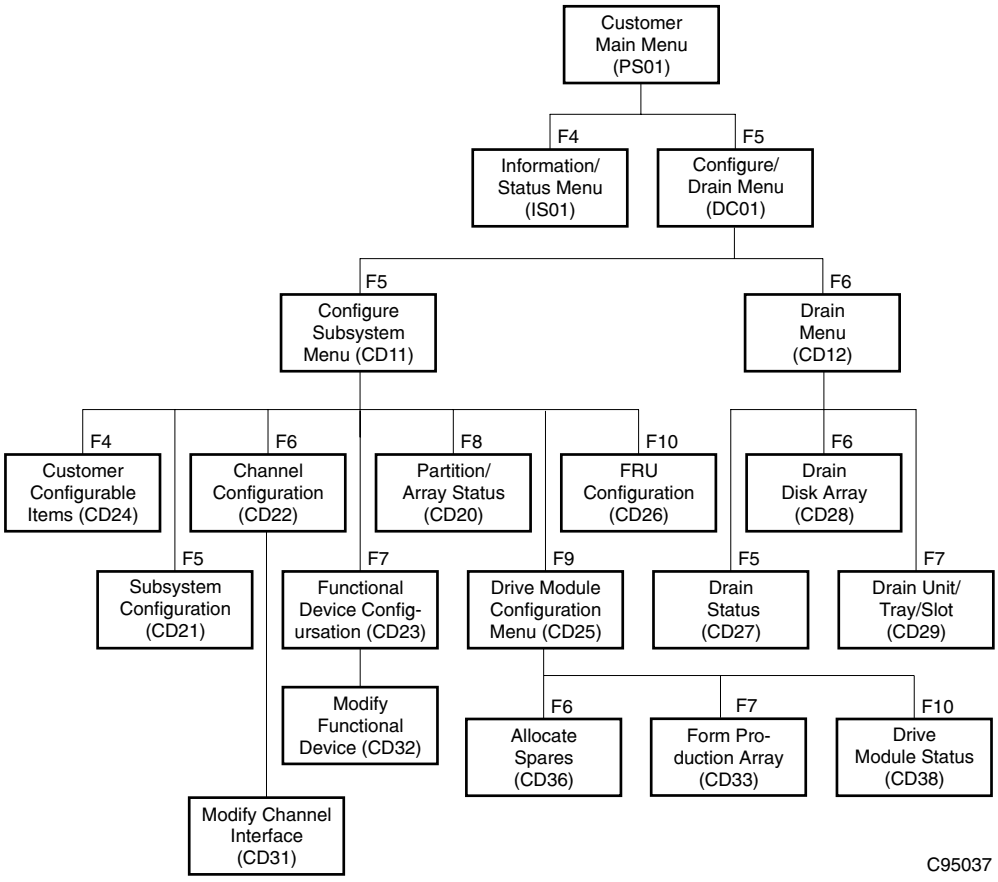


Figure 2-3 Customer Main Menu Tree

Function Keys

Function keys allow you to move around the operator panel menus. There are three function keys that are found on all of the Shared Virtual Array menus and screens, and always have the same function key number. There are four function keys that are common to many of the Shared Virtual Array menus and screens. When they are selections on a menu or screen, they also always have the same function key number. The function keys found on all Shared Virtual Array menus and screens are:

Table 2-2 Shared Virtual Array Function Keys

HELP [F1]	To access context-based HELP about the menu or screen currently displayed.
QUIK MENU [F2]	To access an abbreviated list of operator panel menus. The Quick Menu allows you to quickly move from a menu or screen at the bottom of the menu tree to a menu at the top of the menu tree without having to go through the previous menus. Refer to “Using the Quick Menu” for information on how the Quick Menu option works.
PREV MENU [F3]	To return to the previous menu. *(On the SUBSYSTEM MAIN MENU, this key allows you to quit as keyboard master.)*

The function keys common to many Shared Virtual Array menus and screens are:

Table 2-3 Common Function Keys

PAGE UP **[F4]**	To move to the previous page of data.
PAGE DOWN **[F5]**	To move to the next page of data.
CURS UP **[F6]**	To move the cursor to the previous selection item. (Cursor position is highlighted in reverse video.)
CURS DOWN **[F7]**	To move the cursor to the next selection item.

To perform a menu function, press the appropriate function key. For example, pressing **[F8]** while viewing the Subsystem Main Menu (Figure 2-4 on page 27) displays the status of the partitions and disk arrays.

Any keystrokes made while the hourglass figure is on-screen are ignored.

Data Entry

Use the hexadecimal keys (0 through F) for data entry functions at the operator panel. However, note that while zero is a valid entry in some fields, leading zeros are, in most cases, ignored.

Operational Status

As mentioned before, the second line of the operator panel display contains the subsystem status line, which indicates the status of events that are detected by the subsystem. The subsystem status field usually indicates “Full Box IML Complete.” However, in certain conditions, other subsystem status information may appear here. Finally, if the subsystem detects a problem, it may display information about the problem on the subsystem status field.

When an operator entry is out of the stated range for a field, “Invalid data entered - Press any key to continue” appears on the line above the function keys.

Starting an Operator Panel Session

To start an operator panel session:

1. Determine if another operator is keyboard master.

   The keyboard master is identified in the **Master:** field on the top line of the screen (refer to Figure 2-4), and the actions of the current keyboard master are displayed on the operator panel screen.

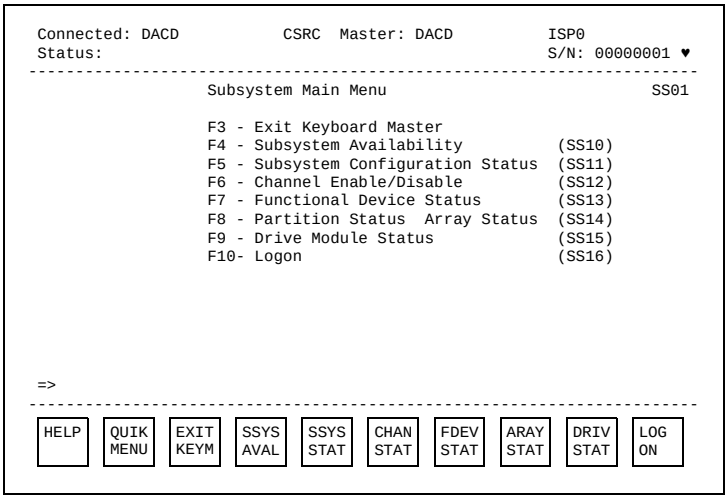


Figure 2-4 Subsystem Main Menu

2. If another operator is keyboard master, wait until the Master: field is blank before requesting to become keyboard master.

Note:

If you request to become keyboard master while another operator is keyboard master, your request will be refused.

3. When the **Master:** field is empty, request to become keyboard master by pressing any key on the keyboard.

   - "Request Key Master" appears in the action field and "Started" appears in the operation status field. When your request to become keyboard master is approved, "Granted" appears in the operation status field, and you can begin your session.

4. If the SUBSYSTEM MAIN MENU is not displayed, press PREV MENU **[F3]** until it is.

   Always start an operator panel session at the SUBSYSTEM MAIN MENU.

5. Select the operator panel function you wish to perform. Refer to chapters 4 through 9 for the operator panel functions that are available to you.

Note: As mentioned in "Moving Around the Operator Panel Screens," to perform restricted operator panel functions, you must be authorized and know the customer logon password.

Selecting and Performing Functions

There are three methods of making selections and executing functions on the operator panel:

Table 2-4 Selecting and Performing Functions

Method	How you can tell	What you do
Cursor-selectable	When a list of items is displayed and one of the items is highlighted in reverse-video. Also, the cursor up **[F6]** and cursor down **[F7]** function keys are displayed.	Move the cursor until the item that you want to select or the function that you want to perform is highlighted. Press the appropriate function key (usually **[F8], [F9], [F10]**, or **[ENTER]**) to make the selection or execute the function.
Data field entry	If one or more data fields into which you can type information are displayed.	Type in the information, using the hex and decimal keys. Press the appropriate function key (usually **[F8], [F9], [F10],** or **[ENTER]**) to make the selection or perform the function.
Soft-key only	If you can simply press a function key to make a selection or perform a function. You do not move the cursor or type in information.	Press the appropriate function key to make the selection or perform a function. Only valid function keys (those with functions assigned on-screen) can be used to make a selection or perform a function. Press function keys that are not labeled (i.e., those that do not have functions indicated on-screen), or pressing the **[CLEAR]**, **[ENTER]**, and hex keys **[0]-[F]** will not cause anything to happen on these screens.

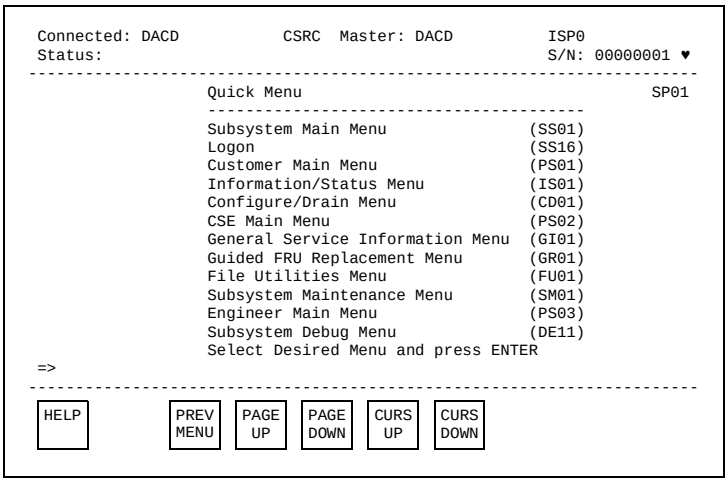
Using the Quick Menu

Every operator panel screen and menu has a Quick Menu option. This Quick Menu allows you to move around through menus and screens more rapidly and easily. It also eliminates the ‘backing out’ steps otherwise required to exit screens and menus.

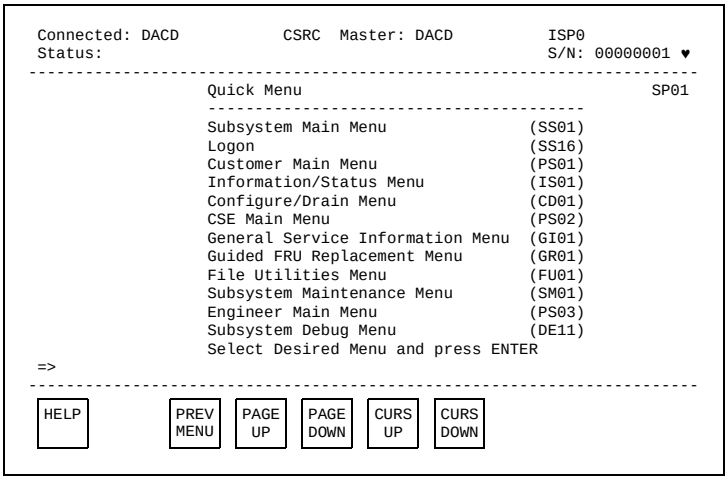
Note: The “Quick Menu (SPO1)” screen does not have a HELP screen. Press **[F1]** (HELP) to display help screens for the menu highlighted by the cursor.

To access the QUIK MENU, press **[F2]**

- If you are working in the non-restricted screens, the following QUIK MENU screen appears:



- If you are working in the restricted screens, the following QWIK MENU screen appears:



1. Move the cursor until the menu that you want to access is highlighted.
2. Press **[ENTER]**. The menu you selected appears.

Initial Configuration of an Shared Virtual Array Subsystem

Once the Shared Virtual Array subsystem is installed, it must be configured to accept data. Configuring the subsystem is achieved in four steps. The first three configuration steps are performed by StorageTek personnel. You can complete the fourth configuration step, or a CSE can do so.

1. The configuration features that are standard for all subsystem configurations are factory-installed on the hard drives in the Shared Virtual Array Controller.
2. As part of the subsystem installation, a CSE installs the optional features selected by your company when placing the order. Features that can be installed with the subsystem include:
   - The addition of ServiceTek.

- The customer cache size in the Controller.

3. As part of the subsystem installation, a StorageTek CSE sets up the minimum subsystem configuration. This set-up procedure consists of several sub-tasks, including:
   - Defining the minimum subsystem (global) configuration
   - Defining the minimum channel configuration
   - Allocating the spares required to form a production array
   - Forming at least one production array
   - Defining the minimum functional configuration and designating a privileged Extended Control and Monitoring (ECAM) device.
4. To complete the subsystem configuration, a trained customer representative or a StorageTek CSE modifies the minimum subsystem configuration.

   In order to perform these configuration sub-tasks, you must have access to restricted functions. In addition, you must thoroughly understand the configuration process and its implications, which are discussed in the *9500 Shared Virtual Array Planning, Implementation, and Usage Guide*.

You can perform all of the configuration sub-tasks at the local operator panel. Once you have assigned passwords and security levels at the local operator panel, you can perform the remainder of these sub-tasks from a host-attached terminal via the IBM Extended Facilities Product (SVAA).

Because SVAA is more flexible and easier to use, it is recommended that after you assign passwords and security levels at the local operator panel, you then perform the remainder of the sub-tasks at a host terminal via SVAA.

Ending an Operator Panel Session

To maintain subsystem security, completely end each operator panel session.

There are two ways to end an operator panel session: by backing out of each screen or by using the Quick Menu.

To back out of each screen:

1. Press PREV MENU **[F3]** until the SUBSYSTEM MAIN MENU is displayed.
2. Press EXIT KEYM [F3] to resign as keyboard master.

To use the Quick Menu to end an operator panel session:

1. Press Quick Menu **[F2]**.
2. Move the cursor until the SUBSYSTEM MAIN MENU is highlighted.
3. Press [ENTER].

The SUBSYSTEM MAIN MENU appears.

Press EXIT KEYM **[F3]** to resign as keyboard master.

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Chapter 3 Viewing Operations

This chapter describes how to view the availability, configuration, and status of Shared Virtual Array resources.

The following table describes the procedures that are found in this chapter and provides a reference page for those procedures.

Table 3-1 Procedures in Chapter 4

To view:	Refer to page:
The availability of Shared Virtual Array resources	33
The subsystem configuration	36
The channel configuration	38
The functional device configuration	39
The partition and disk array status	41
The drive module configuration	42
The FRU (field-replaceable unit) configuration and status	45

Nonrestricted and Restricted Operations

Except for the FRU configuration and status, you can view the information listed above on screens that are *nonrestricted* (no password required) or on screens that are *restricted* (logon password required). Both paths (nonrestricted and restricted) to a viewing operation are identified in the procedure. Access to the FRU configuration and status is always restricted.

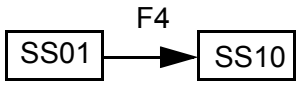
You can also view the status of a drain operation. To view the status of a drain operation, refer to **"Viewing the Status of a Drain Operation" on page 88**.

Viewing the Subsystem Availability

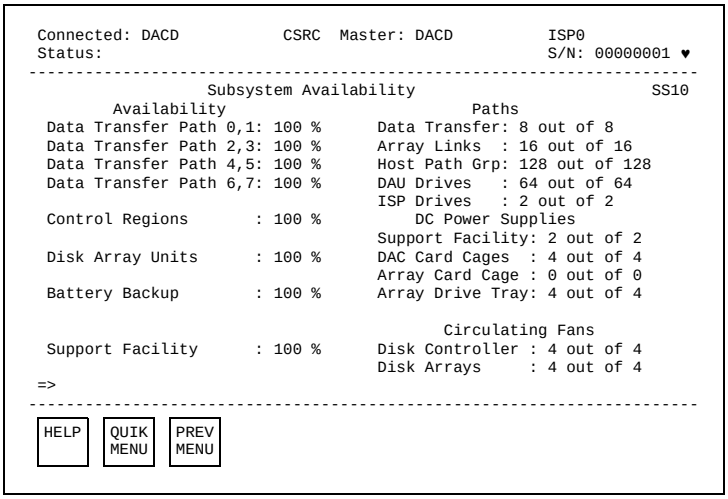
The SUBSYSTEM AVAILABILITY screen describes how much of a specified subsystem resource is currently operational.

To view the SUBSYSTEM AVAILABILITY screen:

1. Follow the nonrestricted or restricted **path** to access the SUBSYSTEM AVAILABILITY screen.



The SUBSYSTEM AVAILABILITY screen appears.



For a definition of the terms used in describing the subsystem availability, refer to the next section.

Press PREV MENU **[F3]** to exit.

