StorageTek®

OS 2200 Client System Component (CSC)

5R1 System Administrator's Guide

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PREFACE

PURPOSE

This is the *OS 2200 Client System Component (CSC) System Administrator's Guide*. This guide is designed to assist system administrators with planning, configuring, migrating to, and managing automated cartridge tape operations using CSC. CSC is the software used by the Unisys 2200 Client System (the "client") to communicate with the Solaris®-based Library Control System or the Nearline Control Solution (the "server").

AUDIENCE

This guide is written primarily for *system administrators*. It assumes that you are familiar with the following hardware and software components:

- Automated Cartridge System (ACS)
- Unisys OS 2200 computers
- Solaris-based Library Control System
- Nearline Control Solution
- Executive Control Language (ECL)
- COMUS

HOW TO USE THIS DOCUMENT

Chapter 1. Overview of CSC

This chapter provides a management summary of CSC. Commands, operations, and interactions with other components are presented in a high-level macro view.

Chapter 2. Considerations for Automated Cartridge Tape Operations

This chapter discusses migration and programming considerations regarding the use of cartridge tape media in an automated tape operation.

Chapter 3. Preparing Your Site for Automated Operations

This chapter discusses how to prepare your site to move to automated tape operations using the ACS.

Chapter 4. Configuring Your Site for Automated Operations

This chapter provides general recommendations and configuration suggestions for managing tapes in the ACS environment. The "Scratch Cartridge Tapes and Scratch Pools" section describes how you can configure and utilize scratch pools with CSC. The section that follows discusses how to allocate drives and how to handle labeled and unlabeled tapes. "Using a TLMS with the ACS" describes how to integrate a Tape Library Management System (TLMS) into ACS operations. Other discussions include implications and special considerations for sites with multiple ACSs and/or multiple clients.

Back Matter

This guide also includes an index.

COMMAND SYNTAX NOTATION

This manual uses the following conventions for representing command syntax notation and message displays:

UPPERCASE	indicates a command or keyword
lowercase italic	indicates a user- or system-supplied variable value. For example, in XX=*userid*, you enter the actual userid for *userid*.
abbreviation	indicates a command that can be abbreviated to its minimum acceptable form. For example, ENAble can be abbreviated to ENA.
vertical bar |	separates operand alternatives. For example, A | B indicates that you must select either A or B.
brackets []	indicate an option that can be omitted. For example, [A | B | C] indicates that you can select A, B, C, or nothing.
braces {}	indicate an option that you *must* choose. For example, {A | B} indicates that you must choose either A or B.
underlining	indicates the system default. If you do not enter a parameter or value, the system will supply the underscored value. For example, A | B | C indicates that if you do not choose an option, the system will default to C.
ellipses ...	indicate that entries can be repeated as often as necessary.
SMALLCAPS	indicate a key, such as XMIT or F1.

RELATED DOCUMENTATION

OS 2200 Client System Component (CSC) Technical Bulletin, Storage Technology Corporation (312537701)

OS 2200 Client System Component (CSC) Installation Guide, Storage Technology Corporation (313471401)

OS 2200 Client System Component (CSC) Operations Guide, Storage Technology Corporation (312537201)

OS 2200 Client System Component User Interface (CSCUI) Programmer's Reference Manual, Storage Technology Corporation (312537401)

OS 2200 Client System Component (CSC) Client Direct Interconnect (CDI) Troubleshooting Guide, Storage Technology Corporation (312537601)

OS 2200 Client System Component (CSC) User Reference Manual, Storage Technology Corporation (312537801)

OS 2200 Client System Component (CSC) UNISYS OS 2200 CSC 5R1 VSM Reference, Storage Technology Corporation (312537901)

Automated Cartridge System Library Software Product Document Set for Solaris, Storage Technology Corporation.

Nearline Control Solution 4.0 Publication Kit, Storage Technology Corporation (313456301)

Exec System Software Operations Reference Manual, Unisys Corporation (7831 0281)

Executive Control Language (ECL) and FURPUR Reference Manual, Unisys Corporation (7830 7949)

Exec System Software Executive Requests Programming Reference Manual, Unisys Corporation (7830 7899)

COMUS End User Reference Manual, Unisys Corporation (7830 7758)

Software Library Administrator (SOLAR) End User Reference Manual, Unisys Corporation (7831 0604)

Communications Management System (CMS1100) Configuration Reference Manual, Unisys Corporation (7830 9846)

Communications Management System (CMS1100) Operations Reference Manual, Unisys Corporation (7831 5694)

ClearPath HMP IX Series Cooperative Processing Communications Platform (CPCOMM) Configuration and Operations Guide, Unisys Corporation (7844 8438)

1. OVERVIEW OF CSC

This chapter presents an overview of CSC and its relationship with the server (Solaris-based Library Control System or the Nearline Control Solution) and the Automated Cartridge System (ACS). This macro view explains CSC concepts, features, and operations from a high-level perspective.

INTRODUCTION TO CSC

Traditionally, mainframe tape operations have been a manual process. A human operator, responding to requests from user applications, manually mounts tapes, dismounts tapes, and maintains information about the site's tape library (e.g., tape location, scratch status, write-protect status, etc.). The ACS is a tape storage and retrieval device that robotically mounts and dismounts cartridge tapes. The ACS, combined with several software components, automates this formerly manual process.

CSC, the Client System Component, is a collection of software components used by the Unisys client to communicate with the server and the ACS. With CSC, a server, and the ACS, most manual tape operations become unnecessary. This helps reduce operations costs, minimize errors, and provide faster, more reliable tape services to system users.

FEATURES OF CSC

CSC doesn't just automate tape operations. It also provides communication tools, diagnostic utilities, and command-activated functions that give you maximum control with minimum effort. CSC features include:

- **Installation**. Using standard COMUS or SOLAR dialogues, you can install CSC simply by responding to a series of prompts.

- **Recovery**. CSC is aware of the tape processing states in the client system and in the server. When external events disturb the synchronization of these states, CSC issues status and control commands to the server to restore automated operations.

- **Manual mount/dismount processing**. CSC allows you to perform tape operations manually at any time by issuing simple commands through the OS 2200 System Console (the "system console") or a properly configured demand terminal.

- **Programmatic user interface**. The programmatic user interface to CSC lets user applications, such as a Tape Library Management System (TLMS), exchange information with the server and monitor ACS activities.

- **Operator interface**. CSC provides a command and control interface through the system console. An operator can receive and respond to critical messages, check the status of communications, and issue tape activity commands directly from the system console.

- **Diagnostics**. CSC diagnostics can be used to turn specific debug flags on or off, breakpoint trace files, and display a variety of program statuses. These features can help you monitor the CSC environment and determine if CSC is operating efficiently.

- **Communication link**. CSC supports the Client Direct Interconnect (CDI) communication method, which operates through an Ethernet LAN. In addition, CSC supports the Transport Service Access Method (TSAM) using CMS or CPCOMM.

- **Multiple ACS support**. If your site has more than one ACS, CSC configurations help you direct cartridge tape allocations to the correct ACS. CSC allows you to define ACS-names to be optionally used in ECL assignment statements. Other configuration options define defaults.

- **Multiple Server Support**. Each instance of CSC can communicate with only one library server. However, multiple instances of CSC can exist when the CARTTAPELIB$ interface is used between CSC and OS 2200. This allows the OS 2200 system to automate operations using multiple library servers.

WHAT CSC DOES

In this discussion, we'll explain how CSC interacts with the various components of the system from a high-level perspective. You should first understand the basic components involved. If you don't, Figure 1-1 presents an overview.

OS 2200 Client System	Communication Link	Server	ACS
	CDI / TSAM		
The CSC software runs on a Unisys OS 2200 computer. Collectively, these are often referred to as the client system, or simply, the "client."	The client system (and therefore, CSC) communicates with the Library Server using CDI or TSAM	Either the Solaris-based Library Control System or the Nearline Control System provides the interface between the client system and the ACS. Collectively referred to as the "Server," it consists of software components running on the server platform.	The ACS is where actual tape operations occur. Consisting of a number of hardware components, the ACS stores, retrieves, mounts, and dismounts cartridge tapes to and from its cartridge drives. The Server manages all ACS activities.

Figure 1-1. Component Overview

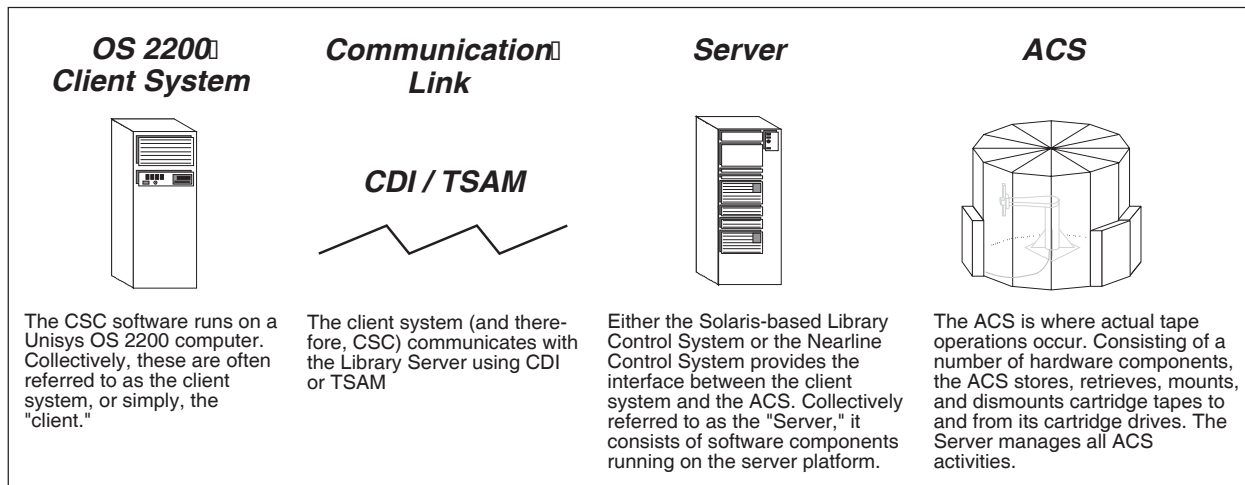## How CSC Automates Operations

Because CSC is designed to automate cartridge tape handling, most CSC operations are transparent to the operator. In general, the only time manual intervention is required is when something goes wrong with one or more interrelated components. Otherwise, you'll use CSC to view and respond to messages, check system statuses and operating conditions, and perform diagnostics.

