

Virtual Machine/  
Enterprise Systems Architecture



# System Operation

*Version 2 Release 4.0*



Virtual Machine/  
Enterprise Systems Architecture



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*Version 2 Release 4.0*

**Note:**

Before using this information and the product it supports, read the information under "Notices" on page vii.

| **Third Edition (July 1999)**

| This edition applies to Virtual Machine/Enterprise Systems Architecture (VM/ESA)<sup>®</sup>, Version 2 Release 4.0, program number 5654-030, and to all subsequent releases of this product until otherwise indicated in new editions.

| This edition replaces SC24-5758-01.

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## Preface

This book describes how to bring up and run the Virtual Machine/Enterprise Systems Architecture (VM/ESA) operating system, Program Number 5654-030, on a processor in Enterprise Systems Architecture/370 (ESA/370) or Enterprise Systems Architecture/390 (ESA/390) mode.

It is intended to help you operate VM/ESA. It primarily contains system operations information.

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## Who Should Read This Book

This book is intended for anyone who operates a VM/ESA system on a processor in ESA/370 or ESA/390 mode.

---

## What You Should Know before Reading This Book

This book assumes that you understand the hardware controls and features of your installation.

It also assumes that you have a general knowledge of basic virtual machine concepts. If you are unfamiliar with VM operating systems, read the *VM/ESA: General Information* book.

Finally, you must have a basic knowledge of the production operating system you will be running in a virtual machine.

---

## What This Book Contains

This book includes the following tasks as part of operating a VM/ESA system:

- Bringing up the VM/ESA system, including the production system and service virtual machines
- Running the VM/ESA system
- Controlling local devices
- Responding to VM/ESA errors
- Shutting down the VM/ESA system, including the production system and service virtual machines
- Collecting information about the system
- Performing data management services
- Running utility programs.

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## Where to Find More Information

See the Bibliography at the back of this publication.

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## How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this book or any other VM/ESA documentation:

- Visit our home page at:  
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There you will find the feedback page where you can enter and submit your comments.
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- Fill out the form at the back of this book and return it by mail, by fax, or by giving it to an IBM representative.

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## Summary of Changes

This section describes how to obtain previous editions of this publication. It also describes the changes made to this book over several previous editions. For your convenience, the changes that were made since the last edition was produced are identified within the text by a vertical bar (|).

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### How to Obtain Previous Editions of This Book

This book contains information formerly found in the *VM/ESA Version 2 Release 1.0 : System Operation*. Previous editions of this book and other books in the VM/ESA library can be ordered using the order numbers listed in the *VM/ESA: General Information* manual.

---

### Summary of Changes for VM/ESA Version 2 Release 4.0

Information on new function is:

**Miscellaneous service updates were added since the previous release.**

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### Summary of Changes for VM/ESA Version 2 Release 3.0

Information on new function is:

#### **CPU Sparing**

CPU Sparing is a feature of the IBM S/390 Parallel Enterprise Server, Generation 4. "Spare" processors are built in. If an active processor fails, a spare processor can be varied online to replace the failing processor.

---

### Summary of Changes for VM/ESA Version 2 Release 1.0

Information on new function is:

#### **CP Configurability II**

This release of VM/ESA further enhances the dynamic capabilities of VM/ESA by fully implementing the ES/9000 Dynamic I/O Configuration capability. This facility enables the user to dynamically define, delete and modify channel paths, control units, and devices to the ES/9000 hardware.

Additionally, CP Configurability II enables users to:

- Delete real device control blocks (RDEVs).
- Select the next active IOCDs file for the next power-on reset.
- Query subchannel measuring for a device or devices.
- Turn subchannel measuring on and off for a device or devices.
- Query the status of all the channel paths on a system.
- Determine if the ES/9000 is in configuration mode (also called "configmode").

- Turn configuration mode on or off.
- Display all of the starting addresses of the hardware system area (HSA) and their lengths.
- Query a real device to determine its status and the channel paths online to the device or devices.
- Turn VM's dynamic I/O support on or off.
- Query VM's dynamic I/O support.
- Vary a channel path online or offline.
- Vary subchannels online or offline.
- Display information about the physical, logical, and VM characteristics of all channel paths to a device.
- Limit the number of guest I/O's to a device.
- Remove the requirement of having to specify RDEVs in HCPRIO for V=R recovery.
- Determine whether to prompt the operator for startup information after a software restart.
- Change, after IPL, all of the bit maps set during initialization and permit or deny changes, after IPL, to the following bit maps: accepted, dynamic I/O, sensed, and throttled.
- Determine how CP should handle new real devices as they are added to a running system.