Terms Used to Describe the Subsystem Availability

Table 3-2 Subsystem Availability Terms

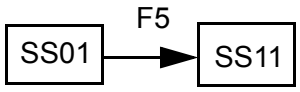
AVAILABILITY	
Data Transfer Paths 0, 1, 2, and 3, or 0-8 for 8 Data Path feature	The percentage of data path resources that are operational.
Total Cache	The percentage of total cache that is operational. Total cache is the sum of user cache and Shared Virtual Array-reserved cache.
User Cache	The percentage of cache that is available for user data.
Disk Array Units	The percentage of disk drives that are available for user data, which equals the number of operational drives divided by the number of installed drives converted to a percentage.
Battery Backup	The relative percentage of dc electrical charge available in the nonvolatile storage (NVS) battery backup system. If the battery can provide at least 72 hours of protection, the display reads 100%. If the battery can provide less than 72 hours of protection, the display reads 0%.
STATUS	
Outlet Temp DAC	Indicates the temperature status (either normal or over temp) at the Disk Array Controller outlet.
Outlet Temp DAU	Indicates the temperature status (either normal or over temp) at the Disk Array Unit outlets. If any Disk Array Unit is over temperature, this field indicates over temp.
PATHS	
Data Transfer	The number of data transfer paths that are operational (maximum of four for 4 Data Path or eight for 8 Data Path).
Channels	The number of channel interfaces that are operational (maximum of 32).
Disk Drives	The number of physical disk drives that are operational (maximum of 128).
Support Facility	The number of operational dc power supplies available to support the system support processors (maximum of 2).
Disk Array Controller	The number of operational dc power supplies available to support the Disk Array Controller (maximum of 4).
Disk Array Unit	The number of operational dc power supplies available to support the Disk Array Units, not including the drive trays (maximum of 4).
Disk Drive Tray	The number of operational dc power supplies available to support the disk drive trays (maximum of 32).
CIRCULATING FANS	
Disk Controller	The number of operational blower assemblies in the Disk Array Controller (maximum of 4).
Disk Array Unit	The number of operational card cage and tray fan assemblies in the Disk Array Units (maximum of 36).

Viewing the Status of the Subsystem Configuration

The SUBSYSTEM CONFIGURATION STATUS screen describes how the subsystem is configured, including the number of channels and the amount of cache installed.

To view the subsystem configuration status:

1. Follow the nonrestricted or restricted **path** to access the SUBSYSTEM CONFIGURATION STATUS screen.



The SUBSYSTEM CONFIGURATION STATUS screen appears.

```
Connected: DACD           CSRC  Master: DACD          ISP0
Status:                                               S/N: 00000001 ♥
--------------------------------------------------------------------------------
                  Subsystem Configuration Status                  SS11

Site Name: DBF00009  Site loc#: 222222       Subsystem Name: DAC00001
S/N:   000000000001  Rel Lev: K06.00.xx      ISP Ver: P990217
SSIDs: 1A96  1A97  1A98  1A99                Host Path Groups- Cl0:4
                                                             Cl1:4
Cache Size
  Installed:  3072 MB  Num Arrays:        4  DA Capacity:   1142.21GB
  Configured: 2944 MB  Global Spares:     2  % Net Load:         50%
  System:      128 MB  Def Array Size: 13+2  % Coll Free Sp:     47%
  Fenced:      256 MB                       % Uncoll Free:       3%
  Avail User: 2944 MB  Date: 99/12/01
Nonvolatile:    8 MB  Time: 12:01:01        ISP/IUP Code Mismatch: N

               Snapshot      Maintenance   IXOF          ESCON

=>
--------------------------------------------------------------------------------
 HELP    QUIK    PREV
         MENU    MENU
```

For a definition of the terms used to describe the subsystem configuration, refer to the next section.

2. Press PREV MENU **[F3]** to exit.

Terms Used to Describe the Subsystem (Global) Configuration

Table 3-3 Subsystem (Global) Configuration Terms

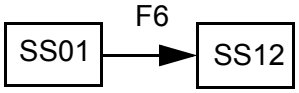
Site Name	The unique name for your site. This name must be the same for all Shared Virtual Array subsystems at a site.
Subsystem Name	The name of a specific subsystem at a site. Each subsystem should have a unique name.
Site Location Number	The number assigned by StorageTek that identifies your site.
Model	A number that identifies the general characteristics (such as hardware level) of the subsystem.
S/N (Serial Number)	The unique hardware number that identifies a specific subsystem.
Cluster/Channels	The number of channels installed for each cluster.
SSIDs	The subsystem identifiers (SSIDs) that identify the functional storage control units (the functional 3990 storage controls). A single Shared Virtual Array subsystem can have up to four SSIDs. If your site has more than one Shared Virtual Array subsystem, each functional 3990 must have a unique SSID.
Release Level	The level of software operating in the Shared Virtual Array Controller.
ISP Version	The level of software operating the Shared Virtual Array support processor.
Cache Size	The size (in megabytes) of customer cache installed in the subsystem.
DA Capacity	The total formatted physical capacity (in gigabytes) of the Disk Array Units.
Number of Arrays	The number of arrays currently defined in the subsystem.
Nonvolatile	The size (in megabytes) of nonvolatile storage (NVS) installed in the subsystem. 16 megabytes of effective NVS is standard in an Shared Virtual Array subsystem.
Net Load	The physical space (in gigabytes) on the disk arrays that is currently occupied by compressed user data.
Global Spares	The number of spare drive modules to be reserved when you form a new array. A subsystem may have one or two array spares assigned. This value is set from Def Array size.
% Net Load	The percentage of the physical disk array capacity that is currently occupied by compressed user data.
Date and Time	Displays the current date and time, based on a 24 hour clock and displayed in coordinated universal time (cut).
List of Options	Indicates what options are installed or activated in the subsystem.

Viewing the Status of the Channel Configuration

The CHANNEL ENABLE/DISABLE screen describes the configuration and status of the Shared Virtual Array channel interfaces.

To view the channel configuration:

1. Follow the nonrestricted or restricted **path** to access the CHANNEL ENABLE/DISABLE screen.



The CHANNEL ENABLE/DISABLE screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------
                  Channel Enable/Disable                          SS12
 Name      Cl  Card  Link Group Enab Speed  Type    Base Range BFDID
 ------------------------------------------------------------------
 ABC00001   0  ICE00  0     A    Y   20.0  ESCON     00   256   00
 ABC00002   0  ICE00  0     B    Y   20.0  ESCON     00   256   00
 ABC00003   0  ICE00  1     C    Y   20.0  ESCON     00   256   00
 ABC00004   0  ICE00  1     D    Y   20.0  ESCON     00   256   00
 ABC00005   0  ICE01  0     E    Y   20.0  ESCON     00   256   00
 ABC00006   0  ICE01  0     F    Y   20.0  ESCON     00   256   00
 ABC00007   0  ICEO1  1     G    Y   20.0  ESCON     00   256   00
 ABC00008   0  ICEO1  1     H    Y   20.0  ESCON     00   256   00
 ABC00009   0  ICE02  0     I    Y   20.0  ESCON     00   256   00
 ABC00010   0  ICE02  0     J    Y   20.0  ESCON     00   256   00
 ABC00011   0  ICEO2  1     K    Y   20.0  ESCON     00   256   00
 ABC00012   0  ICEO2  1     L    Y   20.0  ESCON     00   256   00
                F10 - Modify Channel Enable/Disable
 =>
--------------------------------------------------------------------------
 HELP  QUIK MENU  PREV MENU  PAGE UP  PAGE DOWN  CURS UP  CURS DOWN  ENAB DSAB
```

For a definition of the terms used in the channel configuration, refer to the next section.

The channel information may require more than one screen.

You can also enable and disable channels from this screen. To do so, refer to “Disabling a Channel.”

2. Press PREV MENU **[F3]** to exit.

Terms Used to Describe the Channel Configuration

The following terms are used to describe the configuration of subsystem channels:

Table 3-4 Channel Configuration Terms

Name	The unique name for a channel.
Clust(er)	The cluster (0 or 1) to which the channel interfaces.
Chan(nel)	The channel interface to which the channel is connected within the specified cluster. Shared Virtual Array supports up to 32 parallel channels (16 per cluster), so channel interfaces are designated ‘A’ through ‘P.’
Enab(le)	Identifies whether the channel interface is enabled (Y or Yes) or disabled (N or No).

Table 3-4 Channel Configuration Terms (Continued)

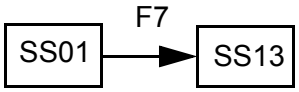
Speed	The data transfer rate (in megabytes per second) of the channel. Shared Virtual Array supports 3.0 or 4.5 megabyte-per-second parallel channels or 20.0 megabyte-per-second ESCON channels.
Type	The type of channel interface installed. Shared Virtual Array supports parallel and ESCON channels.
Base	The base channel address (hexadecimal), which is the lowest interface address on the channel.
Range	The number of addresses (decimal) with which the channel can interface.
BFDID	The base functional device identifier (hexadecimal) for the channel. The BFDID identifies the path between the base address and the functional device.

Viewing the Status of the Functional Device Configuration

The FUNCTIONAL DEVICE STATUS screen describes the configuration and status of the functional devices in the subsystem. (The term “functional” refers to the host view of the Shared Virtual Array device configuration.)

To view the functional device status:

1. Follow the nonrestricted or restricted **path** to access the FUNCTIONAL DEVICE STATUS screen.



The FUNCTIONAL DEVICE STATUS screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
------------------------------------------------------------------------
                    Functional Device Status                      SS13
Name     PT  SSID  FDID   Type  Cyls   GB  CEn CWP CA FW Priv SEn SWP
------------------------------------------------------------------------
A0000001 P   1AA   19A   33909  10017 8.51  Y   N  Y  Y   N    Y   N
A0000002 P   1AA   19B   33909  10017 8.51  Y   N  Y  Y   N    Y   N
A0000003 P   1AA   19C   33909  10017 8.51  Y   N  Y  Y   N    Y   N
A0000004 P   1AA   19D   33909  10017 8.51  Y   N  Y  Y   N    Y   N
A0000005 P   1AA   19E   33909  10017 8.51  Y   N  Y  Y   N    Y   N
UNDEFINE
UNDEFINE
UNDEFINE
UNDEFINE
UNDEFINE
UNDEFINE
UNDEFINE
UNDEFINE
=>
------------------------------------------------------------------------
 HELP | QUIK MENU | PREV MENU | PAGE UP | PAGE DOWN | CURS UP | CURS DOWN | PREV 64 | NEXT 64
```

For a definition of terms used in the functional device configuration, refer to the next section.

The functional device information may require more than one screen.

Press PREV MENU **[F3]** to exit.

Terms Used to Describe the Functional Device Configuration

Table 3-5 Functional Device Configuration Terms

Name	The name assigned to a functional device.
PT	The partition with which the functional device is associated. Functional devices must be in either the Test partition or the Production partition.
SSID	The subsystem identifier (SSID) for the functional storage control with which the functional device is associated.
FDID	The hexadecimal identifier of the functional device. The FDID is a value between 00 and 3FF.
Type	The type of device that the functional device emulates. Functional devices may emulate 3380J, 3380K, 3380KE, 33901, 33902, 33903, or 33909 devices.
CYLS	The number of cylinders for the functional device.
GB	The functional capacity (in gigabytes) of the functional device, which is determined by the capacity of the device model being emulated.
ENA(ble)	Identifies whether host access to the functional device is enabled (Y or Yes) or disabled (N or No).
WP	Identifies whether the functional device is write protected (Y or Yes) or not write protected (N or No). If the functional device is write protected, the data on it is read-only and cannot be overwritten.
CA	Indicates whether cache for the functional device is enabled (Y or Yes) or disabled (No or No). When cache is disabled, data is still cached, but the caching algorithm is changed. Therefore, in a write operation, tracks are queued for immediate de-staging to the arrays, rather than being held in cache. In a read operation, a track is staged to cache and then queued for de-allocation from cache as soon as the read operation is completed.
FW	Indicates whether DASD fast write for the functional device is enabled (Y or Yes) or disabled (N or No). All writes to Shared Virtual Array are DASD fast writes; DASD fast write is never truly disabled.
PRIV	Indicates whether the functional device is a privileged ECAM device (Y or Yes) or not (No or No). To implement the SVAA software, you must designate at least one functional device as a privileged ECAM device--that is, as an eligible designation for Category 1-restricted messages. However, you should limit the number of such devices.

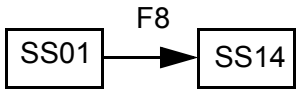
Refer to the *SVAA Configuration and Administration*, **XXXXXX** for more information about ECAM and privileged ECAM devices.

Viewing the Status of the Partition/Array Configuration

The PARTITION/ARRAY STATUS screen describes the configuration and status of the partitions and arrays in the subsystem.

To view the partition and array status:

1. Follow the nonrestricted or restricted **path** to access the PARTITION/ ARRAY STATUS screen.



The PARTITION/ARRAY STATUS screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------
 Partition Status             Array Status                          SS14

 Partition     Size           Array ID  Partition        Size
 ------------------           ----------------------------------
 Production     30            Ary0      Production       13+2
 Test           14            Ary1      Production       13+2
 MAT             0            Ary2      Test              5+2
 Spares          4            Ary3      Test              5+2
 Unavailable    48            Ary4      Undefined
                              Ary5      Undefined
                              Ary6      Undefined
                              Ary7      Undefined



 =>
--------------------------------------------------------------------------
 HELP   QUIK   PREV
        MENU   MENU
```

For a definition of terms used to describe the partition and array status, refer to the next section.

2. Press PREV MENU **[F3]** to exit.

Terms Used to Describe the Partition and Array Configuration

Table 3-6 Partition and Array Configuration Terms

PARTITION STATUS	
Partition	Identifies the partitions to which the drives are assigned. Drives may be in one of four partitions: production (P), test (T), spare (S), and unavailable (U).
Size	The number of functional devices in each partition.
ARRAY STATUS	
Array ID	The unique identifier for an array. The array ID is assigned when the array is formed.
Partition	Identifies to which partition an array is assigned. Arrays must be in either the production or the test partition.
Size	Identifies the size and configuration of the array. In an Shared Virtual Array, 15, 14, or 8 physical devices are organized into a logical group. Within the group, user data is recorded on identically addressed tracks on all but two of the devices. The identically addressed tracks on the other two devices are reserved for the two levels of redundancy data generated by the subsystem. You have three configuration options for a Shared Virtual Array: a 15-device array, a 14-device array, or a 7-device array. In a 15-device array, which is referred to as a 13+2 or 13+2+1 array, one physical device in the array is reserved as a spare device, and is globally available to the subsystem. In a 14-device array, which is referred to as 12+2 or 12+2+2 array, two physical devices in the array are reserved as spare devices and are globally available to the subsystem. In a 7- (or 8-) device array, one physical device is reserved as a spare device. The 15-device array option (13+2) provides more user data capacity. The 14-device array option (12+2) provides more spare devices. The default disk array configuration is the 15-device array. This configuration provides the maximum data capacity with an adequate number of spare drives for data recovery.

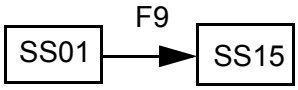
Drives are not dedicated to carrying user data or redundancy data. Instead, the system dynamically assigns user data and control data to the drives.

Viewing the Status of the Drive Module Configuration

The DRIVE MODULE STATUS screen describes the configuration and status of all of the physical drive modules in the subsystem by partition.

To view the drive module configuration:

1. Follow the nonrestricted or restricted **path** to access the DRIVE MODULE STATUS screen.



The DRIVE MODULE STATUS screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------------
                  Drive Module Status        Production          SS15
 U.T.S  Status  Array ID  Type
 ------------------------------------------------
 0.0.0  P.A     Ary0      9.0  GB SSA
 0.0.1  P.A     Ary4      9.0  GB SSA
 0.0.2  P.A     Ary1      9.0  GB SSA
 0.0.3  P.A     Ary5      9.0  GB SSA
 0.0.4  P.A     Ary8      9.0  GB SSA
 0.0.5  P.A     Ary0      9.0  GB SSA
 0.0.6  P.A     Ary0      9.0  GB SSA
 0.0.7  P.A     Ary3      9.0  GB SSA
 0.1.0  P.A     Ary7      9.0  GB SSA
 0.1.1  P.A     Ary6      9.0  GB SSA
 0.1.2  P.A     Ary4      9.0  GB SSA
 0.1.3  P.A     Ary1      9.0  GB SSA
 0.1.4  P.A     Ary6      9.0  GB SSA
=>
--------------------------------------------------------------------------------
 HELP | QUIK MENU | PREV MENU | PAGE UP | PAGE DOWN | PREV PART | NEXT PART
```

For a definition of terms used in the drive configuration, refer to the next section.

The drive module information may require more than one screen.

2. To view another partition, press NEXT PART **[F7]** or PREV PART **[F6]**. Pressing NEXT PART takes you through the partitions in the following order:
   A. Production (P)
   B. Test (T)
   C. Spares (S)
   D. Unavailable (U)
3. Press PREV MENU **[F3]** to exit.

Terms Used to Describe the Drive Module Configuration

The drive module configuration can be described in physical terms or in logical terms. In physical terms, a drive module is identified by its physical unit, tray, and slot (U.T.S.) location. In logical terms, a drive module is identified by its array ID, which identifies the array to which it belongs.