For example, when a user requests a cartridge tape mount, CSC automatically translates and processes the request. If an error occurs – say, the cartridge tape is in a different ACS – CSC will display a message on the system console. Using standard CSC commands, you diagnose the condition and correct it as needed.

User applications, such as a TLMS, interface with CSC via the Client System Component User Interface (CSCUI). CSCUI allows user applications to make requests for cartridge tape volume information, and to move volumes into or out of the ACS.

If any system component fails, CSC will attempt to recover and restore all components to their pre-failure states. In certain cases, this is not always possible.

How CSC and the ACS Communicate

CSC communicates with the server via a LAN, by using either the Client Direct Interconnect (CDI) method, or by using the Transport Service Access Method (TSAM) via CMS or CPCOMM. CDI provides TCP/IP services and connections to Control Path Adapters (CPAs) that attach to the server. The TSAM method connects via a DCP, HLC, or Integrated Channel Adapter.

The server is a collection of hardware and software components that are used to manage all ACS activities. Client system communication and high-level request coordination is handled by software running in either the Solaris-based Library Control System or the Nearline Control Solution.

Solaris-based server software is collectively known as Automated Cartridge System Library Software (ACSLS). Its major components include the Network Interface (NI), the Client System Interface (CSI), and the ACS Library Manager (ACSLM). ACSLS also provides an operator interface to the server: the ACS System Administrator (ACSSA)/Command Processor. The Command Processor allows operators to monitor and control server operations.

The Nearline Control Solution (NCS) is a collection of components that provide client system connectivity to, and control of, the ACS. NCS software executes on a platform using the MVS operating system. Its major components are the Host Software Component for MVS (MVS/HSC) and the Library Station feature. MVS/HSC is the coordination and control software for ACS attachment. Library Station provides an ACSLS-compatible client system interface.

The ACS is where all automated cartridge tape activity occurs. The ACS consists of one or more interconnected Library Storage Modules (LSMs). Each ACS has its own control hardware called the Library Management Unit (LMU). The LMU provides the connection to the server and coordinates operations that involve multiple LSMs. Each LSM contains a robotic arm that moves cartridge tapes from storage cells in the LSM to and from cartridge drives. The electronics that control robotic operations within a LSM are contained in a Library Control Unit (LCU).

Tape requests travel from CSC on the client, through a LAN, to the server. The server then passes the requests to the LMU, which in turn instructs the ACS to

perform the actual operation(s). Notifications travel back to CSC along the same path, but in the opposite direction (from the ACS to CSC). Figure 1-2 provides a top-down overview of CSC, server, and ACS components.
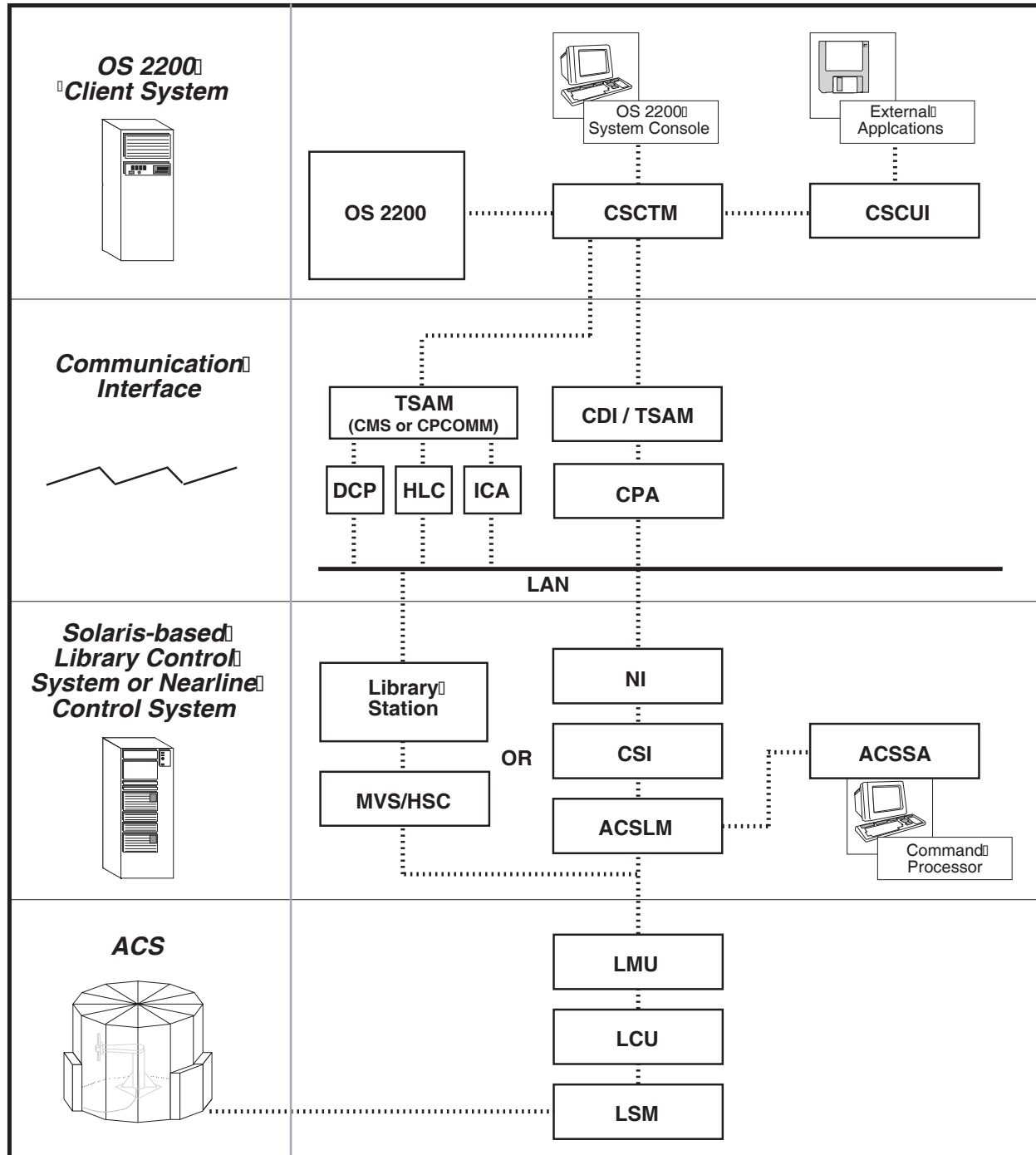
Figure 1-2. Top-Down Overview of CSC Control Path

2. CONSIDERATIONS FOR AUTOMATED CARTRIDGE TAPE OPERATIONS

Tape migration is the process of converting your site from a traditional, manual tape operation to an automated, potentially unattended operation. This involves the installation of software and hardware to facilitate the change. As explained in Chapter 1, CSC is the primary software component and a Library Storage Module (LSM), containing the robotic arm, is the primary hardware component that make automated tape operations a reality.

Before converting your site to automated operations, you should develop a migration plan that addresses the environmental and operational changes that must occur during the migration process. In addition, automated, unattended tape operations introduce a new tape handling philosophy that must be understood if your site is to experience a smooth, trouble-free transition.

This chapter discusses migration and programming considerations regarding the use of cartridge tape media in an automated environment.

MIGRATION CONSIDERATIONS

As the system administrator, you should consider the implications of automated tape operations and how the implementation will affect applications running on your system, as well as your operational environment. The following sections describe these considerations.

The Cartridge Drive Environment

Many sites have stand-alone ½" cartridge drives before they install an ACS and create an automated environment. In some cases, a site converting from 9-track tapes acquires their first ½" cartridge tape units and ACS at the same time. In either case, an ACS and supporting software are required to fully automate your tape operation. Stand-alone cartridge drives easily coexist with an ACS and may be the preferred configuration for your particular site; however, the use of stand-alone cartridge drives will obviously detract from the concept of unattended tape operations.

Converting 9-Track Tape Media to Cartridge Tape Media

The first step in composing a migration plan for converting round reel tape media to cartridge tape media is to establish the appropriate CONV statements in your OS 2200 configuration. However, you must be careful to avoid configuring incompatible device types on a single CONV statement. For example, U47 and U9S are incompatible because the media from one type cannot be used on the other.

The use of device type "T" acquires a new meaning if your operation includes a mixed configuration of round reel and cartridge tape media. Device type T can no longer indicate *any* tape device because of the incompatibility between 9-track and cartridge devices.

Another migration consideration concerns input and output tapes that are different media types. In these cases, you must modify ECL runstreams to take this difference into consideration. An option that might reduce the complicated nature of changing production ECL is to copy 9-track tape media to cartridge tape media before production runs access the tape data. This might be desirable because of the effects of converting catalogued, cycled, 9-track tapes to cartridge tapes. The Master File Directory (MFD) contains the device type under which a tape was catalogued. Thus, the @ASG,A statement in a production run will always request to mount the tape on the same device type that was used during tape creation.

Mixtures of 18- and 36-track units are not fully supported within a single ACS. Neither CSC nor ACSLS or NCS can tell if a tape is written in 18-track or 36-track mode. The tape user is responsible for ensuring that the assigned tape unit is compatible with the requested cartridge. Failure to do so can result in I/O errors and data loss.

Remember, that all migration procedures should consider the impact to your local TLMS operation.

Managing Backup Cartridge Tapes

Most tape assignments combine two independent operations: drive assignment and requesting a tape volume. The File Administration System (FAS) deals with each of these operations independently. Tape unit assignment is not related to tape volume mounting. Your FAS assignments must, therefore, be aware of the location of the volumes that will eventually be requested. If you decide to place your FAS backup tapes in an ACS, you must ensure that the following things are done:

- Direct output tapes to the appropriate ACS by either setting the run default ACS or by specifying an ACS name as the assign mnemonic. The CTL pool can also be used to select an ACS if and ONLY IF all of the tapes in that pool are resident in the desired ACS.