The CP Configurability II enhancements provide VM customers the option to no longer have to shutdown to put a new IOCDS containing device changes. Customers are provided improved information and more control of real I/O devices using a wide variety of new commands and facilities.

For more information, refer to the following books:

*IBM VM/ESA: CP Exit Customization*  
*VM/ESA: Planning and Administration*

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## Summary of Changes for VM/ESA Version 1 Release 2.2

Information on new function is:

- **CLEAN Start:** A CLEAN start IPLs the system without attempting to recover spool files and system data files that existed prior to system shutdown. CLEAN start restores the least amount of the system's environment.
- **SNAPDUMP Storage Dumping Enhancement:** A new CP SNAPDUMP command and a new type of CP dump have been introduced to aid in the diagnosing of software problems without terminating the system.
- **IBM 3990 Model 6 Storage Control:** This new model of the 3990 Storage Control is cached and supports all the functions of former models of the 3990 with several enhancements in the area of connectivity and performance. In addition, the model 6 supports the new Control Unit Initiated Reconfiguration (CUIR) feature.

- **Asynchronous Data Mover Facility (ADMF):** VM/ESA's support of the ADMF hardware feature provides an extension to the existing channel subsystem which is capable of off-loading page move activity onto the I/O processor.
- **SPXTAPE Commands:** SPXTAPE is used for dumping standard spool files and system data files from the spooling system onto tape and for loading SPXTAPE-format files from tape into the spooling system. SPXTAPE offers improvements in performance, tape volume usage, error handling, flexibility, and usability compared to SPTAPE. SPTAPE is still supported so tapes previously created with SPTAPE can be used. However, SPXTAPE and SPTAPE are not compatible.

The following CP commands have been added:

- SPXTAPE CANCEL
- SPXTAPE DUMP
- SPXTAPE END
- SPXTAPE LOAD
- SPXTAPE SCAN



---

## Chapter 1. Introduction

This chapter introduces you to operating Virtual Machine/Enterprise Systems Architecture\* (VM/ESA\*). After reading this chapter, you can:

- Understand the purpose of VM/ESA and the role of system operation
- Describe the kinds of virtual machines you can run
- Describe the consoles you can use and what you will use them for
- Locate information about using a display under VM/ESA, using the hardware console for your processor complex, and using the commands for the production system you run
- Understand the major tasks involved in real system operation.

---

### Purpose of VM/ESA

VM/ESA is an operating system that enables your installation to use a minimum of one Enterprise Systems Architecture/370\* (ESA/370\*) or Enterprise Systems Architecture/390\* (ESA/390\*) processor to run several operating systems at the same time: a production system and one or more test systems. Your installation can also run several service virtual machines and provide for many CMS users.

---

### VM/ESA Components

VM/ESA consists of the following components:

- Control Program (CP)
- Conversational Monitor System (CMS)
- Group Control System (GCS)
- Advanced Program-to-Program Communications/VM (APPC/VM) VTAM\* Support (AVS)
- Transparent Services Access Facility (TSAF)
- Procedures Language VM/REXX
- VM Service Enhancements Staged/Extended (VMSES/E)
- Dump Viewing Facility.

An explanation of the VM/ESA components is provided in the *VM/ESA: General Information* book.

---

### Role of System Operation

As the system operator, your job is to make the real resources of your computer installation available to users so they can get their work done. The hardware at your installation holds most of its computing power, but users cannot easily use the hardware without an operating system and other software. As the real system operator, therefore, you must control the hardware and software that makes the computing power available to users.

---

# VM/ESA Operations Environment

Unless otherwise specified, this book assumes you operate VM/ESA as follows:

- You operate VM/ESA on either an ESA/390 processor with VM Data Spaces provided through the use of Start Interpretive Execution (SIE) extensions or on an ESA/370 processor.

This is also called running a native VM/ESA system, because you are running it on real hardware rather than in a virtual machine.

- You also operate a production system (VM/ESA or another operating system such as MVS/ESA\*) in a virtual machine.
- Production systems run either in the V=R (virtual=real) area, as either a V=R (virtual=real) or V=F (virtual=fixed) preferred virtual machine, or in a V=V (virtual=virtual) area, as a V=V virtual machine.

For recovery purposes, you must know whether the production system is running in a V=R, V=F, or V=V machine. CP performs a recovery function for V=R machines only. It may also be possible to recover V=F machines. See “Recovering the V=F Preferred Virtual Machine” on page 218.

- The production system may be any one of the following operating systems:
  - MVS/SP\*
  - MVS/XA\*
  - MVS/ESA
  - VM/SP
  - VM/SP HPO
  - VM/XA\*
  - VM/ESA
  - VSE
- VM/ESA also has several test and several service virtual machines running as V=V virtual machines.

This book assumes that, as a system operator, you are not responsible for running test systems in virtual machines.