The terms that related to the drive module configuration are described in the following section.

Table 3-7 Drive Module Configuration Terms

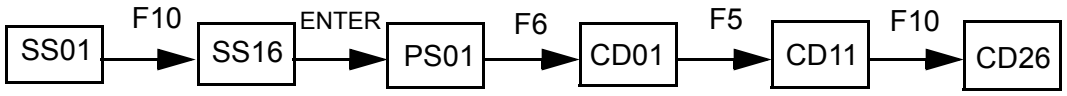
U.T.S.	The Shared Virtual Array unit (0 to 3), tray (0 to 3), and slot (0 to 7) in which the drive module is located. **Note:** Some units may be only half-populated. Therefore, not all U.T.S. locations contain drive modules.
Array ID	The array (Ary0 to Ary7) to which the drive module is assigned. Only drives in Production or Test partitions have an array ID.
Size	Identifies how the array is configured. You have three configuration options for an Shared Virtual Array array: a 15-device (13+2+1) array, a 14-device (12+2+2) array, or a 7- or 8-device (5+2+1) array. In a 15-device array, one drive module in the array is reserved as a spare device. In a 14-device array, two drive modules in the array are reserved as spare devices. In a 7- or 8-device array, one drive module in the array is reserved as a spare.
Partition	The partition to which a drive module is associated. There are four partitions: the Production partition, Test partition, the Spares partition, and the Unavailable partition.
Drive Status	The status of the drive module. Drive modules may be associated with one of five partitions, and they may have different status within the partition.
Spares Partition	The Spares partition contains drives that are available for forming arrays. When you form a test or production array, the drives for the array are taken from the Spares partition. Also, when the subsystem reconstructs a drive, it reconstructs the data onto a drive from the Spares partition.
Test Partition	The Test partition contains drives that are organized into one or more arrays. The purpose of the Test partition is to allow you to test new arrays with non-critical data before moving the arrays into the Production partition.
Production Partition	The Production partition contains drives that are organized into one or more arrays. Drives in the Production partition are used for storing and retrieving data.
Unavailable Partition	The Unavailable partition includes any drive or drive slot (the physical space where a drive can be installed) that is not active. Thus, broken drives or empty drive slots are listed in the Unavailable partition.

Viewing the Status of the FRU Configuration

The FRU CONFIGURATION screen describes the configuration and status of the field-replaceable units (FRUs) in the subsystem, including their hardware and software serial numbers, engineering change (EC) levels, and compatibility levels.

To view the FRU configuration:

1. Access the restricted FRU CONFIGURATION screen.



The FRU CONFIGURATION screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
------------------------------------------------------------------------------
                  FRU Configuration            DAC   Hardware    CD26
 Loc ID      P/N           S/N     EC/N     HW Cpt   FEN-Type
 ------------------------------------------------------------------
 CU.1.ICE00  000000000001  100001  000001     01      Y  10
 CU.1.ICE01  000000000002  100002  000001     01      P  20
 CU.1.ICE02  000000000003  100003  000001     01      N   0
 CU.1.ICE03  000000000004  100004  000001     01      N   0
 CU.1.ICE04  000000000005  100005  000001     01      N   0
 CU.1.ICE05  000000000006  100006  000001     01      N  40
 CU.1.IEA01  000000000008  100008  000001     01      N   0
 CU.1.IEA02  000000000009  100009  000001     01      N   0
 CU.1.IEA03  000000000010  100010  000001     01      N   0
 CU.1.ISF00  000000000011  100011  000001     01      N   0
 CU.1.ISF01  000000000012  100012  000001     01      N   0

 =>
------------------------------------------------------------------------------
 HELP | QUIK MENU | PREV MENU | PAGE UP | PAGE DOWN | PREV PART | NEXT PART | SUB PART
```

For a definition of terms used in the FRU configuration, refer to the next section.

2. The FRUs are listed according to the partition to which they belong beginning with the DAC Hardware partition. To view another partition, press NEXT PART **[F7]** or PREV PART **[F6]**. Pressing NEXT PART takes you through the partitions in the following order:

   DAC Hardware Controller hardware

   DAC-ISP Software System support processor software

   DAC-IUP Software Shared Virtual Array microprocessor software

   DAU-FDE Software Disk array software

3. Press PREV MENU **[F3]** to exit.

Terms Used to Describe the FRU Configuration

Table 3-8 Terms Used to Describe the FRU Configuration

Loc ID	The code that describes the location (in Unit.Tray.Slot nomenclature) of the FRU. These codes are assigned by the manufacturer and are not required in routine operations.
P/N	The part number for the FRU as assigned by the manufacturer.
S/N	The unique hardware identifier (serial number).
EC/N	The engineering change level of the FRU.
HW Cpt	Describes the hardware compatibility level of the FRU.
FEN-Type	Indicates whether a FRU is fenced (Y or Yes), not fenced (N or No), or partially fenced (P or Partially), and the type of fence imposed. When the subsystem fences a FRU, it is taken out of use until it can be replaced or repaired. Fencing does not disrupt the subsystem's operation. A partially fenced FRU indicates that some subset of the FRU (such as a port) is fenced, but all other portions of the FRU is unfenced.

Chapter 4 Subsystem (Global) Configuration

This chapter provides the information necessary to perform subsystem configuration operations via the operator panel. “Terms Used to Describe the Subsystem (Global) Configuration” defines the terms that apply to the global configuration of the subsystem. The remaining sections provide the procedures that the operator may perform. The following table provides a reference page for those procedures.

Table 4-1 Procedures in Chapter 5

Subsystem (Global) Configuration Terms

Table 4-2 Subsystem (Global) Configuration Terms

Site Name	The unique name for your site. This name must be the same for all Shared Virtual Array subsystems at a site.
Subsystem Name	The name of a specific subsystem at a site. Each subsystem should have a unique name.
Site Location Number	The number assigned by StorageTek that identifies your site.
Model	A number that identifies the general characteristics (such as hardware level) of the subsystem.
S/N (Serial Number)	The unique hardware number that identifies a specific subsystem.
Cluster/Channels	The number of channels installed for each cluster.
SSIDs	The subsystem identifiers (SSID) that identify the functional storage control units (the functional 3990 storage controls). A single Shared Virtual Array subsystem can have up to four SSIDs. If your site has more than one Shared Virtual Array subsystems, each functional 3990 must have a unique SSID.
Release Lev	The level of software operating in the Shared Virtual Array Controller.
ISP Ver	The level of software operating the Shared Virtual Array support processor.
Cache Size	The size (in megabytes) of customer cache installed in the subsystem.
DA Capacity	The total formatted physical capacity (in gigabytes) of the Disk Array Units.
Number of Arrays	The number of arrays currently defined in the subsystem.
Nonvolatile	The size (in megabytes) of nonvolatile storage (NVS) installed in the subsystem. 16 megabytes of effective NVS is standard in an Shared Virtual Array subsystem.
Net Load	The physical space (in gigabytes) on the disk arrays that is currently occupied by compressed user data.
Global Spares	The number of spare drive modules to be reserved when you form a new array. A subsystem may have one or two array spares assigned. This value is set from Def Array size.

Table 4-2 Subsystem (Global) Configuration Terms (Continued)

% Net Load	The percentage of the physical disk array capacity that is currently occupied by compressed user data.
Date and Time	Displays the current date and time, based on a 24 hour clock and displayed in coordinated universal time (cut).
List of Options	Indicates what options are installed or activated in the subsystem.

Terms Used to Describe Subsystem Passwords

The following terms are used to describe the configuration of the customer configurable items:

Customer Logon Password

Identifies the logon password that the user must type in to access the Customer Service Menu. The user can change the logon password here.

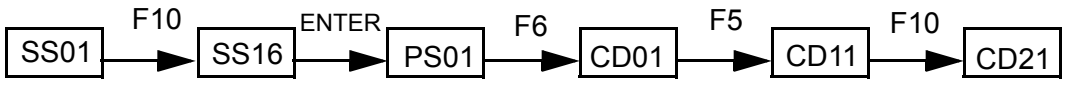
CSE Low Security Logon Password

Identifies the password that the service representative must type in to access the operator panel maintenance menus when the connection security is set to “low.”

Modifying the Subsystem Configuration

To modify elements of the subsystem configuration, including the subsystem identifiers (SSIDs), the number of spares per array, and the date and time:

1. Access the SUBSYSTEM CONFIGURATION screen.



The SUBSYSTEM CONFIGURATION screen appears

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------
                  Subsystem Configuration                          CD21

Site Name: DBF00009  Site loc#: 222222       Subsystem Name: DAC00001
S/N:   000000000001  Rel Lev: K06.00.xx      ISP Ver: P990217
SSIDs: 1A96  1A97  1A98  1A99                Host Path Groups- Cl0:4
                                                              Cl1:4
Cache Size
  Installed:  3072 MB  Num Arrays:        4  DA Capacity:   1142.21GB
  Configured: 2944 MB  Global Spares:     2  % Net Load:          50%
  System:      128 MB  Def Array Size: 13+2  % Coll Free Sp:      47%
  Fenced:      256 MB                      % Uncoll Free:        3%
  Avail User: 2944 MB  Date: 99/12/01
Nonvolatile:    8 MB  Time: 12:01:01        ISP/IUP Code Mismatch: N

               Snapshot      Maintenance   IXOF          ESCON

=>
--------------------------------------------------------------------------
HELP  QUIK MENU  PREV MENU        CURS UP  CURS DOWN        MOD SSYS
```

For a definition of the terms used in the subsystem configuration, refer to “Subsystem (Global) Configuration Terms” on page 48.

2. Move the cursor to the subsystem configuration attribute(s) that you want to change and make the required modification.

Note: Modifying a subsystem configuration requires special training and specific knowledge about the configuration. To perform the following procedures, it is essential that you have this training and knowledge.

- To change the site name:

  Using the hex keys (0-F), type in the site name and press **[ENTER]**. The site name can be up to eight characters long.

- To change the subsystem name:

  Using the hex keys (0-F), type in the subsystem name and press **[ENTER]**. The subsystem name can be up to eight characters long.

- To change the site location number:

  Using the decimal keys (0-9), type in the site location number and press **[ENTER].** The site location number can be up to six characters long and is assigned by StorageTek Customer Services.

- To change the subsystem ID:

  Using the hex keys (0-F), type in the subsystem IDs (SSIDs) and press **[ENTER]**. The SSID identifies the functional storage controls defined for the subsystem and can be up to four characters long.

- To change the Def Array size:

  Type in 13, 12, or 7 and press **[ENTER]**.

  You have three configuration options for a RAMAC array: a 15-device (13+2+1) array, a 14-device (12+2+2) array, or a 7-device (5+2+1) array. In a 15-device or 7-device array, one drive module is reserved as a spare device. In a 14-device array, two drive modules are reserved as spare devices.

- To change the subsystem date:

  Using the decimal keys (0-9), type in the current date and press **[ENTER]**.

  The format for the date is YY/MM/DD (coordinated universal time).

  Valid entries for the year (YY) are: 1 - 99

  Valid entries for the month (MM) are: 1 - 12

  Valid entries for the day (DD) are: 1 - 31.

  For example, to enter December 15, 1998, type in: 98, 12, and 15. (The cursor advances automatically or by pressing CURS DOWN **[F6]**. The slash is automatically inserted.)

Note: Changing the subsystem date changes the date logged in the event log and on SIM messages.

To change the subsystem time:

Using the decimal keys (0-9), type in the current time and press **[ENTER**].

The format for the time is HH:MM:SS (coordinated universal time).

Valid entries for the hour (HH) are: 00 - 24

Valid entries for the minute (MM) are: 00 - 59

Valid entries for the second (SS) are: 00 - 59.

For example, to enter 4:35:23 pm, type in: 16, 35, and 23. (The cursor advances automatically. The colon is automatically provided.)

Note: Changing the subsystem time will change the time logged in the event log and on SIM messages.

3. Move the cursor to change another attribute, or press MOD SSYS **[F10]** to complete the configuration change.

   "Subsystem Config" appears in the action field and "Started" appears in the operation status field. When the operation is complete, "Completed" appears in the operation status field.

4. Press PREV MENU **[F3]** to exit.

Assigning Passwords and Security Levels

You can assign passwords and security levels to restrict access to the subsystem. The passwords that you can assign are:

- Customer Logon Password

  This password restricts access to the customer information, configuration, and drain menus. It must be eight hex (0-F) characters long and start with 'A.'

- CSE Low Security Logon Password
  - This password restricts service representative access to the subsystem when the CSE security level is set to "low."
  - The service representative cannot perform local diagnostics or maintenance on the subsystem without typing in this password.
  - The CSE Low Security Logon Password can be up to eight hex (0-F) characters long, and it must start with 'B.'

- CSE High Security Connection Password

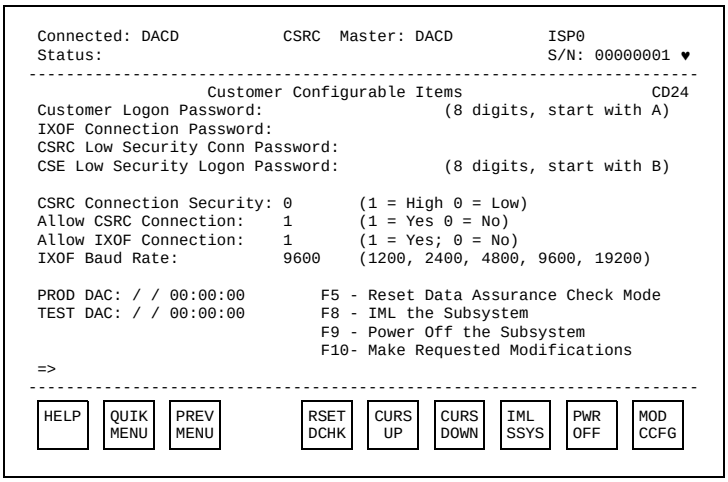
  This password restricts service representative access to the subsystem when the CSE security level is set to "high." The CSE cannot perform local diagnostic or maintenance on the subsystem without obtaining an IDCAMS remote password from the host console operator and typing in the password. The IDCAMS remote password is valid for only one hour from its generation.

Although CSEs and CSRC personnel can use the operator panel menus to access diagnostic and maintenance information, *they do not have access to user data.*

To assign a password or security level:

1. Access the CUSTOMER CONFIGURABLE ITEMS screen.

The CUSTOMER CONFIGURABLE ITEMS screen appears.



2. Move the cursor to and assign the password(s).

- To assign a Customer Logon Password:

  Using the hex keys (0-F), type in the customer logon password and press **[ENTER]**. The customer logon password must be eight hex (0-F) characters long and start with ‘A.’

- To assign a CSE Low Security Logon Password:

  Using the hex keys (0-F), type in the CSE logon password and press **[ENTER]**. The CSE Low Security Logon Password can be up to eight hex (0-F) characters long, and must start with ‘B.’

3. Move the cursor to change another customer-configurable item, or press MOD CCFG **[F10]** to complete the configuration change.

   - “Customer Config Update” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.

4. Move the cursor to perform another operation from the CUSTOMER CONFIGURABLE ITEMS screen, or press PREV MENU **[F3]** to exit.

Changing Passwords and Security Levels

Refer to “Assigning Passwords and Security Levels” on page 51 to change or assign passwords and security levels.