- In a multiple ACS environment OS 2200 can move a tape assignment between ACSs on each tape swap. However, this move cannot change to a different equipment type. Your ECL must request a compatible equipment type that exists in all ACSs containing volumes that FAS may use. For example, if you have one ACS with 18- and 36-track tape units and another with only 36-track units, your FAS tape assignment should use the 36-track units if tapes in both ACSs will be used.

Audit Trail Use in Library Storage

The placement of audit trail tapes in the ACS is a significant step toward fully unattended operations. Knowing all implications of this task assists you in planning the approach for your unique operation. Before using cartridge tapes for audit trail purposes, be aware of the following:

- Control unit buffering is the default mode of operation unless the assign image contains the BUFOFF option. When a control unit buffers data, you can lose data cached in the controller memory if a power loss or control unit failure occurs. This problem is inherent in any cached or buffered equipment, even disks. You can resolve this problem by disabling control unit buffering; however, when you disable control unit buffering you introduce a potential performance problem. You can reduce your exposure to data loss with a duplex audit trail. Each leg of the duplex audit trail should be on a unique cartridge tape subsystem where each subsystem has an independent power source.

- When an application performs many stops, starts, or tape direction changes, cartridge drives are not as fast as 9-track drives.

- In the integrated recovery environment where database activity dictates the amount of activity on the audit trail device, a certain amount of uncertainty exists as to whether audit trail "waits" affect database program performance. Duplexing the audit trail on disk allows you to achieve performance and to protect you from equipment and power failures. The IRU MOVE feature lets you do a periodic copy from the audit trail disk file to cartridge tape. With this method, buffering and tape performance concerns cease to exist.

In addition, consider the following items as you plan your migration:

- Determine how many dedicated cartridge drives are necessary for auditing applications. To do this, answer the following:

  - how many application groups do you use with audit trails?

  - do you duplex the audit trail?

  - how many cartridge drives do you dedicate to each leg of the audit trail?

  - how many cartridge drives are necessary for MAPPER audits?

- Include in your plan the movement of cartridge tapes in and out of the ACS. If your site creates a significant number of audit trails daily, it's important to determine if and how you are to rotate audit trail cycles.

- Make sure that all programs and runstreams affected by audit trails mount tapes from the ACS. In most cases, this implies that you change the assign mnemonic on assign statements. The Integrated Recovery Utility (IRU) will require syntax and source code changes for recovery, load, copy, and dump operations.

PROGRAMMING CONSIDERATIONS

Cartridge tape operations will often necessitate programming changes to tape translate features, programs with internal tape assigns, and ECL. These programming changes must be considered in your migration plan.

Tape Translate Features

The 4480 subsystem does not support the Unisys tape translate features. Modify those applications using the tape translate feature of the Unisys tape control unit so they do software translates instead.

Programs with Internal Tape Assigns

Make sure that modifications to these programs support the appropriate types of tape equipment. Whenever possible, add provisions to specify equipment types externally via ECL.

ECL

Identify runstreams that use the M and S density options. Either remove the M and S options or replace them with the L option. Using either M or S when assigning a cartridge tape will cause the assignment to fail.

Be aware of a possible error condition when a program or runstream does an @FREE,S on a catalogued tape file. Since an @FREE,S retains assignment of the drive to the run, you should limit the run to that device type. If the media changes from 9-track to cartridge, you may encounter an incompatible device situation. This convention is not usually a problem unless there are incompatible equipment types in cycles of the catalogued file.

Where appropriate, change equipment mnemonic references on tape assign statements from 9-track or generic tape to one specific to a half-inch cartridge.

Synchronize the FAS backup to cartridge tape with the changes to the FAS runs ECL.

Before making the first database backups to cartridge tapes, make sure that all database utility runs such as load, save, and recover, can assign cartridge drives.

3. PREPARING YOUR SITE FOR AUTOMATED OPERATIONS

This chapter describes how to prepare your site to move to automated tape operations using the ACS.

PREPARING CARTRIDGE TAPES FOR USE IN THE ACS

Each LSM contains a robotic arm and a visual system that scans OCR/bar-coded identification labels on cartridge tapes and performs mount and dismount functions. This vision system cannot scan a cartridge tape that does not have a proper OCR/bar-coded identification label. When purchasing cartridge tapes, ensure that they include OCR/bar-coded labels specifically designed for cartridge tapes used inside an LSM. Proper labels are crucial to the successful operation of the robotic vision system.

> **NOTE**
>
> *Cartridges without external labels can be used in the ACS. However, manual intervention is required to enter these cartridges. Many automated recovery operations cannot be done on these tapes.*

Initializing a Cartridge Tape with an Internal Label

The volume serial number (volser) on the cartridge tape's internal label must match the external OCR/bar-coded label. Most cartridge tapes can be ordered with pre-initialized internal labels. Internal labels are available in three formats: ASCII, EBCDIC, and unlabeled.

You can create internal labels in ASCII format for tapes used on Unisys clients by running the Unisys utility program TLABEL. TLABEL is used to label tapes on stand-alone cartridge drives only because TLABEL doesn't accept specific volsers. Therefore, the ACS cannot identify the cartridge tape to be labeled.

Unlabeled Cartridge Tapes

While the ACS can accommodate cartridge tapes that do not have internal labels, avoid using them if possible because of potential problems that might occur when operating in manual mode.

Entering Cartridge Tapes into the LSM

The following steps describe general guidelines for entering cartridge tapes into an LSM.

1. Ensure that the file-protect selector is properly set. The recommended setting is "write-enable."

2. **If you're loading the LSM with cartridge tapes for the first time,** you need to physically place each cartridge into an LSM storage cell. Open the doors, walk into the LSM, and place the cartridge tapes into open cells. Do not use the top two rows. Once you've placed the cartridge tapes into the LSM, use the server AUDIT command to update the server's database. The

time required to do volume audits on any ACS is dependent on the total number of cells audited and the number of audited cells that are empty.

WARNING

Do not place cartridge tapes into diagnostic cells. These cells are identified by a pink alignment pattern and are reserved for use by hardware engineers. The robotic arm will not access cartridge tapes stored in these cells.

3. If you're adding a cartridge tape or tapes to an ACS that is already loaded and active, use the enter function. This is available via the ACSLS Command Processor, the CSCUI DO-ENTER user request, and the CSC console interface.

Cleaning Cartridge Drives

Each cartridge drive contains multiple transports. Each transport threads tape onto the tape reel hub, positions the tape, reads from and writes to the tape, rewinds the tape, and unthreads the tape. Each transport operates independent of other transports in the cartridge drive.

Transports are cleaned automatically based on the "Transport Auto Clean Option" selected during server configuration. ACS control software tracks transport use, and when a transport is used the defined number of times, interrupts normal tape processing to mount and then dismount a cleaning cartridge. Cleaning cartridges within the ACS must be identified to ACS control software before they can be used for automatic cleaning. With ACSLS the SET CLEAN command identifies a cartridge tape as a cleaning cartridge. The NCS software identifies cleaning cartridges by a three character prefix (usually 'CLN') followed by three digits.

You can manually clean a transport by entering console commands. For NCS there is a CLEAN command. For ACSLS you enter a MOUNT command for a cleaning cartridge. When a cleaning cartridge is inserted in a transport, the transport cleans itself. After this, you must enter a DISMOUNT command for the cleaning cartridge.

CSC System Administrator's Guide 312537501

4. CONFIGURING YOUR SITE FOR AUTOMATED OPERATIONS

This chapter provides general recommendations and configuration suggestions for managing tapes in the ACS environment. It contains sections on the following topics:

- ACSLS and Nearline Control Solution (see page 4-2)

- Dynamic Timer for Variable Speed LSM (see page 4-3)

- Cartridge Access Ports (see page 4-5)

- Internal Software Processes That Affect Tape Operations (see page 4-5)

- Controlling ACS Tape Unit Allocation (see page 4-8)

- Scratch Cartridge Tapes and Scratch Pools (see page 4-14)

- Using a TLMS with the ACS (see page 4-15)

- Server Volume Reporting Utility (see page 4-18)

- NCS Commands Submission (see page 4-19)

- Multiple Interface Feature (see page 4-20)

- Multi-Client (page 4-21) and Multi-ACS Operations (see page 4-22)

- Multiple CSC Considerations (see page 4-25)

- Changing Scratch Status ACSSCR (see page 4-26)

- Modifying ACS Parameters ACSMAP & ACSNAM (see page 4-28)

- Demand Terminal Security (see page 4-32)

ACSLS AND NEARLINE CONTROL SOLUTION

ACSLS is a software package that runs under the Solaris operating system to allow multiple systems to share an ACS complex. The Nearline Control Solution (NCS) is an MVS software package that also allows multiple systems to share an ACS complex. NCS consists of the Host Software Component for MVS (MVS/HSC), the Client System Component for MVS (MVS/CSC), and the Library Station feature. The Library Station feature allows non-MVS clients to share the ACS complex. CSC uses this feature to communicate with NCS.

The Solaris-based server software and the Library Station feature use the same interface protocol for ACS requests. Although the protocol is the same, CSC must make adjustments to its recovery processing based on the server type. The CSC configuration contains the `SERVER_TYPE` parameter to tell which server is being used.

Library Station and MVS/HSC each accept operator console requests for information or ACS action. When the NCS server type is selected, CSC accepts a console keyin that will pass arbitrary Library Station or MVS/HSC commands to NCS and display the returned results. The command is `*CSC CMD`. The commands that can be issued are documented in the NCS operator guides for Library Station and for HSC.

With either server the DO-VOLRPT request of CSCUI produces a file containing information about volumes in the ACS. CSC obtains this information by executing a volume report utility program on the server and writing the results into a file. The volume report utility of NCS does not have options for controlling the output contents or format. Therefore, the `FORMAT` and `ZERO` parameters of DO-VOLRPT are not functional with the NCS server.

With the Solaris-based server, the only session related parameters are the userid and password used to establish the volume report terminal session. With NCS, both the *CSC CMD interface and the DO-VOLRPT request establish sessions to the NCS server to perform their respective operations. Two sets of session signon parameters are needed. Because the NCS software executes on an existing MVS system at some sites, CSC must also handle other site specific messages in order to establish the terminal session. The CSC configuration parameters `CFG_COMMAND` and `CFG_VOLRPT` enable a site to tailor how CSC establishes the applicable terminal session.

CSC supports several parameters that are unique to the NCS server. In CSC 5R1, the parameters that apply only to the NCS server reside in a new parameter element named NCS$PARAM. The *CSC Installation Guide* contains a separate section for the parameters that are in NCS$PARAM.

DYNAMIC TIMER FOR VARIABLE SPEED LSM

LSMs have differing robotic capabilities. On some models the robotic arm moves very quickly. On other models, by design, the robotic arm moves more slowly. The time required by the robotic arm to *physically* mount or dismount a cartridge tape is by far the most time consuming function within the end-to-end operational cycle. Understandably, CSC is somewhat sensitive to the robotic movement time in its relationship with OS 2200 and the server. Timed events, with timeouts optimized for one model of robotics (at one speed), are not optimal for other robotic speeds.

CSC accommodates configurations with different robotics speeds through the use of a dynamic timer feature. This feature automatically adjusts mount and dismount timeout values based on the robotic arm speed within your LSM.

General Timer Philosophy

Library automation has generally improved tape handling by reducing errors, increasing throughput, and safeguarding tape resources. These objectives are accomplished using a system that delivers an automated solution and reduces the need for human intervention.

Timers are an inherent feature of library automation. In the past, anomalies were diagnosed and resolved by human operators observing physical conditions. With automation, these anomalies are managed by software that implements retry and recovery logic governed by timers.

As an example, when your client issues a request to mount a tape, the server interprets the request and instructs the robotic arm within the LSM to mount the tape. Once mounted, the server acknowledges the event by issuing a response to the client.

Under *normal* operating conditions, you can expect that the tape will be mounted in a reasonable amount of time. Under *abnormal* conditions, the tape may not be mounted within the timer value established within CSC for that particular function. The function may time out.

CSC Timer Philosophy

Timers and timeout events are intended to alert the human operator that CSC is operating outside its optimal range. Usually, the presence of a timeout message indicates that the work load has increased and for the moment, job requests exceed the resources that are available. Frequent timeouts would alert the operator to investigate the system performance to see if there were a more serious failure.

For mount and dismount operations, CSC establishes timeout values that are consistent with OS 2200 allocation philosophy. The mount timeout value for CSC is matched to the timeout period that OS 2200 uses for a SERVICE

message. It is long enough that it will not expire under normal work loads using faster robotics.

When OS 2200 initiates a mount request, it starts its timer. CSC will intercept the request and start its own timer. If the mount request is not satisfied within the CSC timeout value, CSC concludes that the mount failed and queues the information. If the mount request is not satisfied within the OS 2200 timeout period, OS 2200 also concludes that the mount failed and issues a SERVICE message to CSC. When CSC receives the SERVICE message, it reissues the mount request and restarts its timer. This cycle continues until the mount request is either satisfied or terminated.

The Dynamic Timer Feature

The dynamic timer feature is designed for sites who have the slower robotics installed within an LSM in their enterprise. It would be appropriate for a site that has just one LSM with the slower robotics. This feature is also applicable to the site with LSMs of mixed speeds; one of which has the slower robotics.

The nominal timeout values in CSC are too short when the slower robotics are employed. The dynamic timer adjusts the timeout value based on the timeouts CSC is experiencing:

- When a mount (or dismount) timeout occurs, the current timeout value for *that particular drive* is incremented by 10 seconds.

- When 5 consecutive mounts (or dismounts) occur on a *particular drive* without a timeout, the timeout value for that drive is decremented by 10 seconds.

- Timeout values for mount and dismount requests vary within a range of 50 to 230 seconds.

- CSC is aware of your LSM configuration through their attached drives, therefore, timeout management is performed at the *drive level*. This allows for automated support of two or more LSMs, each with differing robotic speed characteristics.

> **NOTE**
>
> *Timeout messages may be displayed on the system console as timeout values are adjusted. This is normal and does not necessarily indicate that a mount or dismount request has failed. All requests that timeout are automatically reissued.*

If your LSM configuration requires the dynamic timer feature, add the W option to the @XQT statement within the CSC initialization runstream.

CARTRIDGE ACCESS PORTS

Cartridge Access Ports (CAPs) are bidirectional ports built into the door panel of an LSM. CAPs allow you to manually enter or eject cartridge tapes from the LSM using server or system console commands. The number of tapes you can enter or eject is determined by the LSM model, the CAP configuration for that model, and your level of CSC. Most of the newer LSMs are configured with multiple CAPs in a variety of sizes. The server initially sets the CAP priority to zero, essentially rendering them useless until the priorities are changed to a non-zero value.

A specific CAP can be requested by including a CAP-ID (acs#,lsm#,cap#) in the server request. When the server receives a request that requires a CAP, and no CAP-ID is specified, the server selects a CAP based on its priority. The NCS server refers to this as the CAP preference value. CAPs with a zero priority are never selected by the server.

You must ensure that CAPs with a nonzero priority are available for enter and eject requests.

INTERNAL PROCESSES AFFECTING TAPE OPERATIONS

This section describes internal processes that affect tape operations.

Cartridge Tape Reassignment Philosophy

CSCTM processing is influenced by external events and internal timers. Mount, dismount, and service requests are three of the external events that initiate CSCTM functions. In each case, a request is sent to the server and a response is received. Based on the response, another request may be sent to recover from some unexpected condition. This request/response/decision sequence repeats until either the original request completes normally, or fails with an unrecoverable status, or the time allotted for the request expires.

One possible consequence of this action is the following situation:

First, a mount is requested for a cartridge tape that is in use on another drive. The mount fails because the volume is already in use.

Second, the requested tape is freed and returned to its cell within the ACS.

Third, *the original mount request does not complete until a SERVICE message is issued.* Without the SERVICE message, there is no external event to cause CSCTM to mount the requested tape.

The above scenario explains why a delay may occur between the time a volume is assigned and the time it's actually mounted on a cartridge drive.

Drive Lock Philosophy

Drive locks are implemented by the ACSLS server with the goal of serializing robotic access to cartridge tape drives. CSC uses these locks to aid the server in this task.

The Unisys client system issues commands to the cartridge tape control unit(s) to gain exclusive use of the *data path* to a cartridge tape drive. The client will not change a drive to the UP or RV state if it cannot control the data path. Once the client controls the data path, the control unit will not allow another client to access that drive.

The server software accepts client requests that control access to the *control path* to a drive. This control takes the form of a numeric lock identifier (id) and an alphanumeric user id. The use of lock ids is optional and id 0 indicates "no locking." As a rule, the lock id of a mount or dismount request must match that of the drive before the server will honor the request. This is also true for lock id 0.

When the client changes the status of a drive from DN, to either UP or RV, CSC issues a lock request to the server. It's important to understand that *CSC does not require these server locks to operate.* It's done for the benefit of other clients attached to the server. As such, CSC tries to keep all UP or RV units in a locked state on the server. The locking may be cleared during recovery from a mount or dismount failure. Once the recovery is complete, CSC relocks the drive after the next dismount. All drives locked by CSC will have the same lock id and user id. The userid can be configured during CSC installation, using the USERID parameter. (Please refer to the *CSC Installation Guide* for additional information.) If the userid is not configured, then the default userid has the following format:

> *siteid* UNISYS *series/model*

where: *siteid* is the machine identifier generated into the client operating system.

and; *series/model* indicates the platform (e.g., 2200/3800)

Labeled and Unlabeled Cartridge Tapes

Tapes in the ACS have external labels for use by the library server and internal labels for use by Exec. Both labels are optional. When both labels are present, the volume identifiers must be the same in both labels.

The robotic hardware has a vision system that can read the external label to identify a cartridge and the library server software uses this identifier as its name for the cartridge. When a cartridge without an external label is entered into an ACS, it is assigned a virtual label with an operator supplied volume identifier. The server uses the information in this virtual label as if it were an actual external label.

When a tape is mounted, Exec uses the internal label to identify the volume. If there is no internal label, Exec issues an "Enter reel number" message to ask for the volume identifier. For an ACS unit, CSC must respond to this query from Exec. CSC responds with the volume returned from the library server.

Using Unlabeled Cartridge Tapes

Neither CSC nor the library server can access the internal cartridge label. For CSC to support the use of internally labeled and unlabeled scratch cartridges, they must be segregated on the server. This is accomplished using server scratch pools. All volumes in a scratch pool have the same type of internal labeling. CSC then uses the presence or absence of the J option on the assignment to select which server scratch pool it selects.

With the CARTTAPELIB$ interface, Exec makes an explicit "Enter reel number" request to CSC when an unlabeled tape is mounted on an ACS unit. When CSC receives this request, it responds with the last volume mounted by the server on the indicated tape unit. If that mount was not done in this execution of CSC, the volume to return is obtained by a query to the library server.

The ER STK$ interface does not have an "Enter reel number" request. With this interface, CSC tells Exec what volume is on a drive whenever a mount completes. Following are two implied conditions to successfully use unlabeled tapes using the ER STK$ interface.

- CSC will only tell Exec what volume is mounted as the result of issuing a mount request. If a mount request is entered through the ACSLS command processor, for example, CSC will not be informed of the mount completion and will not pass the volume identifier on to Exec.

- CSC will only tell Exec what volume is mounted if it receives a response to the mount request from the server. If communication problems prevent CSC from receiving the server response, the mount request will time out and CSC will not pass any volume id to Exec. If the mount completed successfully, Exec is waiting for a reel number and will not issue a SERVICE request. If this happens, Exec will display the "Enter reel number" message on the operator console after 10 minutes without receiving a response.

Tape Automatic Volume Recognition (TAVR)

Tape Automatic Volume Recognition (TAVR) is an OS 2200 feature that provides greater convenience during manual operations. When you mount a cartridge tape in manual mode on a system with TAVR, you can direct the mount to any compatible device, not just the device designated by OS 2200.

CONTROLLING ACS TAPE UNIT ALLOCATION

One gauge of tape automation success is how well the end user's tape needs are handled without human intervention. For this to occur, the tape automation software must be aware of the needs of the tape user, the site defined tape operation guidelines, and information from the library server software regarding ACS status and content. CSC and OS 2200 use this information together to allocate the appropriate tape unit and do the required tape mounts and dismounts.