Performing an IML

To re-start a subsystem after a system malfunction, perform an IML. The IML procedure re-loads and validates the subsystem configuration. To perform an IML from the operator panel:

1. Access the CUSTOMER CONFIGURABLE ITEMS screen.

The CUSTOMER CONFIGURABLE ITEMS screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------------
                  Customer Configurable Items                    CD24
Customer Logon Password:                    (8 digits, start with A)
IXOF Connection Password:
CSRC Low Security Conn Password:
CSE Low Security Logon Password:            (8 digits, start with B)

CSRC Connection Security: 0       (1 = High 0 = Low)
Allow CSRC Connection:    1       (1 = Yes 0 = No)
Allow IXOF Connection:    1       (1 = Yes; 0 = No)
IXOF Baud Rate:           9600    (1200, 2400, 4800, 9600, 19200)

PROD DAC: / / 00:00:00        F5 - Reset Data Assurance Check Mode
TEST DAC: / / 00:00:00        F8 - IML the Subsystem
                              F9 - Power Off the Subsystem
                              F10- Make Requested Modifications
=>
--------------------------------------------------------------------------------
 HELP  QUIK MENU  PREV MENU   RSET DCHK  CURS UP  CURS DOWN  IML SSYS  PWR OFF  MOD CCFG
```

2. Press IML SSYS [F8] to IML the subsystem.

   - The system responds with “Subsystem Will Be IMLed, Do You Want To Continue?”

To continue the IML operation, press YES **[F10]**.

- The subsystem stops accepting new host commands and finishes the operations currently underway.
- “IML Subsystem” appears in the action field and “Started” appears in the operation status field.
- The subsystem initiates the internal steps required for IML. There are many steps in the IML process. As steps are completed, they are listed on the subsystem status field. When the IML is finished, “Full Box IML Complete” appears in the subsystem status field, and the SUBSYSTEM MAIN MENU appears.

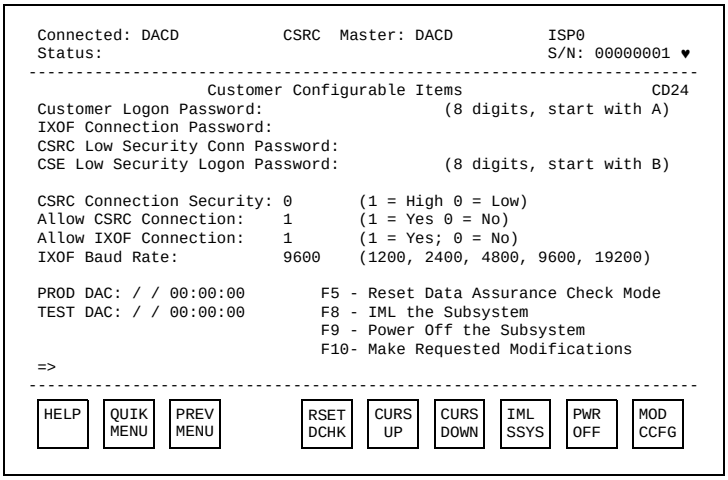
Powering Off the Subsystem via the Operator Panel

You can shut down the subsystem by powering off via the operator panel.

To power off the subsystem from the operator panel:

1. Access the CUSTOMER CONFIGURABLE ITEMS screen.

The CUSTOMER CONFIGURABLE ITEMS screen appears.



2. Press PWR OFF **[F9]** to safely shut down the subsystem.

   The system responds with “Subsystem Power Off, Do You Want To Continue?”

3. To continue the power off operation, press YES **[F8]**.

   - The subsystem stops accepting new host commands and finishes the operations currently underway.
   - “Power Down Subsystem” appears in the action field and “Started” appears in the operation status field.
   - The subsystem initiates the internal steps required for powering off.
   - The operator panel screen goes blank when the power off operation is complete.

Resetting the Data Assurance Check Mode

In certain conditions, an Shared Virtual Array subsystem may enter a data assurance check mode. In this state, data cannot be assured to be correct, and commands that access data or affect the subsystem or device configuration are not accepted.

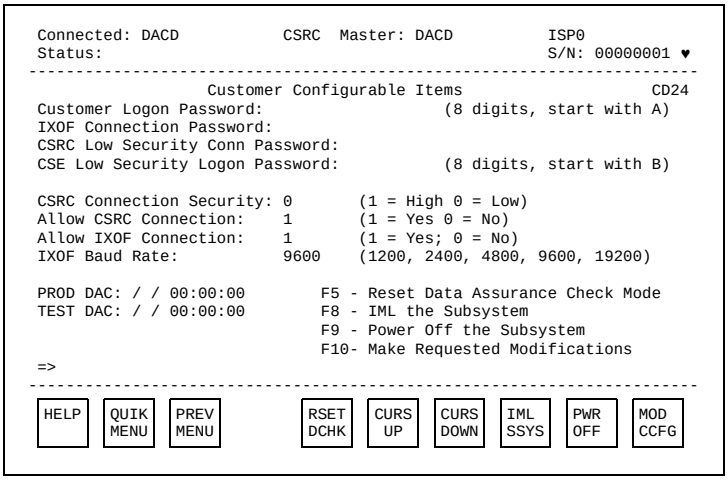
The conditions that cause the subsystem to enter data assurance check mode are:

- The battery backup units that support nonvolatile storage (NVS) have discharged after a power failure with modified records in nonvolatile storage
- The mapping tables cannot be completely recovered during a Controller initialization.

Once the condition that caused the data assurance check is corrected, or if the condition is not expected to compromise data integrity, you can reset the subsystem. To do so:

1. Access the CUSTOMER CONFIGURABLE ITEMS screen.

The CUSTOMER CONFIGURABLE ITEMS screen appears.



Press RST DCHK **[F5]** to reset the subsystem.

- The subsystem resets and begins to accept write data commands from the host.

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Chapter 5 Functional Device Configuration

This chapter provides the information necessary to perform functional device configuration operations via the operator panel. The following table provides a reference page for those operations.

Table 5-1 Procedures in Chapter 6

For information on:	Refer to page:
Defining a Functional Device Configuration	58
Modifying a Functional Device Configuration	59
Duplicating a Functional Device Configuration	58
Deleting a Functional Device Configuration	62
Sending a Functional Device Attention to a Host	64

Note: The CSE defines the functional device configuration at installation. Any subsequent changes to the configuration are modifications. Refer to "Modifying a Functional Device Configuration" on page 59 to modify the functional device configuration.

Functional Device Configuration Terms

The functional device configuration is the "host view" of the system device configuration. The following terms are used to describe the configuration of the functional devices in the subsystem:

Table 5-2 Functional Device Configuration Terms

Name	The name assigned to a functional device.
PT	The partition with which the functional device is associated. Functional devices must be in either the Test partition or the Production partition.
SSID	The subsystem identifier (SSID) for the functional storage control with which the functional device is associated.
FDID	The hexadecimal identifier of the functional device. The FDID is a valuer between 00 and 3FF.
Type	The type of device that the functional device emulates. Functional devices may emulate 3380J, 3380K, 3380KE, 33901, 33902, 33903, or 33909 devices.
CYLS	The number of cylinders for the functional device.
GB	The functional capacity (in gigabytes) of the functional device, which is determined by the capacity of the device model being emulated.
ENA(ble)	Identifies whether host access to the functional device is enabled (Y or Yes) or disabled (N or No).
WP	Identifies whether the functional device is write protected (Y or Yes) or not write protected (N or No). If the functional device is write protected, the data on it is read-only and cannot be overwritten.

Table 5-2 Functional Device Configuration Terms (Continued)

CA	Indicates whether cache for the functional device is enabled (Y or Yes) or disabled (N or No). When cache is disabled, data is still cached, but the caching algorithm is changed. Therefore, in a write operation, tracks are queued for immediate de-staging to the arrays, rather than being held in cache. In a read operation, a track is staged to cache and then queued for de-allocation from cache as soon as the read operation is completed.
FW	Indicates whether DASD fast write for the functional device is enabled (Y or Yes) or disabled (N or No). All writes to RAMAC Virtual Array are DASD fast writes; DASD fast write is never truly disabled.
PRIV	Indicates whether the functional device is a privileged ECAM device (Y or Yes) or not (N or No). To implement the SVAA software, you must designate at least one functional device as a privileged ECAM device--that is, as an eligible designation for Category 1-restricted messages. However, you should limit the number of such devices. Refer to the *SVAA Configuration and Administration*, XXXXXX for more information about ECAM and privileged ECAM devices.

Defining a Functional Device Configuration

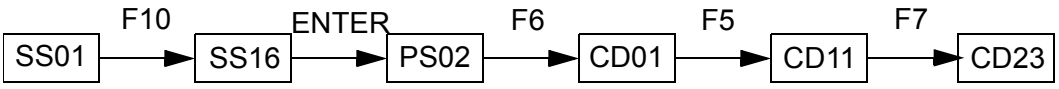
After the first functional device is configured, the fastest way to define a new functional device configuration is to duplicate an existing functional device configuration (refer to“Duplicating a Functional Device Configuration” on page 58) and then modify it (refer to “Modifying a Functional Device Configuration” on page 59).

Duplicating a Functional Device Configuration

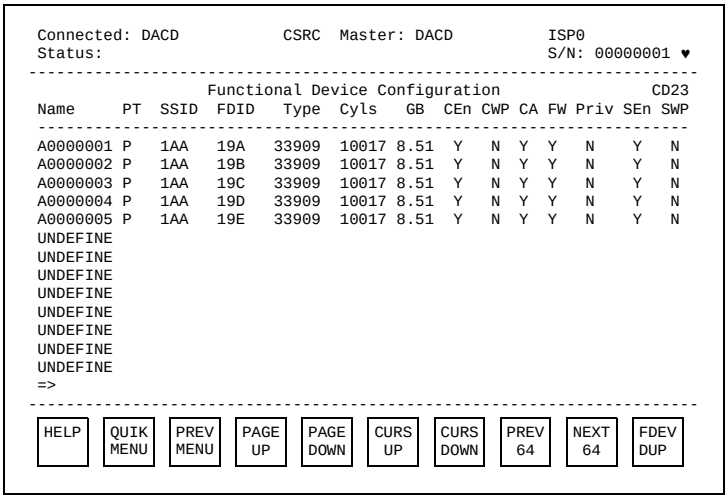
You can define a functional device by duplicating the configuration of an existing functional device, provided the functional device selected is defined and the next functional device in the list is undefined.

To duplicate a functional device configuration:

1. Access the FUNCTIONAL DEVICE CONFIGURATION screen.



The FUNCTIONAL DEVICE CONFIGURATION screen appears.



For a definition of terms used in the Functional Device Configuration, refer to Table 5-2 on page 57.

2. Move the cursor until the functional device you want to copy is highlighted.

Note: Remember that the next functional device on the list must be undefined.

3. Press FDEV DUP **[F9]**.
   - “Functional Device Dup” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.
   - The previously undefined functional device that was next in the list retains its FDID but has the functional device configuration of the device that preceded it.
4. To name the newly defined functional device or to modify the functional device configuration, refer to “Modifying a Functional Device Configuration.”
5. You can perform other functions within the FUNCTIONAL DEVICE CONFIGURATION screen, or press PREV MENU **[F3]** to exit.

Modifying a Functional Device Configuration

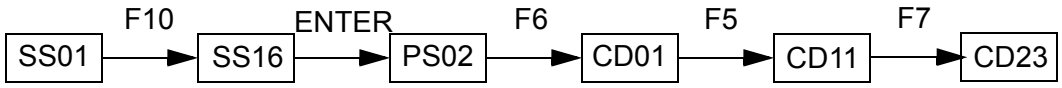
In some situations, you can modify elements of the functional device configuration including the:

- Functional device name
- Functional device partition
- Functional device type
- Functional device status (enabled or disabled)
- Functional device modifiers such as:
  - Its Write Protect status (enabled or disabled)
  - Its Cache status (active or inactive)

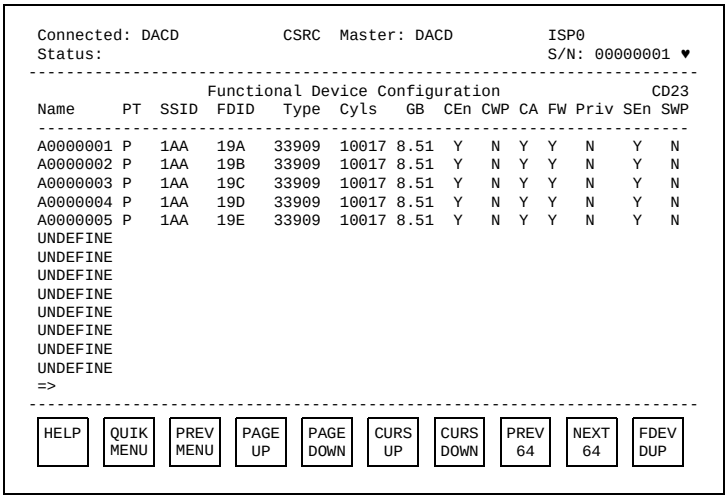
- Its DASD fast write status (enabled or disabled)
- Whether it is an ECAM device (yes or no)

To modify the functional device configuration:

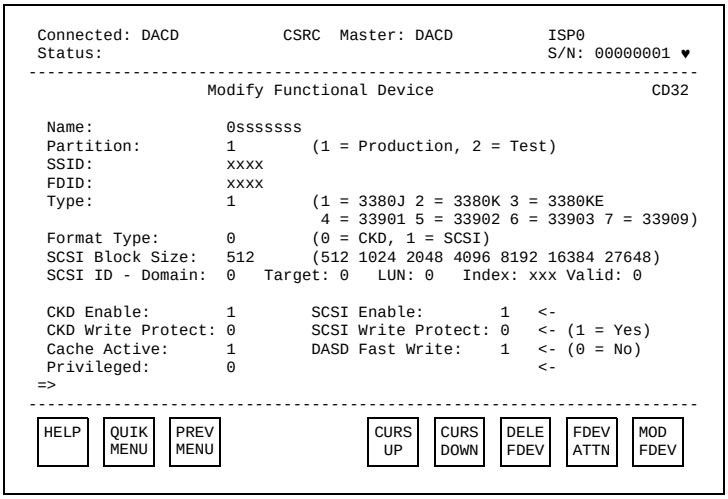
1. Access the FUNCTIONAL DEVICE CONFIGURATION screen.



The FUNCTIONAL DEVICE CONFIGURATION screen appears.



2. Move the cursor until the functional device you want to modify is highlighted.
3. Press **[ENTER]**.
   - “Functional Device Select” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.
   - The MODIFY FUNCTIONAL DEVICE screen for the selected functional device appears.



For a definition of terms used in the Functional Device Configuration, refer to Table 5-2 on page 57.

4. Move the cursor to the functional device configuration attribute(s) that you want to change and make the required modifications.

Caution: Modifying a functional device configuration requires special training and specific knowledge about your subsystem configuration. To perform the following procedures, it is essential that you have this training and knowledge.

- To change the name of a functional device:

  Using the hex keys (0-F), type in the functional device name and press **[ENTER]**. The functional device name can be up to eight characters long.

- To change the partition of a functional device:

  To change the partition of a functional device that has data associated with it, delete the existing functional device and redefine it.

  Type in ‘1’ to select the production partition or ‘2’ to select the test partition and press **[ENTER]**.

- To change the type of device that the functional device is emulating:

  To change the type of device that the functional device is emulating, delete the existing functional device and redefine it.

- To enable or disable the functional device:

  Type in ‘0’ to disable the functional device or ‘1’ to enable the functional device. Press **[ENTER]**.

- To change the write protect status of the functional device:

  Type in ‘0’ to disable write protection for the functional device or type in ‘1’ to enable write protection for the functional device. Press **[ENTER]**.

- To change the cache status of the functional device:

  Type in ‘0’ to deactivate full cache status for the functional device or ‘1’ to activate full cache status for the functional device. Press **[ENTER]**.

- To change the DASD fast write designation of the functional device:

  Type in ‘0’ to disable DASD fast write for the functional device or ‘1’ to enable DASD fast write for the functional device. Press **[ENTER]**.

- To change the functional device’s ECAM privileges:

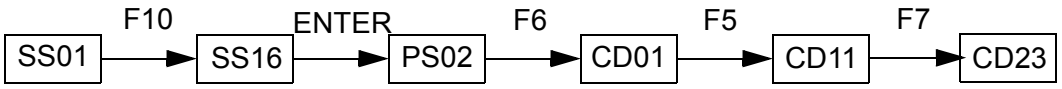
  Type in ‘0’ to indicate that the functional device is not a privileged ECAM device or ‘1’ to indicate that the functional device is a privileged ECAM device. Press **[ENTER]**.

5. Move the cursor to change another functional device attribute, or press MOD FDEV **[F10]** to make the modifications.
   - “Functional Device Config” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.
6. Press PREV MENU **[F3]** to exit.

Deleting a Functional Device Configuration

You can delete a functional device from the functional device configuration. However, before deleting a functional device, back up the data to another functional device. Once the data is backed up:

1. Take the functional device that is to be deleted offline.
2. Access the FUNCTIONAL DEVICE CONFIGURATION screen.



The FUNCTIONAL DEVICE CONFIGURATION screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------------
                    Functional Device Configuration                    CD23
 Name     PT  SSID  FDID   Type  Cyls    GB  CEn CWP CA FW Priv SEn SWP
 ------------------------------------------------------------------------------
 A0000001 P   1AA   19A   33909  10017 8.51  Y   N  Y  Y   N    Y   N
 A0000002 P   1AA   19B   33909  10017 8.51  Y   N  Y  Y   N    Y   N
 A0000003 P   1AA   19C   33909  10017 8.51  Y   N  Y  Y   N    Y   N
 A0000004 P   1AA   19D   33909  10017 8.51  Y   N  Y  Y   N    Y   N
 A0000005 P   1AA   19E   33909  10017 8.51  Y   N  Y  Y   N    Y   N
 UNDEFINE
 UNDEFINE
 UNDEFINE
 UNDEFINE
 UNDEFINE
 UNDEFINE
 UNDEFINE
 UNDEFINE
 =>
--------------------------------------------------------------------------------
 HELP | QUIK MENU | PREV MENU | PAGE UP | PAGE DOWN | CURS UP | CURS DOWN | PREV 64 | NEXT 64 | FDEV DUP
```

For a definition of terms used in the Functional Device Configuration, refer to Table 5-2 on page 57.