This section gives an overview of tape usage and configuration items that affect tape unit allocation. After these is an overview of how these items are used in combination to control the characteristics of the tape allocated tape unit. Following are the topics covered here.

- @ASG J option
- @ASG equipment type
- @ASG volume identifier
- @ASG CTL pool name
- Site defined defaults for scratch pools
- Run default ACS setting
- Site defined setting for scratch preference
- Site defined setting for query scratch

@ASG J Option

The presence or absence of the J option of @ASG tells if the user requires a tape containing internal labels. The internal labels are written on the tape and are not accessible to the ACS hardware, the library server software, or CSC. When a blank tape is assigned, CSC and the library server must select a cartridge with the appropriate internal labeling. This is accomplished using different scratch pools on the library server that each contain volumes with the same internal labeling (all labeled or all unlabeled). CSC then uses the presence or absence of the @ASG J option to determine which scratch pool to use in the server request.

This is the "how" for satisfying labeled versus nonlabeled requests. There is more information about configuring and using scratch pools in the section titled "Scratch Cartridge Tapes and Scratch Pools" (p. 4-14).

@ASG Equipment Type

The type field of the @ASG statement tells OS 2200 the type of equipment you want to assign. Traditionally the type is a Unisys defined equipment identifier or a site defined unit or control unit name. With CSC, the type field can also specify the library requirements of a tape device. This section tells how the type field influences tape unit allocation.

When OS 2200 processes an @ASG statement, it looks for a match for the type field in an OS 2200 internal data structure. The contents of this data structure are

defined during the OS 2200 generation using configuration parameters called CONV statements. Each CONV statement contains a name that can be used as the equipment type of an @ASG statement and a list of the hardware types that can be used when that type is requested. In the following sections, unless otherwise noted, the types listed are all from the CONV definitions.

General tape type

Any tape equipment type that is not one of the types below is referred to in this section as a general tape type. When a general tape type is used, the decision about allocating an ACS versus a non-ACS unit is based on other factors. These factors include other fields of the @ASG statement, site defined tape library preferences, and the user defined preferences.

Examples of general tape types include HIC, HIS98, and T.

General library type

LCART, U47L, and U47LM are equipment types that receive special handling within OS 2200 such that they always allocate an ACS unit. They were originally defined for generic library units, 18 track library units, and 36 track library units respectively. The types of tape units that can actually be allocated are defined on the CONV statements. For existing levels of OS 2200, CONV LCART contains only U47L hardware. CONV U47L and CONV U47LM each contain the single hardware type U47L and U47LM respectively. Your site may add additional unit types to CONV statements for LCART and U47LM during the OS 2200 system generation. Since there is only one possible 18-track unit that can be in an ACS, expanding the CONV U47L is not practical.

General non-library type

NLCART, U47NL, and U47M are equipment types that receive special handling within OS 2200 such that they always allocate a non-ACS unit. Like their general library counterparts, they were originally defined for generic, 18-track and 36-track units and each contain only a single usable type of hardware. Your site may add additional unit types to CONV statements for NLCART, U47NL, and U47M during the OS 2200 system generation.

ACS name

An ACS name is an alphanumeric string that can be used as the equipment type of an @ASG to allocate a tape unit in a specific ACS. The definition and processing of ACS names differs between the ER interface and the CARTTAPELIB$ interface to OS 2200. With each interface, OS 2200 must have a list of valid ACS name definitions. The default definitions can be changed using the ACSMAP processor as described in the section titled "Modifying ACS Parameters" (p. 4-28). With the ER interface, OS 2200 does all of the processing

to select only ACS tape units as specified by the supplied ACS name. With the CARTTAPELIB$ interface, the CSC configuration has an ACS_MAP parameter defining the ACS names for which this CSC is responsible. CSC then handles the selection of a unit in the appropriate ACS.

Absolute unit name

OS 2200 allows the user to request a specific unit using an equipment type of * followed by a site define name of the unit. This type of assignment always allocates the requested unit.

Absolute control unit name

OS 2200 allows the user to request any unit that is controlled by a specific control unit. This is done by using an equipment type of * followed by a site defined name of the control unit. The need for and selection of an ACS versus a non-ACS unit is based on other the other user defined fields and site defined defaults.

@ASG volume identifier

The presence or absence of a volume identifier on the @ASG statement determines if it is a specific assignment or a blank assignment respectively. In the absence of overriding options, a specific assignment always uses a tape unit in the ACS containing the requested volume or it uses a stand alone unit if the volume does not reside in any ACS. The ACS usage for a blank assignment is based on the user specified equipment type and CTL pool and on site defined settings for scratch preference and possibly query scratch.

CTL Pool Name

A CTL Pool Name is an alphanumeric field on the @ASG statement that, with one exception, is passed to CSC to further define the tape user's needs. When passed on a blank assignment, CSC translates the CTL pool name into a scratch pool identifier that is included in the request to the server. The one exception from above is when the value NONCTL appears in the CTL pool name. This is an indication to OS 2200 that a non-ACS unit is to be allocated and OS 2200 does not involve CSC in the allocation.

Scratch pool defaults

The library server segregates blank volumes into groups with the same characteristics called scratch pools. Each request to the library server to mount a blank volume must specify one of these scratch pools. CSC supplies a default scratch pool if the user request does not specify a CTL pool.

Run Default ACS

One characteristic of Unisys ECL is that default settings exist for most fields. With tape automation, there is now a default ACS associated with each run. This default is used when an assignment requires an ACS unit and neither the user nor the library server give any indication of which ACS should be used. The @ACSNAM processor can be used within a run to change the run default ACS setting.

The initial setting of the run default ACS is taken from the system default ACS. The system default ACS exists only to provide this initial setting. The system default ACS can be changed using the @ACSMAP processor as described in the section titled "Modifying ACS Parameters" (p. 4-28).

Scratch Preference

OS 2200 and CSC reference an internal parameter to determine the default location for mounting scratch cartridge tapes. The scratch preference setting can be using the ACSMAP processor as described in the section titled "Modifying ACS Parameters" (p. 4-28). It has one of the following settings:

- **ACS preference.** Directs to the ACS all scratch cartridge tape requests except those that specifically request equipment outside the ACS (NLCART, for example).

- **Non-ACS preference.** Directs to stand-alone drives all requests for scratch cartridge tapes that do not have an assign mnemonic specifying an ACS drive (LCART, for example).

Query Scratch

Query Scratch is a setting that determines if the library server takes part in the allocation of an ACS tape unit for a blank volume assignment. When set to TRUE, OS 2200 sends a request through CSC to the library server asking for recommendations on which unit to assign. The server returns units that are closest to the desired scratch volumes. The FALSE setting directs OS 2200 (and CSC when the CARTTAPELIB$ interface is used) to perform this unit selection without assistance from the library server.

One side effect of setting Query Scratch to TRUE is that the run default ACS setting can be overridden by the library server. The server recommends drives closest to volumes in the requested or defaulted scratch pool. When these volumes exist in more than one ACS, the server recommends the one containing the most volumes from that scratch pool.

Effects on Tape Unit Allocation for Blank Assignments

Table 4-1 shows how the items mentioned above affect which unit is allocated for a blank assignment. Query Scratch is not mentioned directly because its effects are reflected in the run default ACS.

Table 4-1. Tape Unit Allocations for Blank Assignments

@ASG Equip Type	@ASG CTL pool	Is Scratch Preference=ACS	Location of selected unit
General type	None	N	non-ACS
General type	Specified	N	run default ACS
General type	NONCTL	either	non-ACS
general type	Specified or none	Y	run default ACS
LCART	Specified or none	either	run default ACS
LCART	NONCTL	either	FAC reject
NLCART	NONCTL or none	either	non-ACS
NLCART	specified	either	FAC reject
ACS name	specified or none	either	requested ACS
ACS name	NONCTL	either	FAC reject
abs unit	any	either	requested unit
abs cu	none	N	non-ACS on that cu or FAC reject if none exist
abs cu	specified	N	run default ACS unit on that cu or FAC reject if none exist
abs cu	NONCTL	either	non-ACS on that cu or FAC reject if none exist
abs cu	specified or none	Y	run default ACS unit on that cu or FAC reject if none exist

Effects on Tape Unit Allocation for Specific Assignments

Table 4-2 shows how the items mentioned above affect which unit is allocated for a specific volume assignment. Neither the CTL pool name nor the Query Scratch setting affect this type of assignment.

Table 4-2. Tape Unit Allocations for Specific Assignments

@ASG Equip Type	Is volume in ACS	Location of selected unit
general type	Y	ACS containing the volume
general type	N	non-ACS
LCART	Y	ACS containing the volume
LCART	N	run default ACS
NLCART	Y or N	non-ACS
ACS name	Y or N	specified ACS
abs unit	Y or N	requested unit
abs cu	Y	unit in the ACS containing the volume that is also on the requested cu or FAC reject if none exist
abs cu	N	non-ACS unit on that cu or FAC reject if none exist

SCRATCH CARTRIDGE TAPES AND SCRATCH POOLS

ACSLS maintains lists of cartridge tapes designated as scratch cartridge tapes. One of these cartridge tapes will be selected and mounted when CSC requests a scratch cartridge tape mount. The server reports the volume identifier of the selected cartridge tape in response to the mount scratch request. After the cartridge tape is mounted, the server no longer considers it a scratch cartridge tape. When the data on a cartridge tape is no longer needed, a request can be made to the server to set the scratch attribute for that tape.

Groups of scratch cartridge tapes, called scratch pools, are defined using the server's DEFINE POOL command. Scratch pools are distinguished by a scratch pool identifier (ID). The scratch pool ID is a number between 0 and 65534. In addition to changing the scratch attribute of a cartridge tape, the server's SET SCRATCH command can set or change the scratch pool ID. Also, the ACSSCR utility can be used to change the scratch attribute or set or change the scratch pool ID for a cartridge tape.

CSC requires two scratch pools, one for labeled cartridge tapes and another for unlabeled cartridge tapes. These scratch pool IDs are configured during CSC installation, using the DEFAULT_LABELED_POOL and DEFAULT_UNLABELED_POOL parameters. Additional scratch pools can also be defined. These scratch pool IDs are configured during CSC installation, using the TRANSLATE_POOL parameter. These additional pools are accessed by using the CTL-POOL field of the @ASG or @CAT statement. Please refer to the *CSC Installation Guide* for additional information.

In summary, the following are prerequisites for proper scratch pool use:

- On the server, at least two scratch pools must be defined.

- The scratch pool ID must be set for each cartridge tape.

- CSC must be configured to include the scratch pool IDs for labeled and unlabeled cartridge tapes.

- If more than two scratch pools are defined on the server, CSC must be configured to include the scratch pool IDs for cartridge tapes in these scratch pools.

- Pool 0 (zero) should not be used as one of the CSC configured scratch pools because it has special significance on the server.

USING A TLMS WITH THE ACS

A TLMS guards cartridge tape ownership, maintains scratch pools, and tracks cartridge tape usage. A TLMS can be completely automated, completely manual, or a combination of both.

The advantages of using a TLMS include:

- data protection
- secure ownership
- confirmed location
- flexible retention periods
- other site-specific security or tape management concerns

User programs can also control tape activities through the CSC User Interface (CSCUI). For more information on CSCUI, see the *CSCUI Programmer's Reference Manual.*

Synchronizing Scratch Status

Depending on the methods used to control access, cartridge tapes are scratched when:

- The operator intervenes
- The retention period expires
- The TLMS acts upon the cartridge tape's scratch status

Your TLMS, the server, and OS 2200 each view scratch status in a different way. You should synchronize the scratch status of each cartridge tape between the ACS and the TLMS. A lack of synchronization can cause loss of data and unexpected results during processing.

TLMS View of Scratch Status

The TLMS defines a cartridge tape as "available" based on retention information and other parameters provided when the tape was created.

The TLMS considers cartridge tapes that are no longer "in use" to be scratch tapes. An important function of any TLMS is to protect user data by ensuring that only valid scratch cartridge tapes are written on.

Server View of Scratch Status

The server maintains a database containing a list of all cartridge tapes that exist in each attached ACS. This information includes the cartridge tape's scratch status. The server satisfies a request for a scratch mount using only cartridge tapes that it considers scratch.

The ACS cannot read data written to the cartridge tape label, nor can it access information about tape ownership or retention. Therefore, the ACS cannot provide data protection for specific cartridge tape mount requests.

When you enter a cartridge tape into an LSM using the enter command, the server automatically sets that cartridge tape's status to non-scratch. The server also changes the status of a cartridge tape to non-scratch when the tape is mounted.

You can use the Command Processor on the server to set a volume's scratch status on the server. You can also restore a cartridge tape's scratch status using CSCUI.

OS 2200 View of Scratch Status

Labeled Cartridge Tapes

OS 2200 allows and denies changes to a cartridge tape's scratch status based on your software configuration, the options used when creating the tape, and the presence of a TLMS. If you use a TLMS for tape management, cartridge tape scratching is a function of this facility. This means that cartridge tapes are candidates for scratching when the data base information indicates that the tape's retention date has expired. The TLMS utilizes its database to maintain the cartridge tape status and expiration values. Without the TLMS present, a labeled cartridge tape is considered scratch if the retention date in the tape label has expired.

Unlabeled Cartridge Tapes

If your system has a TLMS, unlabeled cartridge tape scratching is handled the same way as labeled tapes. Data base information is used to determine whether the cartridge tape should be scratched.

If the TLMS feature is not present in your system, OS 2200 always considers the cartridge tape a scratch tape.

Server and TLMS Scratch Status Interactions

Because the server and TLMS (on the client) use different criteria to determine the scratch status of a cartridge tape, the same tape may have a different scratch status on each system. For example, the TLMS considers any expired cartridge tape to be scratch, while the server might still consider the tape to be in use.

By contrast, the TLMS may mark a cartridge tape as in use, while the server considers the tape to be scratch. In these cases, you should synchronize cartridge tape statuses between the TLMS and the server. In general, the server takes a very conservative view. When in doubt, it flags the cartridge tape as in use. In the overall philosophy of CSC, the server, and the TLMS, the cartridge tape status as recorded by the TLMS is favored.

Scratching a Cartridge Tape

Users can scratch a cartridge tape by submitting the volser in one of two ways:

- Use the appropriate function code with a user program registered with the SCRATCH/UNSCRATCH request in CSCUI. This is the mechanism the TLMS uses to synchronize tape databases in the client and server. For more information, see the *CSCUI Programmer's Reference Manual*.

- Enter SET SCRATCH on the Command Processor.

- Use the ACSSCR utility. For more information, see the "Changing Scratch Status" topic (p. 4-26) later in this chapter.

Unscratching a Cartridge Tape

You can unscratch a cartridge tape as follows:

- Use the appropriate function code with a user program registered with the SCRATCH/UNSCRATCH request in CSCUI. This is the mechanism the TLMS uses to synchronize tape databases in the client and server. For more information, see the *CSCUI Programmer's Reference Manual*.

- Mount a scratch cartridge tape in the ACS. The tape status immediately changes to non-scratch (in use).

- Enter SET SCRATCH OFF on the Command Processor of the Solaris-based server.

- Use the ACSSCR utility. For more information, see the "Changing Scratch Status" topic (p. 4-26) later in this chapter.

Scratch Synchronization Utilities

OS 2200 commercial TLMSs synchronize scratch statuses between their databases and the server database through utility programs. A common implementation involves two programs:

- A **real-time program** that detects changes in the TLMS's view of scratch status of a cartridge tape as they occur. When it detects a status change, it makes the appropriate call to CSCUI, submitting a scratch or unscratch request. This program runs as a background job whenever the TLMS and CSC are operational.

- A **batch program** that can provide a complete reconciliation of the TLMS's and the server's databases. When this batch job detects differences between the TLMS's view and the server's view, it initiates an update the server's database. The batch program then applies the status according to the TLMS's view of the cartridge tape's scratch status. The program makes these cartridge tape status change requests by calling CSCUI.

A TLMS may issue a large number of cartridge tape status changes when it periodically resets cartridge tapes to scratch based on expiration or other criteria. The

resulting "scratch list" may include 100 or more cartridge tapes. The TLMS, or its associated utility program, then passes the volsers from this scratch list to CSCUI as SCRATCH requests. You should run the TLMS scratch list function often enough to ensure an adequate supply of cartridge tapes in the ACS scratch pool.

SERVER VOLUME REPORT UTILITY

The server software includes a utility that creates a report of library volumes. The volume report utility is run from a terminal session to the server. CSCUI provides the DO-VOLRPT interface to request a volume report. CSC contains the supporting logic to create a terminal session and execute volrpt. The CSC configuration contains the information needed to create the terminal session. The CSCUI requester supplies information that is used to customize the volrpt parameters. The following items are required for DO-VOLRPT to work successfully:

- There must be a login name and password on the server that can access the volume report utility. With ACSLS, the existing access signon has the correct attributes. With NCS, a signon must be created with the appropriate attributes and permissions.

- The CSC parameter elements must contain statements with the user name and password that can access the volrpt utility. These are the SIGNON or CFG_VOLRPT statement with ACSLS or the NCS server, respectively.

- With the NCS server, three JCL procedures must be created on the server to run the volume report utility.

- A predictable sequence of messages must occur during the terminal signon to the server. Adding items that sometimes require a response, such as a mail check in .profile, will cause the terminal session establishment to fail.

- The CSCUI requester must create a cataloged file of DO-VOLRPT parameters. This file must be accessible by the CSC run. The parameters in this file are documented in the *OS 2200 Client System Component User Interface (CSCUI) 5R1 Programmer's Reference Manual* (7844 8677).

- A program must pass a DO-VOLRPT request to CSCUI containing the parameter file name. There is a program called DOVOLRPT in the file SYSLIB*CSC-2 that can perform this task.

If the configuration parameters and NCS processes are not set up correctly, the user's DO-VOLRPT request will fail with status 19. At the time of the failure, a console message will be displayed, telling which area of the configuration is not correct.

The file SYSLIB*CSC-2 contains a program that requests a volume report. The following is an example of ECL that uses this program to produce a volume report.

```
@ASG,CP   TEST*PARMFILE(+1).
@DATA,ILQ TEST*PARMFILE(+1).
List none
Headings off
ACS 1
Output File Asg,CP Test*Output(+1).
@END
@FREE     TEST*PARMFILE(+1).
@SYS$LIB$*CSC-2.DOVOLRPT  TEST*PARMFILE.
```

Executing this ECL would create a new cycle of the file TEST*OUTPUT containing the volume report.

NCS COMMAND SUBMISSION

The *CSC CMD console keyin allows operators to submit commands to the NCS server and display the server response. CSC accomplishes this by establishing a terminal session to the NCS server and entering console mode. While in console mode, commands may be submitted to the library control software and the console responses are displayed.

The configuration of the library control software on the NCS server defines a leading character for console keyins that it will handle. The CSC configuration parameter CFG_COMMAND COMPRFX in the NCS$PARAM element defines this leading character for CSC. CSC ensures that each command submitted via *CSC CMD begins with this prefix character and is thus directed to the library control software.

THE MULTIPLE INTERFACE FEATURE

The CSC control path between the Unisys 2200 system and the server includes the following components:

- CSCTM software

- Communications interface software (CDI, CMS, or CPCOMM)

- Network hardware (CPA, HLC, DCP, ICA)

- Physical LANs

- Network interface hardware on the server

- Network control software on the server

- Server software to control ACS hardware

The communications interface software can support multiple paths to the server, depending on the hardware and network available. For example, CDI can control multiple CPAs, and CMS can control multiple HLCs or DCPs. CSCTM can direct the communication software to use a specific CPA or HLC or DCP to send requests to the server. CSCTM periodically tries to exchange messages with the server through each known path. CSC software actively controls which path is used and it monitors the status of server communication through each path.

Each communication interface has a unique IP address. The Solaris-based server software typically assumes that each IP address is a separate client system. When a single client can use multiple IP addresses, the server may need to use a different recovery from a failing path. The csc_ip_switch.dat file on the server allows this. It is documented in the *ACSLS System Administrator's Guide*.