3. Move the cursor until the functional device you want to delete is highlighted.
4. Press **[ENTER]**.

- “Functional Device Select” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.
- The MODIFY FUNCTIONAL DEVICE screen for the selected functional device appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
------------------------------------------------------------------------
                  Modify Functional Device                        CD32

 Name:              0sssssss
 Partition:         1        (1 = Production, 2 = Test)
 SSID:              xxxx
 FDID:              xxxx
 Type:              1        (1 = 3380J 2 = 3380K 3 = 3380KE
                              4 = 33901 5 = 33902 6 = 33903 7 = 33909)
 Format Type:       0        (0 = CKD, 1 = SCSI)
 SCSI Block Size:   512      (512 1024 2048 4096 8192 16384 27648)
 SCSI ID - Domain:  0   Target: 0   LUN: 0   Index: xxx Valid: 0

 CKD Enable:        1        SCSI Enable:        1   <-
 CKD Write Protect: 0        SCSI Write Protect: 0   <- (1 = Yes)
 Cache Active:      1        DASD Fast Write:    1   <- (0 = No)
 Privileged:        0                                <-
=>
------------------------------------------------------------------------
 HELP | QUIK MENU | PREV MENU |  | CURS UP | CURS DOWN | DELE FDEV | FDEV ATTN | MOD FDEV
```

For a definition of terms used in the Functional Device Configuration, refer to Table 5-2 on page 57.

5. Delete the functional device by pressing DELE FDEV **[F8]**.
   - “Functional Device Delete” appears in the action field and “Started” appears in the operation status field.

     If the subsystem determines that no back-end data is associated with the functional device and that the functional device is not part of a path group, the subsystem deletes the functional device configuration.

     If the subsystem determines that back-end data is associated with the functional device and that the functional device is not part of a path group, the subsystem responds with: “Back End Storage Detected - Do You Want To Continue?”
6. To delete the functional device configuration, press Yes **[F9]**.
   - “Functional Device Delete” appears in the action field and “Started” appears in the operation status field.
   - When the operation is complete, “Completed” appears in the operation status field.
   - The functional device configuration for that FDID is deleted and the functional device name returns to “undefined”
   - An updated FUNCTIONAL DEVICE CONFIGURATION screen appears.

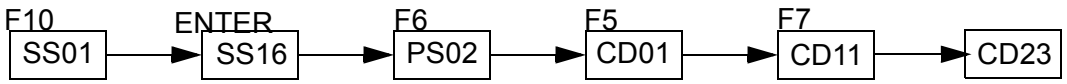
You can perform other functions within the FUNCTIONAL DEVICE CONFIGURATION screen, or press PREV MENU **[F3]** to exit.

Sending a Functional Device Attention Interrupt to a Host

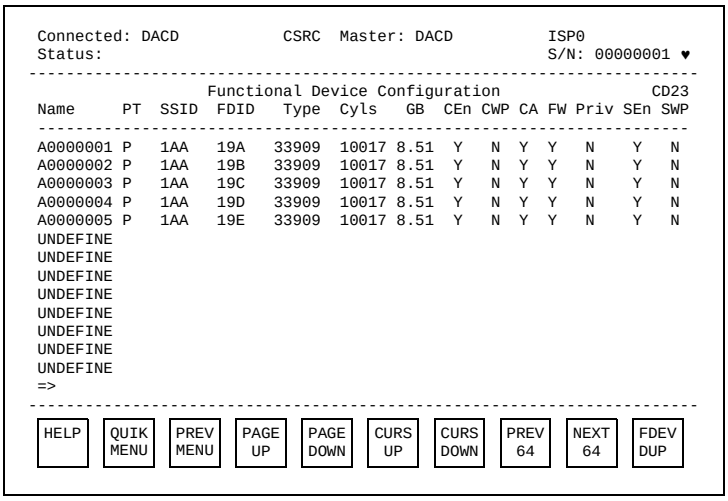
If the host operating system misses a device end from a Shared Virtual Array subsystem and experiences a “hang” condition, sending a functional device attention interrupt to the host may free the condition.

To send a functional device attention interrupt to a host:

1. Access the FUNCTIONAL DEVICE CONFIGURATION screen.



The FUNCTIONAL DEVICE CONFIGURATION screen appears.



For a definition of terms used in the Functional Device Configuration, refer to Table 5-2 on page 57.

2. Move the cursor until the functional device for which you want to generate an attention interrupt is highlighted.
3. Press FDEV ATTN **[F10]**.

   “Functional Device Atn” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.

Note: There may be a slight delay between the time the “Completed” message appears at the operator panel and the functional device status is retrieved by the host.

4. You can perform other functions within the FUNCTIONAL DEVICE CONFIGURATION screen, or press PREV MENU **[F3]** to exit.

Chapter 6 Channel Configuration

This chapter provides the information necessary to perform channel configuration operations via the operator panel. “Terms Used to Describe the Channel Configuration” defines the terms that apply to the channel configuration. The remaining sections provide the procedures that the operator may perform. The following table provides a reference page for those procedures.

Table 6-1 Procedures in Chapter 7

For information on:	Refer to page:
Modifying a Channel Configuration	67
Duplicating a Channel Configuration	69

Notice that you cannot add or delete a channel. When the channel hardware is installed, the channel automatically appears in the list of channels, with the default configuration. A channel can only be deleted by deinstalling the channel hardware.

Channel Configuration Terms

The following terms are used to describe the configuration of subsystem channels:

Table 6-2 Channel Configuration Terms

Name	The unique name for a channel.
Clust(er)	The cluster (0 or 1) to which the channel interfaces.
Chan(nel)	The channel interface to which the channel is connected within the specified cluster. Shared Virtual Array supports up to 32 parallel channels (16 per cluster), so channel interfaces are designated ‘A’ through ‘P’.
Enab(le)	Identifies whether the channel interface is enabled (Y or Yes) or disabled (N or No).
Speed	The data transfer rate (in megabytes per second) of the channel. Shared Virtual Array supports 20.0 megabytes-per-second ESCON channels.
Type	The type of channel interface installed. Shared Virtual Array supports Fibre and ESCON channels.
Base	The base channel address (hexadecimal), which is the lowest interface address on the channel.

Table 6-2 Channel Configuration Terms (Continued)

Range	The number of addresses (decimal) with which the channel can interface.
BFDID	The base functional device identifier (hexadecimal) for the channel. The BFDID identifies the path between the base address and the functional device.

Table Table 6-3 displays the valid base address and BFDID for the defined address ranges.

Table 6-3 Channel Addressing (Maximum 256 Configurable)

Number of Continuous Addresses		**Number of Valid Base IDID/FDIDs**	**Valid Base IDID/FDIDs (hexadecimal)**
dec	**hex**		
8	8	32	00 08 10 18 20 28 30 38 40 48 50 58 60 68 70 78 80 88 90 98 A0 A8 B0 B8 C0 C8 D0 D8 E0 E8 F0 F8
16	10	16	00 10 20 30 40 50 60 70 80 90 A0 B0 C0 D0 E0 F0
32	20	8	00 20 40 60 80 A0 C0 E0
64	40	4	00 40 80 C0
128	80	2	00 80
256	100	1	00

[1] Maximum 256 channel addressing applies ONLY to SRLs <K05.00.xx
[1] Only decimal address ranges are displayed on subsystem operator panels.

Table 6-4 Channel Addressing (Maximum 1024 Configurable)

Number of Continuous Addresses dec	hex	Number of Valid Base IDID/FDIDs	Valid Base IDID/FDIDs (hexadecimal)
8	8	128	000 008 010 018 020 028 ... 390 398 0A0 0A8 0B0 0B8 0C0 0C8 0D0 0D8 0E0 0E8 0F0 0F8 1A0 1A8 1B0 1B8 1C0 1C8 1D0 1D8 1E0 1E8 1F0 1F8 2A0 2A8 2B0 2B8 2C0 2C8 2D0 2D8 2E0 2E8 2F0 2F8 3A0 3A8 3B0 3B8 3C0 3C8 3D0 3D8 3E0 3E8 3F0 3F8
16	10	64	000 010 020 030 ... 390 0A0 0B0 0C0 0D0 0E0 0F0 1A0 1B0 1C0 1D0 1E0 1F0 2A0 2B0 2C0 2D0 2E0 2F0 3A0 3B0 3C0 3D0 3E0 3F0
32	20	32	000 020 040 060 ... 380 0A0 0C0 0E0 1A0 1C0 1E0 2A0 2C0 2E0 3A0 3C0 3E0
64	40	16	000 040 080 100 140... 380 0A0 1A0 2A0 3A0
128	80	8	000 080 100 180 200 280 300 280
256	100	4	000 100 200 300
512	200	2	000 200
1024	400	1	000

Note: Maximum 1024 channel addressing applies ONLY to SRLs.
Only decimal address ranges are displayed on subsystem operator panels.

Modifying the Channel Interface Configuration

You can modify elements of the channel interface configuration including the:

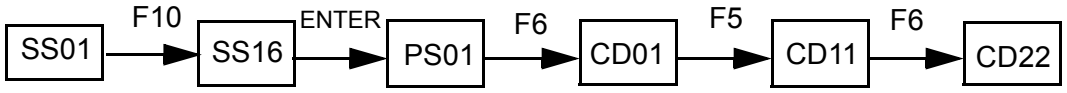
- Channel name
- Channel status (enabled or disabled)
- Channel base address
- Channel range
- Base functional device identifier (BFDID) for the channel range.

Note: Before modifying the channel speed, the system disables the channel interface. When you finish modifying the channel interface configuration, the system re-enables the channel interface, unless you disable the channel during the modification procedure.

To modify a channel configuration:

1. Vary the channel offline from the host operating system.

2. Press CHAN DSAB **[F10]** to disable the channel.
3. Access the CHANNEL CONFIGURATION screen.



The CHANNEL CONFIGURATION screen appears.

Note: Modifying a channel configuration requires special training and specific knowledge about your subsystem configuration. To perform the following procedures, it is essential that you have this training and knowledge.

4. Move the cursor until the channel you want to modify is highlighted.
5. Press **[ENTER]**.
   - "Channel Select" appears in the action field and "Started" appears in the operation status field. When the operation is complete, "Completed" appears in the operation status.
   - The MODIFY CHANNEL INTERFACE screen for the selected channel appears.

For a definition of terms used in the Channel Configuration, refer to Table 6-2 on page 65.

Note: Changing the channel configuration of an enabled channel takes that channel offline for a short time.

6. Move the cursor to the channel configuration attribute(s) that you want to change and make the required modifications.

- To change a channel name:

  Using the hex keys (0-F), type in the channel name and press **[ENTER]**. The channel name can be up to eight characters long.
- To enable or disable the channel:

  Type in '0' to disable the channel or '1' to enable the channel. Press **[ENTER]**.
- To change the channel base address:

  Using the hex keys (0-F), type in a channel base address and press **[ENTER]**. The valid parameters for a channel base address are listed in Table 7-3, "Valid Channel Configuration Entries," on page 68.
- To change the channel range:

  Type in the address range for the channel and press **[ENTER]**. The valid parameters for channel range are listed in Table 7-3 on page 68.
- To change the channel BFDID:

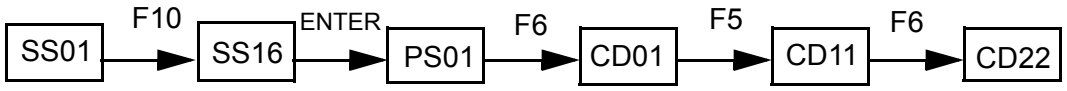
  Using the hex keys (0-F), type in the base functional ID and press **[ENTER]**. The valid parameters for a channel BFDID are 0-255 (as listed in Table 7-3 on page 68).

7. Move the cursor to change another channel configuration attribute, or press MOD CHAN **[F10]** to complete the channel configuration modifications.
   - "Channel Config" appears in the action field and "Started" appears in the operation status field. When the operation is complete, "Completed" appears in the operation status.
8. Press PREV MENU **[F3]** to exit.
9. If desired and if the channel is enabled, vary the channel online to the host operating system.

Duplicating a Channel Configuration

You can define a channel configuration for an channel by duplicating the configuration of an existing channel configuration. To do so:

1. Access the CHANNEL CONFIGURATION screen. .



The CHANNEL CONFIGURATION screen appears.

2. Move the cursor until last configured channel in the list is highlighted and the next channel in the list is unconfigured.
3. Press CHAN DUP **[F9]**.
   - "Channel Duplication" appears in the action field and "Started" appears in the operation status field. When the operation is complete, "Completed" appears in the operation status.
   - The previously unconfigured channel that was next in the list has the channel configuration of the channel that preceded it.

To name the channel or to modify the channel configuration, refer to "Modifying the Channel Interface Configuration."

You can perform other functions within the CHANNEL CONFIGURATION screen, such as modifying the channel configuration, or press PREV MENU **[F3]** to exit.

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Chapter 7 Drive Module Configuration

This chapter provides the information necessary to perform drive module test, configuration, and drain operations via the operator panel. “Terms Used to Describe the Drive Module Configuration” defines the terms that apply to the drive module configuration. The remaining sections provide the procedures that the operator may perform. The following list provides a reference page for those procedures.

Table 7-1 Procedures in Chapter 8

For information on:	Refer to page:
Allocating spares to the spares partition	72
Forming a production array	73
Moving test arrays to production	75
Re-configuring an array	75
Draining a disk array	76
Draining part of an array	77
Viewing the status of a drain operation	80

Drive Module Configuration Terms

The drive module configuration can be described in physical terms or in logical terms. In physical terms, a drive module is identified by its physical unit, tray, and slot (U.T.S.) location. In logical terms, a drive module is identified by its array ID, which identifies the array to which it belongs.

The terms that relate to the drive module configuration are described in the following section.

Table 7-2 Drive Module Configuration Terms

U.T.S.	The Shared Virtual Array unit (0 to 3), tray (0 to 3), and slot (0 to 7) in which the drive module is located. **Note:** Some units may be only half-populated. Therefore, not all U.T.S. locations contain drive modules.
Array ID	The array (Ary0 to Ary7) to which the drive module is assigned. Only drives in Production or Test partitions have an array ID.

Table 7-2 Drive Module Configuration Terms (Continued)

Size	Identifies how the array is configured. You have three configuration options for a Shared Virtual Array array: a 15-device (13+2+1) array, a 14-device (12+2+2) array, or a 7- or an 8-device (5+2+1) array. In a 15-device array, one drive module in the array is reserved as a spare device. In a 14-device array, two drive modules in the array are reserved as spare devices. In a 7- or 8-device array, one drive module in the array is reserved as a spare.
Partition	The partition to which a drive module is associated. There are four partitions: the Production partition, Test partition, the Spares partition, and the Unavailable partition.
Drive Status	The status of the drive module. Drive modules may be associated with one of five partitions, and they may have different status within the partition.
Spares Partition	The Spares partition contains drives that are available for forming arrays. When you form a test or production array, the drives for the array are taken from the Spares partition. Also, when the subsystem reconstructs a drive, it reconstructs the data onto a drive from the Spares partition.
Test Partition	The Test partition contains drives that are organized into one or more arrays. The purpose of the Test partition is to allow you to test new arrays with non-critical data before moving the arrays into the Production partition.
Production Partition	The Production partition contains drives that are organized into one or more arrays. Drives in the Production partition are used for storing and retrieving data.
Unavailable Partition	The Unavailable partition includes any drive or drive slot (the physical space where a drive can be installed) that is not active. Thus, broken drives or empty drive slots are listed in the Unavailable partition.

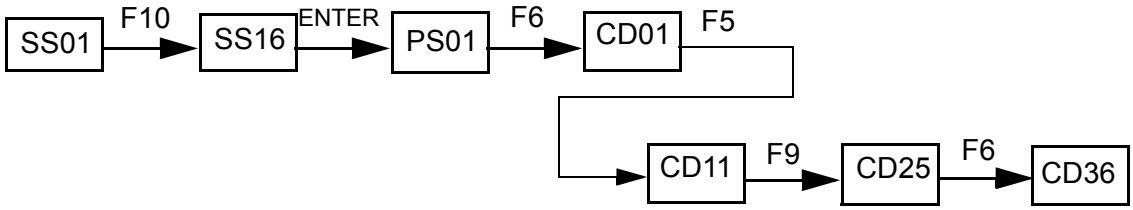
Allocating Spares to the Spares Partition

Allocating spares is the process of reassigning drive modules from the MAT partition to the Spares partition. To be eligible for allocation, a drive module must be in the MAT partition and have a status of M.A. (MAT partition, active).

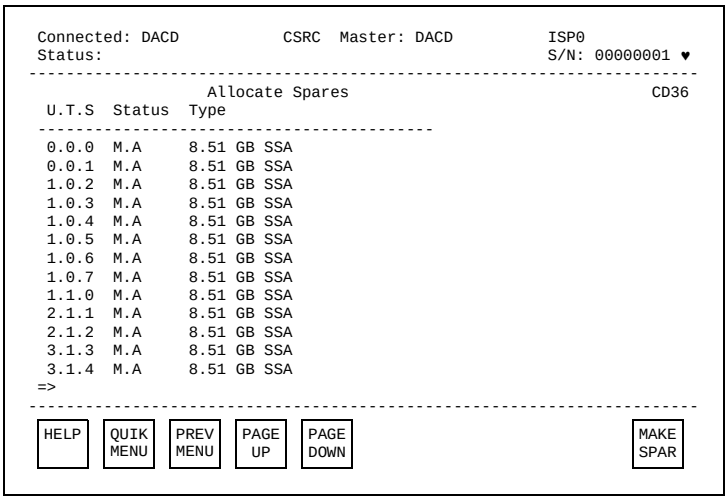
When you allocate spares, all eligible spares in the MAT partition are reassigned; you cannot select only specific drive modules to be reassigned to the Spares partition.

To move all of the eligible drives in the MAT partition to the spares partition:

1. Access the ALLOCATE SPARES screen.



The ALLOCATE SPARES screen appears.



For a definition of terms used in Allocating spares, refer to Table 7-2 on page 71.

2. Press MAKE SPAR **[F10]** to allocate all media active (M.A.) drives to the spares partition (S.A).
   - “All MAT drives to Spares” appears in the action field and “Started” appears in the operation status field. When the operation is complete, “Completed” appears in the operation status field.
3. Press PREV MENU **[F3]** to exit.

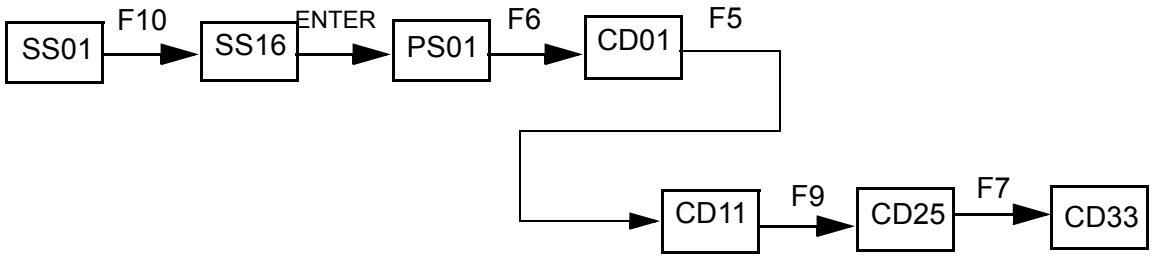
Forming a Production Array

To form a production array, the spares partition must have 15, 14, or 8 available drives, depending on your specifications in the subsystem configuration.

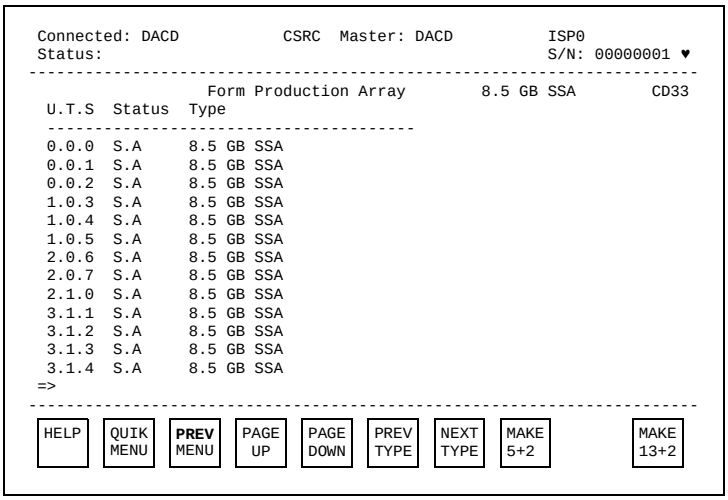
To form a production array:

1. Verify that there are enough drive modules in the Spares partition to form an array.

2. Access the FORM PRODUCTION ARRAY screen.



The FORM PRODUCTION ARRAY screen appears.



For a definition of terms used in Allocating spares, refer to Table 7-2 on page 71.

3. Select the drive type from which you will form the array. Press NEXT TYPE and PREV TYPE to move between types.
4. Press MAKE 5+2, MAKE 12+2, or MAKE 13+2 (**[F8]**-**[F10]**) to form a new production array.
   - “Form Production Array” appears in the action field and “Accepted” appears in the operation status field.
   - An updated FORM PRODUCTION ARRAY screen appears.

     Because forming and initializing an array is a background task that the subsystem can perform asynchronously, you do not have to receive a “Completed” message in the operation status field before starting another task.

     When the array has been formed and initialized, “Initialize AryX Complete” appears in the subsystem status field, where X is the array number assigned by the subsystem.
5. Form another production array, or press PREV MENU **[F3]** to exit.

The subsystem allows you to form multiple arrays at one time.

Note: The subsystem automatically reserves the designated number of spare drives to support the subsystem’s standby redundancy.

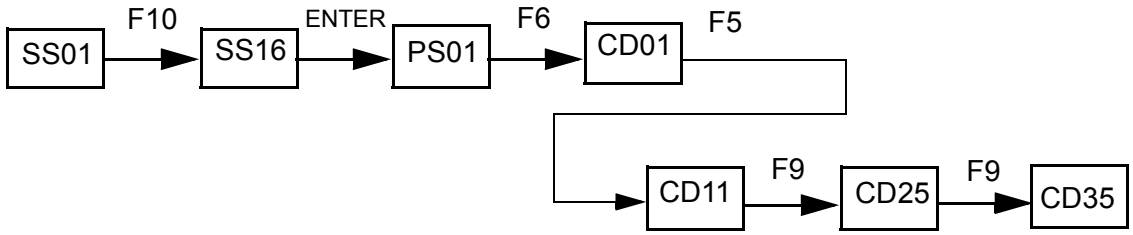
Moving Test Arrays to Production

Moving test arrays to production is the process of reassigning arrays (and their associated drive modules) from the Test partition to the Production partition.

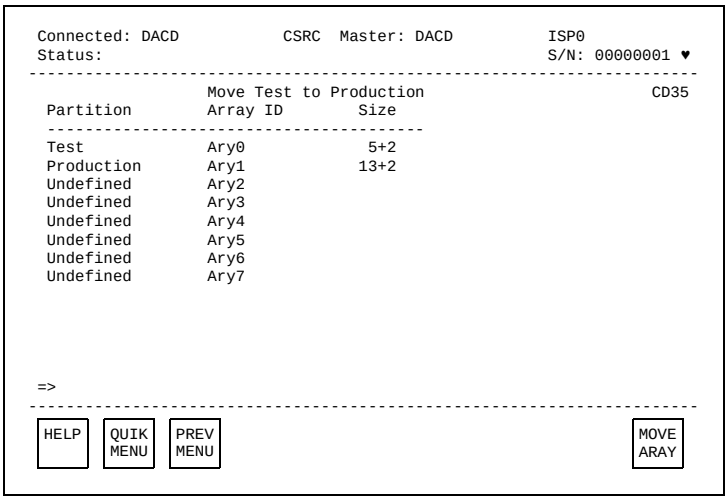
When you move test arrays, all arrays in the Test partition are reassigned; you cannot select only specific test arrays to be reassigned to the Production partition.

To move the test arrays into production:

1. Access the MOVE TEST TO PRODUCTION screen.



The MOVE TEST TO PRODUCTION screen appears.



For a definition of terms used in Allocating spares, refer to Table 7-2 on page 71.

2. Press MOVE ARYS **[F10]** to move the test arrays into production.
   - The subsystem returns a response indicating that all of the test arrays displayed on the screen were moved into production.
   - An updated MOVE TEST TO PRODUCTION screen appears.
3. Press PREV MENU **[F3]** to exit.

Re-configuring an Array

To re-configure an array (i.e., change the array from a 13+2 array to a 5+2 array or vice versa), you must drain the array and form a new array. To do so:

1. Drain the array to be re-configured; refer to “Draining a Disk Array.”

2. Form a new array (production or test) with the different configuration; refer to “Forming a Production Array” on page 73.

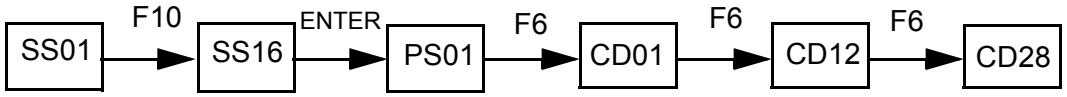
Draining a Disk Array

To drain a disk array (test or production), the subsystem off-loads the data stored in the array to other arrays in the same partition. If there is not sufficient subsystem capacity to accommodate the off-loaded data, the subsystem rejects the drain request.

Also, drain operations are asynchronous operations. While they occur in the background, you can perform other operator panel functions.

To drain a disk array:

1. Access the DRAIN DISK ARRAY screen.



The DRAIN DISK ARRAY screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------
                  Drain Disk Array                                  CD28

 Partition        Array ID       Size
-----------------------------------------
   Production       Ary1           13+2
   Production       Ary2           13+2
   Test             Ary3            5+2
   Test             Ary4            5+2


         Disk Array ID:

         WARNING: DO NOT EXECUTE THIS FUNCTION
         WITHOUT CUSTOMER AUTHORIZATION


 =>
--------------------------------------------------------------------------
 HELP   QUIK MENU   PREV MENU                                   DRAN IT
```

For a definition of terms used in Allocating spares, refer to Table 7-2 on page 71.

Caution: The drain screen includes a warning that a drain operation must not proceed without authorization. ***Do not drain any part of the subsystem without a proper understanding of what a drain operation involves.***

2. If you are authorized to continue, use the hex and decimal keys to type in the Array ID of the array to be drained.
3. Press DRAN IT **[F10]**.

   The system responds with “Array Will Be Drained, Do You Want To Continue?”

Caution: This is your last opportunity to abort the drain operation.

4. To continue the drain operation, press YES **[F9]**.
   - If you continued the drain operation, “Drain Array” appears in the

action field and “Accepted” appears in the operation status field.

- When the drain operation is accepted, an updated DRAIN DISK ARRAY screen appears.
- When the drain operation is complete, “Drain Array Complete” appears in the subsystem status field.

A request to drain an array will fail if:

- Another multiple-drive drain operation is currently being processed
- The array is already draining or a drain operation is pending for it
- There is not enough free subsystem capacity to hold the data contained in the array.

5. Press PREV MENU **[F3]** to exit.

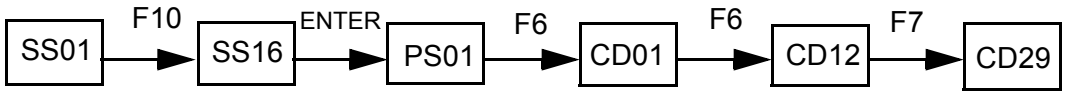
Draining Part of an Array

To drain a Disk Array Unit, a tray of drive modules, or a single drive module, the subsystem off-loads the data stored in the unit, tray, or drive (respectively) to another array in the same partition. If there is not sufficient subsystem capacity to accommodate the off-loaded data, the subsystem rejects the drain request.

Also, drain operations are asynchronous operations. While they occur in the background, you can perform other operator panel functions.

To drain part of an array:

1. Access the DRAIN UNIT/TRAY/DRIVE screen.



The DRAIN UNIT/TRAY/DRIVE screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
------------------------------------------------------------------------
                  Drain Unit/Tray/Slot                            CD29

                  Disk Array Unit ID:    (0-3)
                  Drive Tray ID: (0-3)
                  Drive Slot ID: (0-7)


                  WARNING: DO NOT EXECUTE THIS FUNCTION
                  WITHOUT CUSTOMER AUTHORIZATION


      Enter Unit ID only for Disk Unit Drain
      Enter Unit ID and Tray ID for Disk Tray Drain
      Enter Unit ID, Tray ID, and Slot ID for Disk Module drain


 =>
------------------------------------------------------------------------
 HELP   QUIK MENU   PREV MENU          CURS UP   CURS DOWN          DRAN IT
```

For a definition of terms used in Allocating spares, refer to Table 7-2 on page 71.

Caution: The drain screen includes a warning that a drain operation must not proceed without authorization. ***Do not drain any part of the subsystem without a proper understanding of what a drain operation involves.***

2. If you are authorized to continue, select the Disk Array Unit or subset of the unit to be drained.

- **To drain a single drive module**:

  A. Using the hex keys (0-F), type in the Disk Array Unit ID, the Tray ID, and the Drive ID of the drive module to be drained.

  B. Press DRAN IT **[F10]**.

  - The system responds with “UTS Will Be Drained, Do You Want To Continue?”

Caution: This is your last opportunity to abort the drain operation.

  C. To continue the drain operation, press YES **[F9]**.

  - If you continued the drain operations, “Drain unit/tray/drive” appears in the action field and “Accepted” appears in the operation status field.
  - When the drain operation is accepted, an updated DRAIN UNIT/ TRAY/DRIVE screen appears.
  - When the drain operation is complete, “DRAIN DRIVE U.T.S. COMPLETE” appears in the subsystem status field.

  A request to drain a single drive will fail if:

  - The drive is being reconstructed
  - The drive is already undergoing a drain operation.
  - A drain operation for the drive is pending.

- **To drain a tray of drives**:

  A. Using the hex keys (0-F), type in the Disk Array Unit ID and the Tray ID of the drive modules to be drained; leave the Slot ID space empty.

  B. Press DRAN IT **[F10]**.

  You are asked “Drain Unit:Tray:Drive: Are you sure?”

Caution: This is your last opportunity to abort the drain operation.

  C. To continue the drain operation, press YES **[F9]**.

  - If you continued the drain operation, “Drain unit/tray/drive” appears in the action field and “Accepted” appears in the operation status field.
  - When the drain operation is accepted, an updated DRAIN UNIT/ TRAY/DRIVE screen appears.
  - When the drain operation is complete, “Drain Tray *x* Complete”

appears in the subsystem status field.

A request to drain a tray of drives will fail if:

- The tray is already draining or a drain operation is pending for it
- There is not enough free subsystem capacity to hold the data contained in the tray.

- **To drain a full Disk Array Unit**:

A. Using the hex keys (0-F), type in the Disk Array Unit ID only; leave the Tray ID and Slot ID spaces empty.

B. Press DRAN IT **[F10]**.

- You are asked “Drain Unit:Tray”Drive: Are you sure?”

Caution: This is your last opportunity to abort the drain operation.

C. To continue the drain operation, press YES **[F9]**.

- If you continued the drain operation, “Drain unit/tray/drive” appears in the action field and “Accepted” appears in the operation status field.
- When the drain operation is accepted, an updated Drain Unit/Tray/Drive screen appears.
- When the drain operation is complete, “Drain Unit *x* Complete” appears in the subsystem status field.

A request to drain a Disk Array Unit will fail if:

- The unit is already draining or a drain operation is pending for it
- There is not enough free subsystem capacity to hold the data contained in the tray.

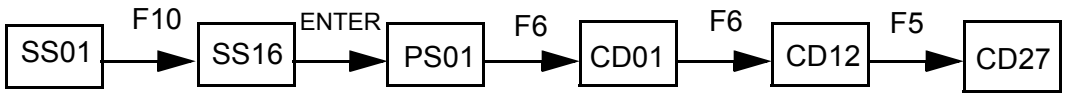
3. Perform another drain operation or press PREV MENU **[F3]** to exit.

While you cannot perform more than one multi-drive drain operations (array drains, unit drains, or tray drains) at a time, you can perform any number of single drive drain operations at a time.

Viewing the Status of a Drain Operation

To view the status of all of the physical drive modules in the subsystem that are currently being drained:

1. Access the DRAIN STATUS screen.



The DRAIN STATUS screen appears.