MULTI-CLIENT OPERATIONS

When several clients attach to the same server, you must carefully manage the status of all cartridge drives. Different clients can't dynamically share the same cartridge drives.

Tape Transport Access

A given transport is available to only one client at a time, and must be unavailable to all other clients.

The commands you use to accomplish partitioning of transports are specific to the client operating system. For example, OS 2200 uses the UP or DN commands.

When you boot each client, apportion the ACS transports among the various clients as follows:

- Use the DN command to bring down the transport(s) and render them unavailable to this client. The transport(s) are now free for use by any client.

- Use the UP command to bring up the transport(s) and make them available to this client only.

- Always keep the 4780 control units in an UP state unless you want to take them off line electronically.

MULTI-ACS OPERATIONS

Optimizing Cartridge Drive Selection

Your ACS can have one or more interconnected LSMs. An ACS can mount any cartridge tape on any cartridge drive on any LSM *within the same ACS*.

When an ACS has multiple LSMs, the cartridge drives in one LSM may be available for allocation, but a specified cartridge tape may reside in another LSM. Ideally, a drive would be available in the LSM that contains the specified cartridge tape. If not, CSC influences OS 2200 drive allocation to minimize time spent passing the cartridge tape from LSM to LSM. CSC tries to allocate a cartridge drive closest to the LSM that contains the selected cartridge tape.

An ACS can't mount a cartridge tape if that tape resides in a separate ACS. When you allocate a tape with a specific volser, the server determines the ACS location. The software then selects a drive within that ACS and mounts the specified cartridge tape. However, if communications fail between the client and the server, the server cannot inform the client of the ACS containing the requested cartridge tape. The tape unit will be allocated within the ACS indicated by run or system defaults. The volume mount will then fail if this is not the correct ACS.

Scratch cartridge tapes can reside in any ACS. When you request a scratch mount in a multi-ACS configuration, you must choose the ACS for the mount. You can accept the default ACS, change the default, or code an ACS-name into the tape allocation ECL for your job.

It's especially important to avoid misallocating a cartridge tape between two ACSs when the ACSs are in different geographic locations. Obviously, EJECTing a cartridge tape from one ACS and ENTERing it into the other is impractical.

If you DOWN an ACS from the server, the ACS resources are available to OS 2200. However, the ACS resources are *not* available for automated ACS allocations. The impact of bringing down all ACS resources can be considerable. You should plan any such action thoroughly before execution.

Specifying an ACS

ACS operating system functions define mnemonics for selecting a particular ACS. These mnemonics may be used in the equipment type field of @ASG and @CAT statements. The mnemonics "ACS00" through "ACS99" always exist after a system boot. These correspond to the server-defined ACS numbers 0-99, respectively. The names and ACS number associations can be updated with the ACSMAP processor that is described in the section titled "Modifying ACS Parameters" (p. 4-28) later in this chapter.

NOTE

You can't assign 36-track cartridge tapes with an explicit ACS-name on system base release levels prior to SB6.

Default ACS

CSC implements two ACS defaults:

- A system default
- A run default specified by a user

System Default ACS

OS 2200 contains the system default ACS. This is set to ACS00 after a system boot.

Run Default ACS

This default determines the mount location for a tape when an ACS unit is required and neither the user nor the server has selected a particular ACS. For example, a user requests a scratch tape with equipment type U47L.

When a run starts, its default is the system default ACS value. Users can change this default within a run by using the ACSNAM processor. Users can change the run default ACS as many times as needed in the run. The run default remains in effect until a different run default is applied *within the same run*, or until the run terminates.

Tape Unit Location

NOTE

For system base release levels prior to SB6, you must use the proper designator (U47M or U47LM) to allocate the desired cartridge drive for 36-track cartridge tapes.

When a client requests a specific cartridge tape mount, the server determines the cartridge tape's ACS and LSM locations, or reports that the tape doesn't reside in any ACS. CSC allocates a cartridge drive to be consistent with both the location that the server reports, and with the physical location of the cartridge tape.

When user programs request a cartridge tape mount in a multi-ACS environment, the mount can be directed to several locations, including the following:

- To a user-specified drive outside the ACS
- To a user-specified ACS
- To a default ACS

- To an ACS chosen by the server

When users code specific identifiers that may conflict with other conditions, CSC will honor the specific, user-supplied parameter. The guiding philosophy is that the user has made a specific request for a valid reason.

CSC evaluates the following factors in selecting an ACS:

- User @ASG ACS specification (or lack of specification)
- Server location of the first cartridge tape of a non-scratch assignment
- Default ACS

CSC evaluates which ACS to allocate according to the following conditions, in sequence:

1. **If a user job specifies an *ACS-name* in the @ASG ECL, CSC will allocate a cartridge drive in that ACS.**

   This is true even in a specific request where the server finds the cartridge tape in a different ACS. If the ECL statement doesn't contain an *ACS-name*, CSC tests the validity of the next condition.

2. **If a user job specifies a volser in the @ASG ECL (or in the MFD for @ASG,A), the server will select the ACS.**

   If the user ECL contains a specific *volser*, or if an @ASG,A statement defines a specific *volser* and that cartridge tape resides in an ACS, the server returns a list of preferred cartridge drives to CSC. This list of preferred cartridge drives corresponds to the ACS where the cartridge tape resides. CSC then allocates a drive in the specified ACS.

   If the user ECL contains a specific *volser* and that cartridge tape is not in an ACS, CSC allocates a non-ACS transport.

   If the user ECL does not contain a specific volser, CSC evaluates the next condition.

3. **There is no preference. Use the run default ACS.**

   CSC directs the allocation to use the run default ACS. If a run default ACS has not been changed, then it is still the same as the system default ACS.

ACS00 is the system default ACS. Users can specify a run default ACS that overrides the system default for the duration of the run only. Cartridge tape allocations in a multi-ACS environment are compatible with OS 2200 tape processing.

In most cases, the combination of the ACS location provided by the server and the default ACS is sufficient to allocate transports. This minimizes the need for users to modify existing ECL.

MULTIPLE CSC CONSIDERATIONS

CSC is an interface component between OS 2200 and a StorageTek library
server. CSC communicates with OS 2200 using either an Executive Request
interface or the CARTTAPELIB$ extended mode call interface. At any given
time, OS 2200 can support one CSC via the ER interface and up to four CSCs via
the CARTTAPELIB$ interface. Using multiple CSCs introduces the following
configuration, operation, and administrative concerns:

- Each concurrent CSC is a separately licensed product with its own unique
  installation.

- Only one CSC can be installed in mode A. All others must be mode B

- All CSCs can share a single instance of CDI. That instance of CDI exists in
  only of the CSC installations.

- Each CSC using CMS or CPCOMM must have a unique TSAM process.

- Only one CSC can use the STK$ interface.

- Each CSC that uses the CARTTAPELIB$ interface is identified by a user
  defined CTL identifier. These CTL ids must be unique.

- Each CSC must have a unique console keyin.

- When OS 2200 queries the server to determine which unit to allocate, it polls
  the CARTTAPELIB$ connected CSCs first and the ER connected CSC last.
  The CARTTAPELIB$ CSCs are polled in the order that they appear in the
  output of the CTL FS console keyin. This order is established by the order in
  which the CSCs are started.

- Although each library server is autonomous, care must be taken to ensure
  that volume identifiers are unique across all libraries. Failure to do so can
  produce unpredictable results for the duplicated volumes.

CHANGING SCRATCH STATUS

The ACSSCR utility is a standalone processor which sets or clears the scratch status of one or more cartridge tapes. ACSSCR sets up CSCUI scratch packets based on user input, and calls the CSCUI interface to set the scratch status.

ACSSCR (ACS Scratch)

ACSSCR accepts commands from the user to specify what action to take. The commands are:

CLEAR   clears the scratch status.

SET   sets the scratch status.

HELP   displays the input formats.

END   terminates multi-scratch mode.

EXIT   terminates the program.

VOL   accepts volume names in multi-scratch mode.

The following input formats are allowed to change the scratch status of specific volumes:

- `SET/CLEAR volume`

  Changes the scratch status of the tape and assigns it to the pool with which the tape was previously associated.

- `SET/CLEAR volume,label-type`

  Scratches the tape and assigns it to the default LABELED or UNLABELED pool based on the `LABELED` or `UNLABELED` keyword in `label-type`.

- `SET/CLEAR volume POOL=ACS-pool`

  Scratches the tape and assigns it to the pool specified in `ACS-pool`, which can range from 0 to 65533.

- `SET/CLEAR volume CTLPOOL=CTL-poolname,label-type`

  Changes the scratch status of the tape to the LABELED or UNLABELED CTL-pool, defined by `CTL-poolname` (which can be up to 12 characters), and the `LABELED` or `UNLABELED` keyword in `label-type`..

If you need to change the scratch status of multiple volumes, enter multi-scratch mode by substituting the volume name with the word *MULTI on a SET/CLEAR command; i.e., SET *MULTI,LABELED. On the next line(s), enter the word VOL followed by the volume names. Up to 10 volumes may be entered on one line with a maximum of 42 volumes total per each SET/CLEAR command. A multi-volume scratch request must always be terminated with an END command.

To execute the program, enter the following:

```
@ACCSCR
```

ACSSCR then displays two header lines and prompts the user for input.

```
ACSSCR 1R1 (1-1-5)
Enter SET/CLEAR commands, HELP, or EXIT
```

The following is an example of ACSSCR multi-scratch mode.

```
@ACCSCR
SET *MULTI POOL=5
VOL W0003,W0004,WOOO10,W0005
VOL W00020,W00099
END
CLEAR *MULTI,UNLABELED
VOL W00101,W0103,W00200,W00305
END
@EOF
```

Input lines cannot be greater than 80 characters. Input lines are echoed in the print and are validated by ACSSCR to verify correct formats and valid fields. If an error is detected, the following error message is displayed and the line is ignored:

```
*ERROR: error text - input ignored
```

If no error has occurred, ACSSCR sets up the CSCUI request packet and issues the request. Upon return from CSCUI, a message is displayed indicating the status of the request.