```
Connected: DACD          CSRC  Master: DACD          ISP0
Status:                                              S/N: 00000001 ♥
--------------------------------------------------------------------------------
                    Drain Status                                        CD27
  U.T.S  Status  S/N
  ----------------------
  0.0.0   P.D    00000001
  0.0.1   P.D    00000002
  0.0.2   P.D    00000003
  0.0.3   P.D    00000004
  0.0.4   P.D    00000005
  0.0.5   P.D    00000006
  0.0.6   T.D    00000007
  0.0.7   T.D    00000008
  0.1.0   T.D    00000009
  0.1.1   T.P    00000010
  0.1.2   T.P    00000011
  0.1.3   T.P    00000012
  0.1.4   T.P    00000013
 =>
--------------------------------------------------------------------------------
 HELP | QUIK MENU | PREV MENU | PAGE UP | PAGE DOWN
```

For a definition of terms used in Allocating spares, refer to Table 7-2 on page 71.

All of the fields in the DRAIN STATUS screen are display only. No changes can be made to a drain status through the viewing selection.

Note:

For information about the status of drive modules that are draining, refer to Table A-1, “Drive Module Status Descriptions,” on page 101.

2. Press PREV MENU **[F3]** to exit.

Chapter 8 Service Management System Overview

The Shared Virtual Array has a comprehensive service management system that includes error detection facilities and error recovery and reporting programs. An overview of the Shared Virtual Array's service management system is included here.

Error Detection

The Shared Virtual Array support processor in the Control Unit handles error detection for most of the subsystem through its predictive service analysis (PSA) facility. However, media maintenance is performed by the Disk Array Units and the drive electronics. PSA and media maintenance are discussed in the following sections.

Predictive Service Analysis

PSA is a knowledge-based system that resides in the ISP, while its detection capability is integrated into the Shared Virtual Array's operational code. PSA monitors the subsystem's operational performance and, using a data base of possible situations and sets of rules, detects "change-in-status" situations, including:

- If a subsystem component requires service
- If a subsystem component is running with degraded performance or has error or statistical counters that need to be downloaded
- If information about the status of a subsystem operation should be reported.

Related failure reports are grouped and tracked through a structure called a 'Composite Failure Event (CFE).' Each CFE has a unique ID (CFE ID), allowing the information to be retrieved and reviewed as needed. The PSA database resides on the ISP drives; its detection capabilities are embedded in the functional code.

If PSA detects a problem, it starts isolation and takes appropriate action, as dictated by database rules. If a FRU requires service, PSA may also relay a SIM to the host describing the FRU and suspected problem. If the system has a remote support connection, the same information is relayed to the Field Support Center as a MIM message.

PSA-generated information is regularly downloaded to the remote support center as part of normal Event Log MIM processing to allow problem analysis and correction.

Media Maintenance

If a drive module experiences a read error, the drive electronics detects the error and begins retry and recovery procedures. If the number of media errors logged against a drive module exceeds a threshold limit, the

drive is marked as defective. In this case, the Control Unit initiates a drive reconstruction process that is transparent to the host.

For more information about defective track management, media maintenance, defective device management and drive reconstruction, refer to the *Shared Virtual Array Planning, Implementation, and Usage Guide, MO6007B*.

Error Recovery and Reporting

If PSA detects a change-in-status condition that indicates a problem with a component, it begins the error recovery process by isolating the component and initiating a series of steps that analyze the problem and identify the failing component. These steps are discussed in the following sections.

Fencing

If necessary, PSA can dynamically reroute data flows and fence off a FRU or a subset of a FRU. In doing so, PSA fences off the smallest discrete functional unit of a FRU--the minimally fenceable resource. The minimally fenceable resource is taken out of service, but the balance of the FRU or path remains operational. To impose a fence, the subsystem restricts the paths to the minimally fenceable resource.

All fence requests are passed to the ISP. The ISP checks the request to ensure that the fence will not noticeably disrupt operations and will not remove the last path to a resource. It also records all fence activity--when a fence is set and when it is released--in its database. Changes in the status of a fence operation are logged as events to the database.

Most fences are also automatically cleared by the Shared Virtual Array subsystem. After replacing the FRU, the CSE will indicate through the operator panel that a failing component has been replaced, and the subsystem will test the FRU and release the fence.

State Saves

A state save is a snapshot of the state of a subsystem at the moment a microcode, software, or hardware problem occurs. State saves are initiated by subsystem software whenever a problem is detected.

Note: State saves *do not* record or compromise customer data and do not store data on customer arrays. State saves record only maintenance and failure event data, and store it on the Controller ISP hard drives; customer data remains secure and undisturbed on array drives.

Using state save data, service representatives can isolate a problem, determine its likely cause, and issue a corrective ‘fix’ as needed.

When the subsystem records a state save, a SIM is issued to the host and recorded in the Shared Virtual Array’s error recording log. State saves are assigned to a category based on their severity.

Each state save file has a header identifying its cause, time of occurrence, and options, plus an error value indicating whether the state save was completed.

Service Information Messages

If PSA identifies a change-in-status condition that should be reported, the ISP sends a message to the host as a service information message (SIM). The SIM includes a description of the condition and its cause and, in the case of a component failure, the impact of the failure and the impact of the repair. Depending on the severity of the SIM, a SIM alert message may be sent to the host console. SIMs and SIM alerts are discussed in more detail in Chapter 11, “Service Information Messages” on page 101.

Event Logging and Reporting

The Shared Virtual Array also sends the SIM to the host error recovery program (ERP) where it is logged to the error recording data set (ERDS). The Performance Monitoring and Predictive Maintenance (PM2) program allows you to print reports that include SIM information. PM2 provides performance and error reports for maintenance history, daily reporting, and monthly statistics. PM2 reports also aid the service representative in troubleshooting subsystem problems by correlating SIM and Call Home information with the error and event logs.

ServiceTek

If the subsystem is supported by ServiceTek, StorageTek’s machine-initiated maintenance (MIM) facility, the subsystem automatically places a service order to the Customer Service Remote Center (CSRC). If the subsystem is not supported by ServiceTek, the operator records the information contained in the SIM alert and places a service order, as needed.

ServiceTek calls are driven either by the detection of a fault, or by the expiration of the download timer (a time interval set by the CSRC). The download timer ensures the regular collection of the subsystem event log. If a problem is detected, ServiceTek sends an alert to the CSRC.

A partial list of Shared Virtual Array-generated SIMs and MIMs is provided in Chapter 11, “Service Information Messages.”

ServiceTek periodically downloads the event log to CSRC. The CSRC system integrates the event logs from all Shared Virtual Array ServiceTek users into an engineering database. From this database, the system updates and creates the PSA rules. This cycle allows us to constantly improve service for Shared Virtual Array users.

Guided FRU Replacement (GFR)

PSA compiles a suspect FRU list that identifies the most likely failed FRU. A SIM relayed to the host contains a coded identifier of that FRU in the REFCODE. If the subsystem is supported by ServiceTek, this information

is also automatically relayed to the CSRC. If not, the operator contacts the CSRC with this information.

Once on-site, the CSE begins a guided FRU replacement procedure without interrupting the subsystem's normal activities. After the CSE has replaced the FRU and the subsystem completes a diagnostic check of the FRU, it will release the FRU fence.

If PSA detects a problem, but cannot pinpoint the FRU that requires service, the CSE can access a menu-driven, guided service information (GSI) facility. In special cases, an Engineering alert notifies the CSRC and engineering of the need for special diagnostic engineers who can perform diagnostics on the subsystem via a remote link.

Note:

Although CSEs and CSRC personnel can use the operator panel menus for diagnostic and maintenance information, they do not have access to any customer data.

Host Error Recovery

In most cases, the Shared Virtual Array Control Unit executes error recovery actions. However, in the following conditions, full host ERP involvement is required.

- If both data paths in a storage cluster have failed and there are no path groups to a channel in the other storage cluster from which internal subsystem recovery can be invoked.
- If the card processing a command chain has failed, and no path group to another channel has been established. If another path exists, it must be tried through host ERPs.
- If a host processing error or a file protect fault occurs. Shared Virtual Array has no control over host system errors.

No matter how involved the host ERPs are in error recovery, no changes to the host ERPs are required to support an Shared Virtual Array subsystem.

Customer Service Remote Center (CSRC)

StorageTek products receive product support and service from the Customer Services Division. Support and service are available through CSRC, a 24 hours-a-day, 7 days-a-week, multilevel organization.

At the CSRC, diagnostic engineers investigate user's subsystem problems and determine corrective actions. There are two levels of CSRC support. Level 1 is responsible for end-user customer support. Level 2 is responsible for CSE telephone support.

Level 1 Support

Level 1 support receives customer calls and diagnoses problems. Using diagnostics, the event log, ServiceTek information, and the incident tracking database, the primary goal of Level 1 support is to work with the user to resolve subsystem malfunctions without the necessity of sending a CSE to the site. If required, Level 1 support dispatches a CSE to the site with the appropriate FRU and continues to minimize the impact of the subsystem malfunction until the CSE arrives.

Level 2 Support

Level 2 support provides telephone assistance to StorageTek technical specialists and CSEs. Level 2 uses all the tools available to assist the CSE in resolving a subsystem problem in a timely manner.

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Chapter 9 Operator Panel Messages

On an operator panel screen, there are four message fields that provide information on the status of a subsystem and the operations it is currently performing.

These four fields are:

- The System “Status” field
- The “Action” field
- The operational “Status” field
- The “FSC” field.

Refer to Figure 2-1 on page 21 for an illustration showing the location of these fields.

The messages displayed in these four fields also provide information about faults or errors detected by the subsystem during some subsystem operations. The following sections describe the purpose of these message fields and some of the messages, including error messages, that may appear in these message fields.

Subsystem Status Messages

The messages that appear in the subsystem “Status” field describe the status of internal subsystem processes. Many of the messages provide information about the initial microcode load (IML) process diagnostics and FRU validation. Others provide information about state save operations.

All of the messages that may be displayed in this field are not listed here. Instead, the following table lists some of the subsystem status messages that indicate a fault or error condition and a brief description of their meaning.

Table 9-1 Subsystem Status Messages

Message	Meaning
FRU Failed Validation XXXXX (FFFF)	Indicates that a FRU with a FRUID=XXXXX failed validation during an IML. FFFF is the fault symptom code that describes the error.
Software Check0 State Save in Progress	Occurs if a microprocessor cannot complete an operation because of a nonrecoverable software failure.
Hardware Check0 State Save in Progress	Occurs if a microprocessor cannot complete an operation because of a hardware failure.
Double Check0 State Save in Progress	Indicates that a second software or hardware Check0 occurred before recovery of the first Check0 was finished.

Table 9-1 Subsystem Status Messages

ISP State Save in Progress	Occurs if a support processor cannot complete an operation because of a hardware or software failure.
Freezer State Save in Progress	Occurs if a disk array unit cannot complete an operation because of a hardware or software failure.
State Save Data Completed	Indicates that all of the state save data has been recorded on the ISP hard drive.
State Save Compression Started	Indicates that the subsystem is compressing the state save data.
State Save Compression Completed	Indicates that the subsystem has finished compressing the state save data.

Action Messages

Action messages describe the operation that the subsystem is currently performing. The only fault or error condition described in the “Action” field is “Default Action Function,” which indicates that the operation that was requested is not available. Refer to the appropriate section of this manual to find out how to perform the operation.

Operational Status Messages

The messages that appear in the operational “Status” field describe the status of the operation currently in process. The following table includes the operational status messages that indicate a fault or error condition and a brief description of their meaning and, where applicable, the actions the operator should take in response to the message.

Note:

Only those operational status messages that indicate a fault or error condition are listed. Many other informational messages may appear in the operational “Status” field.

Table 9-2 Operational Status Messages

Message	**Meaning**
Failed	Indicates that the requested operation has failed.
Timed Out	Indicates that a step within the requested operation required more time than was allotted for it by the subsystem.
In Progress	Indicates that the subsystem is processing the requested operation.
Refused	Indicates that an operator request for keyboard mastership has been refused.
Cancelled	Indicates that the requested operation has been cancelled.

Table 9-2 Operational Status Messages (Continued)

No Changes	Indicates that no changes or modifications were made.

Fault Symptom Codes

As with other subsystems, when Shared Virtual Array issues a fault symptom code (FSC), it indicates an error in the subsystem. However, there are different types of fault symptom codes. A fault symptom code sent to the host as part of a service information message indicates an error in processing a request made at the host. A fault symptom code displayed on the operator panel indicates an error in processing a request made at the operator panel.

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Chapter 10 Service Information Messages

This chapter discusses service information messages (SIMs) and how a Shared Virtual Array subsystem generates and reports them.

SIM Overview

The Shared Virtual Array support processor constantly monitors Shared Virtual Array operations for “change-in-status” conditions. When it detects such a condition and determines that the condition should be reported to the host, the ISP generates a SIM. It then sends the SIM to a host console on the next I/O operation asynchronous of the change-in-status condition. If the subsystem is ServiceTek-equipped, a MIM event may also be sent to the Customer Service Remote Center (CSRC). Shared Virtual Array generates service SIMs based on the change-in-status condition detected. Because of its RAID architecture, unlike the 3390 and 3990, Shared Virtual Array does not generate media SIMs. Media maintenance is internal to the Disk Array Units; it does not require Controller or host ERPs, or operator intervention.

A service SIM is a text message that notifies users and service personnel that the subsystem hardware has experienced a condition requiring a service action, that subsystem operation may be affected by a threshold being reached or other event, or that general service-related information is being conveyed to the user. A service SIM acts as the service-action trigger for a Shared Virtual Array subsystem. The subsystem sends a service SIM when the ISP has detected an error condition, threshold, or event, AND has:

- Fenced and/or isolated the field-replaceable unit (FRU) that requires service

OR

- Determined that the error cannot be isolated or corrected by Shared Virtual Array’s extensive internal error recovery programs or user intervention may be required.

In most cases, the Shared Virtual Array Control Unit executes error recovery actions. Host ERP involvement is delayed until after the failing FRU has been isolated. This frees up host resources for other processes. However, in certain conditions, full host ERP involvement is required.

A service SIM identifies the error condition and its severity classification, the general hardware area that experienced the fault, the impact of the failure, the FRU requiring service, and the impact of the repair.

The service SIM reduces the amount of work an operator or CSE must do to identify and isolate a problem, and to request service.

In general, if a service SIM is reported and the required repair is not made, the SIM is reported two more times, at approximately eight hour intervals.

If the subsystem is powered down before the SIM count of three is reached, the SIM reporting process continues after the next power-on IML is completed.

SIMs are not issued during IML and until 16K start I/O operations have occurred. All SIMs, both initial reporting or repeat events, are stored on the subsystem until these conditions have been met.

SIMs that have a severity of SERVICE are information SIMs and generally do not require a service call. They provide information about the status of specific situations such as a remote session or drain operation. Usually, SIMs at a severity level of service are reported only once.

If a SIM cannot be issued to the host due to channel unavailability, no further SIMs will be issued until that initial failing SIM can be sent to and acknowledged by the host. The ISP will periodically check for acknowledgement and re-send the SIM until this occurs. In the meantime, all subsequent SIMs will accumulate in the SIM database on the ISP, and will eventually be sent. No SIMs will be discarded until all initial and repeat occurrences have been sent to and acknowledged by the host.

SIM Alert Message Formats

As stated previously, Shared Virtual Array notifies the operator that a SIM event has occurred via a SIM alert message at the host operator console. While Shared Virtual Array may create unique SIMs (SIMs different than those produced by the 3990-3), the SIM alert messages sent to the operator console are, in general, consistent with those sent by the 3990-3. In only a few instances are the SIM alert messages unique to Shared Virtual Array.

Figure 10-1 shows the general format of a SIM alert message. Figure 10-2, and Figure 10-3, show examples of a SIM alert message for the specific MVS and VM operating environments. Table 10-1 on page 93 describes the message fields within the SIM alert message.