If a non-zero status is returned from CSCUI, the following message is displayed:

```
Scratch[Unscratch] request for volume volume failed with
status nn.
```

If a zero status is returned, but a non-zero request completion status is returned from CSCUI, the following message is displayed:

```
Scratch[Unscratch] request for volume volume failed with
req-comp status nn.
```

See the *CSCUI Programmer's Reference Manual* for status codes.

If the request completed with a request completion status of zero, then an appropriate message is displayed stating the pool into which the volume was assigned.

Error messages related to multi-scratch mode are:

"Not in multi-volume mode – END ignored"

An END command was entered when ACSSCR was not in multi-scratch mode. The command is ignored.

"Only 42 volumes total allowed – extra input on line ignored"

The number of volumes entered for a single SET/CLEAR command exceeded 42 volumes.

"*ERROR: SET (or CLEAR) *MULTI must precede VOL cmd – input ignored"

VOL statements were entered without first setting multi-scratch mode via the SET/CLEAR *MULTI statement.

MODIFYING ACS PARAMETERS

Two processors, ACSMAP and ACSNAM, are included on the CSC product tape to help you manage your ACS environment. Once the CSC installation is complete, both processors can be found in the filename for the CSC product file as specified in the CSCFLE parameter. The default filename is SYSLIB*CSC.

ACSMAP (ACS Map)

ACSMAP is an interactive processor intended for system administrator use. It must be run under a userid that has the SSCARTLIB privilege, or under the security officer's userid.

ACSMAP allows you to configure:

- ACS-names
- the system default ACS
- ACS parameters

> **NOTE**
>
> *The ACS parameter settings mentioned here are maintained in Exec memory. They are reset to default values when the system is booted.*

Configuring ACS-Names

To configure ACS-names, execute ACSMAP in one of the following ways:

`@ACSMAP,L file-spec.`

or;

`@ACSMAP,L file.element-spec`

where `file-spec.` or `file.element-spec` is an ASCII SDF element of a data file containing ACS-name to ACS-ID mappings.

Each record of your SDF element must conform to a fixed format. Positions 1-6 are reserved for the ACS-name, and positions 7-10 are reserved for the ACS-ID. ACS-ID is the numeric value of the ACS as defined on the server. ACS-ID entries may be in one of the following formats:

- Hexadecimal, signified by a leading "0X"
- Octal, signified by a leading "0"
- Decimal, signified by the absence of "0X" or "0"

Valid ACS-ID values can range from 0 to 126 in decimal; 0 to 0176 in octal; or 0 to 0X7E in hexadecimal.

ACSMAP can also be executed in the following manner, allowing you to manually enter ACS-names and ACS-IDs in lieu of using an SDF element or data file.

```
@ACSMAP,L
ACS01 000
ACS02 001
REMOTE002
@EOF
```

The preceding example maps logical names ACS01, ACS02, and REMOTE to the addresses 000, 001, and 002, respectively. The ACS-IDs need not be in any order, but they must match the ACS-IDs configured on the server.

Configuring the System Default ACS

To configure the system default ACS, execute ACSMAP in the following way:

```
@ACSMAP,D acs-name
```

The following example sets the system default ACS to LOCAL2:

```
@ACSMAP,D LOCAL2
```

NOTE

Executing the ACSMAP processor while other runs are active has no effect on the active runs. To completely redirect all allocations which could be subject to a default, terminate and restart the batch tape jobs. DEMAND runs should change their run default ACS with the ACSNAM processor, then reissue the @ASG statement.

Configuring ACS Parameters

To list all ACS parameters and the option each parameter is set to, execute ACSMAP in the following way:

```
@ACSMAP,S
```

To configure ACS parameters, execute ACSMAP in the following way:

```
@ACSMAP,S parameter/option,parameter/option,...
```

Parameter values are described in Table 4-3. *Option* is either TRUE or FALSE (T or F).

Table 4-3. @ACSMAP Parameters and Options

Parameter	Description
BYPASSLSM	Determines if an LSM preference exists for mounting a tape. Options are: TRUE Use only for configuration of one ACS containing a single LSM. FALSE Request the ACS location of each requested cartridge tape before selecting a cartridge drive (default).
LOADMSG	Controls the display of standard tape load messages on the system console for tapes mounted in the ACS. Options are: TRUE Display the load messages. FALSE Do not display the load messages (default).
NONACS	Defines whether standalone cartridge drives are configured in OS 2200. Options are: TRUE Standalone cartridge drives are configured in OS 2200 (default). FALSE Standalone cartridge drives are not configured in OS 2200.
QUERYSCRATCH	Determines if OS 2200 will query for the mount location of blank volumes that would otherwise use a unit in the run default ACS. TRUE OS 2200 will query for the mount location of blank volumes. FALSE OS 2200 will not query for the mount location of blank volumes (default).
SCRPREF	Defines whether a scratch cartridge tape mount is honored inside or outside the ACS. Options are: TRUE Mount scratch cartridge tapes inside the ACS. FALSE Mount scratch cartridge tapes outside the ACS (default).
SERVMSG	Controls the display of standard tape service messages on the system console for cartridge tapes mounted in the ACS. Options are: TRUE Display service messages (default). FALSE Suppress service messages.

The *parameter/option* constructs can be continued or wrapped to the next line by ending the line with a semi-colon (;). For example:

```
@ACSMAP,S BYPASSLSM/F,LOADMSG/TRUE,NONACS/FALSE,;
      SCRPREF/T,SERVMSG/FALSE
```

An alternative is to execute ACSMAP multiple times. For example:

```
@ACSMAP,S BYPASSLSM/F
@ACSMAP,S LOADMSG/TRUE
@ACSMAP,S NONACS/FALSE
@ACSMAP,S SCRPREF/T
@ACSMAP,S SERVMSG/FALSE
```

ACSNAM (ACS Name)

ACSNAM is a processor intended for end user as well as system administrator use. ACSNAM allows you to list your current ACS configuration and configure the run default ACS.

To list the entire ACS-name table, including the associated ACS-IDs, the current system default ACS-name, and the run default ACS-name, use the P option and execute ACSNAM in the following manner:

```
@ACSNAM,P
```

To change the current run default ACS-name, use the R option and execute ACSNAM in the following manner:

```
@ACSNAM,R acs-name
```

The following example illustrates how you might use ACSNAM to assign TAPE1 to a unit in the ACS called LOCAL1. TAPE2 is assigned in REMOTE.

```
@RUN TAPJOB,,,,,
.
.
.
@ACSNAM,R LOCAL1
@ASG,TF TAPE1.,LCART
.
.
.
@ACSNAM,R REMOTE
.
.
.
@ASG,TF TAPE2.,U47L
.
.
.
```

DEMAND TERMINAL SECURITY

Demand terminal security is a feature that can be controlled by your security officer. The execution of CSC and CDI commands from a demand terminal in console mode (@@CONS), will be regulated by global security privileges. These privileges are established during the product installation process, and can be configured any time after the installation. Authorized security levels include:

1 = Basic	4 = Display
2 = Limited	5 = Response
3 = Full	6 = System Console

Table 4-4 indicates the default values established for each CSC and CDI command during the product installation process.

Table 4-4. Demand Terminal Security Default Values

If your security level is...	You can execute the following commands for...	
	CSC	**CDI**
1 or higher	HELP, LEVEL, MEMORY, QUEUES, STATUS	BUFFER, FLAGS, FS, HELP, ID, STATUS
3 or higher	*N/A*	PING
5 or higher	ABORT, ACTIVATE, BRKPT, CLEAR, CYCLE, DEBUG, DISMOUNT, DOWN, EABT, EJECT, ENTER, MOUNT, QUERY, TERM, UP, VENTER	BRKPT, CLR, DN, DUMP, SET, TCP, TERM, UP

Changing Security Levels

Demand terminal security levels can be overridden by editing the CSC$PARAM and CDI$PARAM elements found in the CSC parameter file. This file is specified in the CSCPARM parameter during the product build process. The default filename is SYSLIB*CSC-PARM. To configure these elements, you can use the @ED processor or any other editor that creates ASCII elements. For example, to change the security level for the *CSC QUEUES and *CSC STATUS commands from level 1 to level 2, you must first obtain read and write access to the ACS product file.

The next step is to call the editor and update the CSC$PARAM element. For instance, you might enter the following statement:

```
@ED,U  SYS$LIB$*CSC-PARM.CSC$PARAM
```

Display the entire element, and insert the following parameter at any line within the element:

```
I SEC_LEVEL_2=QUEUES,STATUS
```

This new parameter will override the previously established default security levels for *CSC QUEUES and *CSC STATUS. You can insert as many parameter lines as you want. When you're finished, exit the editor and save your updates. If CSC was active when the changes were made, you will have to terminate and restart CSC before the new security levels take effect.

To change the security level for a *CDI command, you would repeat the above process, but substitute CDI$PARAM for CSC$PARAM. For example, to change the security level for the *CDI HELP and *CDI STATUS commands from level 1 to level 2, call the editor and update the CDI$PARM element. For instance, you might enter the following statement:

```
@ED,U  SYS$LIB$*CSC-PARM.CDI$PARAM
```

Display the entire element, and insert the following parameter at any line within the element:

```
I SEC_LEVEL_2 HELP,STATUS
```

This new parameter will override the previously established default security levels for *CDI HELP and *CDI STATUS. You can insert as many parameter lines as you want. When you're finished, exit the editor and save your updates. If CDI was active when the changes were made, you will have to terminate and restart CDI before the new security levels take effect.

Rules to Consider When Changing Security Levels

When editing the CSC$PARAM and CDI$PARAM elements to override default security levels, consider the following rules:

- When a default security level is overridden, the change is applied globally to all demand terminal users. There is no option to change a security level for an individual user.

- When editing CDI$PARAM, use a space to separate the parameter from the commands. When editing CSC$PARAM, use an equal sign (=) to separate the parameter from the commands.

- Spaces are not allowed before or after commas.

- If CSC and CDI are active at the time you edit the CSC$PARAM and/or CDI$PARAM elements, it will be necessary to terminate and restart CSC and CDI before the changes take effect.

- If a CSC or CDI command entered on a demand terminal is misspelled or the syntax is incorrect, you will not receive an error or warning.

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EFFECTIVE PAGES

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