```
MESSAGE, ADDRESS, AREA, SEVERITY, MACHINE TYPE, SERIAL NUMBER
REFERENCE CODE, SUBSYSTEM ID, VOLUME AND SERIAL NUMBER, CYLINDER AND HEAD, REPEATED
```

Figure 10-1 SIM Alert Message Format

```
IEA480E Ocuu,CACHE, SERVICE ALERT, MT=9200XD3, SER=200-00000001
REFCODE=0000-0000-0000, ID=01, VOLSER=volser, cchh=x'cccc hhhh', REPEATED
```

Figure 10-2 An Example MVS SIM Alert Message

```
DMKDAD403I  ccuu, SCU, MODERATE ALERT, MT=9200XD3, SER=200-00000001
REFCODE=0000-0000-0000, ID=01, VOLSER=volser, CChh=x' cccc hhhh' , REPEATED
```

Figure 10-3 An Example VM/SP and VM/SP HPO SIM Alert Message

Table 10-1 SIM Alert Messages

SIM Alert Message Field	Description
Message	Identifies a category of SIM alert for the environment and condition. Messages beginning with 'IEA' are MVS SIM alert messages. Messages beginning with 'DMK' are VM/SP HPO SIM alert messages.
Address	Identifies the channel or unit address (the I/O address) of the failing functional storage control. This address is 'Ocuu' in MVS SIM alert messages, and 'ccuu' in VM/HPO and VM/SP SIM alert messages.
Area	Identifies the general area of Shared Virtual Array that requires service. For example, SCU (storage control unit) in this field shows that a fault requiring service has occurred in the non-cached part of the hardware. CACHE in this field shows that a fault requiring service has occurred in the cache or NVS. DASD in this field shows that a fault occurred in the device hardware.
Severity	Identifies the severity of the failure. The severity may be: ACUTE, SERIOUS, MODERATE, or SERVICE.
Machine type	Identifies the machine type and model number of the reporting unit.
Serial number	Identifies the serial number of the reporting unit.
REFCODE	Identifies a reference code that provides additional information about the fault or error. Refer to "SIM Reference Codes (SIM REFCODE)."
REPEATED	Identifies a SIM alert as a repeat SIM--a presentation of a previously reported SIM. This field is blank for the initial SIM presentation.

SIM Reference Codes (SIM REFCODE)

As indicated in the preceding table, a SIM contains a 12-character (six-byte) REFCODE that identifies, where appropriate, the fault symptom code for the error and a list of FRUs the CSE may need to repair the unit.

The first four characters (first two bytes) of the REFCODE is the fault symptom code (FSC). This FSC can be typed in at the operator panel (refer to "FSC Lookup") to obtain general information about the error. These bytes are the same as bytes 20 through 21 of the SIM sense data.

The remaining eight characters (or four bytes) provide information about your subsystem and the location of the error that caused a SIM. These bytes are the same as bytes 11 through 14 of the SIM sense data.

Refer to the *Shared Virtual Array Reference, MO6005B* for more information about SIM sense bytes.

Note: REFCODE=0000-0000-0000 identifies an information-only SIM. It does not reflect a machine fault condition and does not require a service call.

SIM ALERT Severity Levels

Table 10-2 lists the different severity levels established for SIM alert messages. It also describes the general effect on the system and applications of the condition that caused the SIM alert.

Table 10-2 SIM Severity Levels

Severity Field	Meaning	Recommended Action
SERVICE	No system or application performance degradation is expected in any environment. No system or application outage has occurred. The SIM is presented purely for informational purposes.	Although presented for informational purposes, the SIM may be part of a larger impact on system operations. Therefore, if accompanied by other higher-severity SIMs, an evaluation of the potential effects on system operations in terms of the higher severity SIMs is warranted. Otherwise, no specific action need be taken unless directed by local site data collection procedures.
MODERATE	Performance degradation is possible in a heavily loaded environment. No system or application outage has occurred.	Promptly evaluate the effects on system operations. As required, plan for service action by the customer service engineer. If you defer action, application outages and/or unacceptable performance degradation may occur if previously recoverable exceptions become unrecoverable.
SERIOUS	A primary I/O resource in the subsystem is disabled. Significant performance degradation is possible. System or application outage may have occurred.	Immediately evaluate the effect on system operations. Plan appropriate system recovery actions. Call for service action, which is required to restore the unit to full operation.

Table 10-2 SIM Severity Levels (Continued)

ACUTE	A major I/O resource in the subsystem is disabled, or damage to the unit is possible. Performance may be severely degraded. System and/or application outages may have occurred.	Treat as an emergency. Evaluate the current or potential effect on system and application operations. Determine appropriate system recovery actions or actions to prevent possible product damage. Call for service action, which is required to restore the unit to full operation.

SIM Logging and Reporting

At the host, a host error recovery procedure (ERP) logs the SIM in the error recording data set (ERDS). If the SIM severity level is less than or equal to a pre-established severity level threshold (refer to “SIM Severity Reporting Option”), a SIM alert message is sent to the operator console. The SIM alert message contains a subset of the information included in a SIM. Refer to “SIM Alert Message Formats” for more information about the SIM alert message.

Because the ERDS often contains more detailed information about the condition than the SIM alert message, StorageTek’s Performance Monitoring and Predictive Maintenance (PM2) program, the host Environmental Record Editing and Printing (EREP) program, or a similar program can be used to produce a report describing the error. Refer to the *PM2 Installation and Operation* manual, 16720 for more information about printing Shared Virtual Array SIM records only.

Error reports such as these speed problem determination and can help you to decide when to request immediate or deferred service.

SIM Severity Reporting Option

Shared Virtual Array allows you to select which SIM alert messages are sent to the host console, although the selection must be implemented by a StorageTek CSE.

The following SIM severity reporting options are available:

Setting	Reporting Option
Zero	**All SIMs are reported as SIM alert messages.**
One	All SIMs, except those with the lowest severity, SERVICE, are reported as SIM alert messages.
Two	Only SIMs with the two highest severity levels, SERIOUS and ACUTE, are reported as SIM alert messages.
Three	Only SIMs with the highest severity level, ACUTE, are reported as SIM alert messages.

Note: ACUTE alerts cannot be suppressed.

As shipped from StorageTek, the severity reporting option is pre-set to zero; therefore, all SIMs are reported as SIM alert messages. Upon installation, you may request that the CSE change the severity reporting option. However, if you modify the setting, we recommend that:

- You do not suppress alerts with a severity higher than MODERATE.
- You regularly run EREP to extract the System Exception Report, which contains detailed SIM activity for ALL logged SIM activity, including those that have had SIM alert console messages suppressed.

To have SIMs automatically initiate EREP, keep the SIM severity reporting option at three. In this case, when a SIM alert message is received and the full SIM is logged in the error recording log, it will be automatically included in an Asynchronous Notification Record Detail report.

PM2 Report

PM2 (Performance Measurement and Predictive Maintenance) reports are generated from SIMs and printed by operators. PM2 compiles subsystem performance and error information from daily reports, monthly statistics, and maintenance histories to assist service representatives in troubleshooting subsystem problems. PM2 information can also be used to correlate SIM and ServiceTek (MIM) information. Figure 10-4 on page 97 shows the format of a PM2 report.

```
REPORT DATE:  01/03/97  (003/97)              SERVICE INFORMATION MESSAGE (SIM) REPORT          REPORT ISIM1 (4.6E.0)

                                                  RUBBLE MINING COMPANY                          SITE LOC # - 010018

  ----REPORTING----  -------------FAILING-------------  DEVICE  EMUL  ----DATE/TIME-----  CFE  SERVICETEK  MACHINE LOG TIME
  SERIAL MODEL DEV#  SERIAL MODEL DEV# FRAME  FDID  SSID   TYPE   TYPE  DAY/YR HH:MM:SS.TH  ID     STATUS
HH:MM:SS.TH


  111111 3081  0666  555555 3081  0666 123456  00    01    9210   3390  003/97 18:32:31.61  111   OPEN PROB    18:32:31.62

        DEVICE DEPENDENT DATA           SENSE DATA = 00900100 00243FE0 23090057 20000210 41123456 0001321F 05104201 F7111010

                  **** SERVICE INFORMATION MESSAGE ****

                               PERMANENT ERROR.          UNIT INOPERABLE.         EXCEPTION CLASS/FSC = 321F.
                               SIM MESSAGE CODE = F1, STORAGE CONTROL - SERVICE REPRESENTATIVE SIM.
                               ERROR ON STORAGE PATH(S) FOR SSID(S).
                               REPAIR WILL DISABLE STORAGE PATHS FOR SSID(S).
                               SERVICE ALERT.
                               1 STORAGE PATH AFFECTED BY FAILURE.             4 STORAGE PATHS IN SSID.
                               STATUS IS UPGRADED.             1 SSID AFFECTED BY REPAIR.
                               SIM IS THE SAME AS A PREVIOUS ERROR.
                               AFFECTED CONTROL REGION = 1.
                               STANDARD RAMAC SYSTEM.
                               AVAILABLE CACHE -    512.0 MEGABYTES
                               FRU AND LOCATION - IEA FROM CU.1.IEA12
```

Figure 10-4 Example of a PM2 Report

Machine-Initiated Maintenance (MIM)

Machine-initiated maintenance reduces onsite CSE requirements by automatically reporting whether a system is inoperable, degraded, subject to potential failure, or ready to offload event log data. When a fault condition occurs or a download timer expires, a MIM alert message is sent to a remote service center PC.

Messages concerning actual or potential unit problems are sent as they occur; critical messages are repeated at 24-hour intervals until servicing is complete. The remote support center (Customer Service Remote Center, or CSRC) evaluates the messages to determine maintenance requirements, then performs remote servicing or dispatches a service representative for service.

Shared Virtual Array-Generated SIMs and MIMs

Table 10-3 provides a partial list of the SIM and MIM events generated by Shared Virtual Array, listed by functional area and fault symptom code, problem description, severity, and whether a MIM event is also issued.

PSA-generated SIMs are not listed because a specific problem may be manifested by several fault symptom codes occurring at different times or frequencies. All PSA-originated SIM/MIM events range in severity from MODERATE to ACUTE. They may contain SIMs, MIMs, or both, depending on the precise nature of the problem isolated and being reported by PSA. In all cases, the action to be taken by the user is to examine the subsystem op panel menu giving further information on the CFE_ID being reported. A PSA-originated SIM/MIM event is identified by byte 29 and byte 30 bits 0-3 containing a value between 0x64 and 0x1000 (100-4096) which is the CFE_ID.

Table 10-3 System-Generated SIM and MIM Events

Functional Area/FSC	Problem Description	Severity	MIM Issued
Extended Control and Monitoring (ECAM) events			
730C	HOST INITIATED MAT COMPLETE	SERVICE	No
730D	HOST INITIATED DRAIN COMPLETE	SERVICE	No
7328	OP PANEL INITIATED DRAIN COMPLETE	SERVICE	No
7329	OP PANEL INITIATED MAT COMPLETE	SERVICE	No
Low Spares events			
3E5F	NEED SPARES!!!	ACUTE	Yes
3E61	ONE SPARE REMAINING	SERIOUS	Yes
3E62-5	2-5 SPARES REMAINING	MODERATE	Yes
3E66-F	6-15 (OR MORE) SPARES REMAINING	SERVICE	Yes
Drive Reconstruction events			
3E01	DRIVE RECONSTRUCTION BEGIN	SERVICE	No
3E02	DRIVE RECONSTRUCTION END	SERVICE	No
Conditional Capacity (none remaining or threshold reached) events[1]			
3E40	PRODUCTION PARTITION-NONE REMAINING	ACUTE	No
3E41	PRODUCTION PARTITION-THRESHOLD REACHED	SERIOUS	No
3E50	ATTACHED TEST SET PARTITION-THRESHOLD REACHED	ACUTE	No
3E51	ATTACHED TEST SET PARTITION-THRESHOLD REACHED	SERIOUS	No
Subsystem Security (Secure Options) events			
71C2 through 71C9	SECURITY VIOLATION	MODERATE	Yes
7201	SECURITY VIOLATION UNCORRECTED	MODERATE	Yes
7200	SECURITY VIOLATION ONGOING	MODERATE	Yes
Data Loss events			
3E20	TRIPLE DRIVE FAILURE	ACUTE	No
Support Facility Problems Detected events			
3FFF	SUPPORT FACILITY DOWN	SERIOUS	No
Host-based Application Problems events			
FFF5	ASYNCHRONOUS PROCESSING ERROR	SERVICE	No
MIM Failure Event			
7351	MIM SEND FAILED WITH RETRY	SERVICE	No

Note:

1. Customer action is required.

Chapter 11 Error Recovery Actions

This chapter describes the procedures an operator should perform in fault or error conditions. It describes the actions an operator should take for general fault or error conditions (errors other than an array failure).

In any error situations, the operator should also follow the established error handling procedures for the site.

General Operator Error Recovery Actions

For a fault or error that is not an array failure, the operator should perform the following procedure:

1. Generate an error report for the subsystem (a PM2 report or its equivalent).
2. Record all of the information that is available about the fault or error, including any information displayed on the operator panel. This includes:
   - The site location number, subsystem model number, and serial number of the machine, which are displayed on the operator panel SUBSYSTEM CONFIGURATION screen.
   - The fault symptom code, which may be displayed on the operator panel, included in the SIM REFCODE, or included in the error report.
   - The REFCODE, which is included in the SIM alert.
   - The FRUID, which may be displayed on the operator panel or included in the error report.
3. Perform a Fault Symptom Code (FSC) lookup. (Refer to “FSC Lookup”.)
4. Record the phone number of the phone nearest to the subsystem.
5. Call for StorageTek service. (If the subsystem is supported by ServiceTek, this step is automatically performed by the subsystem.)

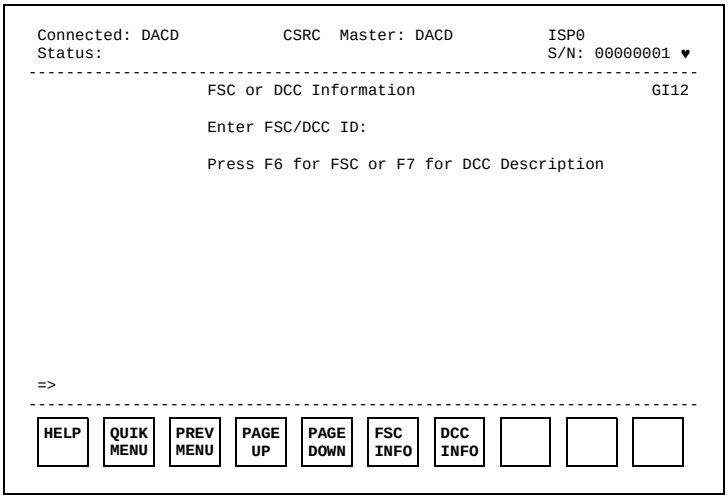
FSC Lookup

When you receive a FSC at any operator panel screen, you can use the FSC lookup facility to determine the meaning of the FSC. To do so:

1. Record the alpha-numeric FSC.
2. Press HELP **[F1]**.

   The HELP screen appears.
3. Press FIND FSC **[F10]**.

The FSC AND DCC INFORMATION screen appears.

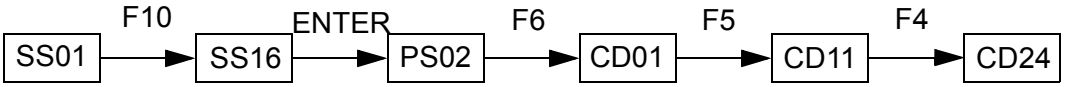


4. Type in the four-character FSC.
5. Press FSC INFO **[F5]**.
   - "Getting FSC Text" appears in the action field and "Started" appears in the operation status field.
   - A brief description of the fault appears on the screen.

PPRC Emergency Bridge Disconnect

In the even that one of the 9500s has become disabled, use the following procedure to break the bridge connection so the operating 9500 can be IMLed. This procedure works for Standard PPRC, Direct PPRC, and WAN PPRC.

1. Use the following menu sequence to get to the CD24 Customer Configurable Items screen.



2. At the CD24 screen, press the [F4] key to terminate the PPRC secondaries.
3. The CD24 screen will show a warning. Press the [F9] key for Yes.

Note: All devices that were PPRC secondary devices will be put in the simplex state.

The 9500 will do a warm start at this time.

Appendix A Drive Module Status

Table A-1 lists and describes the status designations for a drive module. The drive module status is represented by a two-character code: the first character identifies the partition with which the drive is associated; the second character shows the current state of the drive.

Status codes are displayed either as two characters or as two characters separated by a period. For example, the status of a drive module associated with the Production Partition in the active state is “PA” or “P.A.”.

Table A-1 Drive Module Status Descriptions

Production Partition		
Production: Active	P.A. (PA)	Drive module is a member of an array that is associated with the Production partition.
Production: Broken	P.B. (PB)	Drive module has been marked as broken. It will remain in this state until reconstruction is complete. It will also appear as U.B. in the unavailable partition.
Production: Copy (receiving drain data)	P.C. (PC)	Drive module is receiving data from the drain of a single drive module in the Production partition.
Production: Draining	P.D. (PD)	Drive module is being drained.
Production: Initialize array	P.I. (PI)	Drive module is part of an array initialization process.
Production: Pending drain	P.P. (PP)	Drive module is waiting to be drained. The drain cannot begin for one of the following reasons: A drive module reconstruction is in progress. Another drive in the array is being drained. The number of available spares is inadequate (this can occur if the number of spares was reduced after the drain request was accepted)
Production: Reconstruction	P.R. (PR)	Drive module is being used to reconstruct data for a Production partition drive module that failed.
Test Partition		
Test: Active	T.A. (TA)	Drive module is a member of an array that is associated with the Test partition.
Test: Broken	T.B. (TB)	Drive module has been marked as broken. It will remain in this state until reconstruction is complete. It will also appear as U.B. in the unavailable partition.
Test: Copy (receiving drain data)	T.C. (TC)	Drive module is receiving dat5a from the drain of a single drive module in the Test partition.
Test: Draining	T.D. (TD)	Drive module is being drained.

Table A-1 Drive Module Status Descriptions (Continued)

Test: Initialize array	T.I. (TI)	Drive module is part of an array initialization process.
Test: Pending drain	T.P. (TP)	Drive module is waiting to be drained. The drain cannot begin for one of the following reasons: A drive module reconstruction is in progress Another drive in the array is being drained The number of available spares is inadequate (this can occur if the number of spares was reduced after the drain request was accepted)
Test: Reconstruction	T.R. (TR)	Drive module is being used to reconstruct data for a Test partition drive module that failed
Spares Partition		
Spare: Active	S.A. (SA)	Drive module is available for forming arrays, for data reconstruction, or for receiving data from a drain of a single drive module
Spare: Fenced	S.F. (SF)	Drive module is fenced for a periodic drive test
Spare: Pending drain	S.P. (SP)	Drive module is waiting to be drained pending completion of a periodic drive test
Unavailable Partition		
Unavailable: Broken	U.B. (UB)	Drive module in slot is broken
Unavailable: No active drive module	U.N. (UN)	No active drive module is sensed in slot or slot has not been installed

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