However, you may run one or more of the following service virtual machines:

- Accounting virtual machine
  - Error recording (EREP) virtual machine
  - Symptom record recording virtual machine
  - RSCS virtual machine
  - VM/Pass-Through virtual machine.
- As the operator, you use CP most of the time. However, some tasks may require you to work in the CMS environment.
  - You are *not* running a programmable operator.
  - You are *not* using RACF\*.
  - Production systems use VM/ESA's reserve/release support to share some of their DASD volumes with other systems, which run either in other virtual machines or on other processor complexes. For example, if you are running an MVS/SP production system, it may share some of its DASD volumes with MVS/XA test virtual machines on the same processor complex, or with an MVS/SP system running native on another processor complex, or both.

This affects the way you control DASDs.

---

## Virtual Machines You Run

As the VM/ESA operator, you run several kinds of virtual machines. Although there are probably as many ways to divide operator responsibilities as there are installations, this book assumes that you run the following kinds of virtual machines:

- VM/ESA operator's virtual machine
- Production system in a virtual machine
- Service virtual machines.

## Running the VM/ESA Operator's Virtual Machine

When you bring up the VM/ESA system, CP automatically logs on the primary system operator at the VM/ESA primary system console. The primary system console is a display. Your installation defines its device number on the RDEVICE statement in the system configuration file or on the RDEVICE macro in HCPSYS.

Your installation defines the primary system operator's logon ID on the SYSTEM\_USERIDS statement in the system configuration file or on the SYSOPR macro in HCPSYS. Your installation may also have defined other logon IDs for you to use when you perform special operations tasks. For example, an installation often has a spooling operator who controls the installation's printers. If you are the spooling operator, you often use another logon ID at another console.

However, the primary system operator has special privileges. If you are responsible for controlling VM/ESA, you usually use the logon ID of the primary system operator.

In addition to having special CP command privileges, the primary system operator's virtual machine has default settings that differ from those of other users. For example, the primary system operator's default setting for the TERMINAL MODE command is CP rather than VM. And the initial setting of the SET RUN command is ON rather than OFF.

Otherwise, the primary system operator's virtual machine is the same as any other virtual machine.

## Running a Production System in a Virtual Machine

To run a production system in a virtual machine, you must:

1. Log on to VM/ESA using the production system's logon ID.

This creates the production system's virtual machine and gives it virtual storage, processors, and I/O devices to use as defined in the system directory.

In many cases, the production system virtual machine is autologged and has a secondary operator definition (usually OPERATOR). This can free a display for other use and can help avoid accidental CP READ situations or logging off the production system.

2. Use CP commands to set up any special running environment the production system's virtual machine requires.
3. Load (IPL) the production operating system in the virtual machine.

Once the production system comes up, running in a virtual machine is the same as running on a real processor, with few exceptions. In response to your commands, the production system performs the same functions in a virtual machine as it does on a real machine. It manages virtual machine storage, processors, and I/O devices the same way it manages real storage, processors, and I/O devices.

The difference between running a production system on a real processor and running it in a virtual machine is not the way you communicate with it. The difference is in the way you control the resources available to the operating system. A virtual machine has resources provided by CP. To stop, start, add, detach, or change virtual machine resources, you must communicate with CP.

## Running Service Virtual Machines

If accounting, error recording (EREP), or symptom record recording is active on VM/ESA, you need to log on to the accounting, error recording, or symptom record recording virtual machines. From these virtual machines, you enter CP and CMS commands to create accounting, EREP, and symptom record reports.

If your installation has installed any of the following licensed programs, you must operate the service virtual machines they require:

- Remote Spooling Communications Subsystem (RSCS)
- VM/Pass-Through
- VTAM Communications Network Applications (VCNA)
- VM/Virtual Telecommunications Access Method (VM/VTAM).

For information about when and how to stop these service virtual machines, see the appropriate publications listed here and in the bibliography:

- *RSCS General Information*
- *VM/Pass-Through Facility General Information*
- *VTAM Communication Network Application (VCNA) General Information.*

Finally, each time you bring up VM/ESA, CP automatically logs on a virtual machine called AUTOLOG1. The AUTOLOG1 userid is the default. You can change the AUTOLOG1 userid by using the STARTUP operand on the SYSTEM\_USERIDS statement in the system configuration file. Your installation may use this service virtual machine to perform some system initialization tasks automatically. For example, AUTOLOG1 or the userid you specified on the SYSTEM\_USERIDS statement in the system configuration file, can start up other virtual machines or dedicate devices to them.

---

## Consoles You Use

As the VM/ESA operator, you use several consoles to load VM/ESA and control several virtual machines. There are many ways to set up the consoles; this book assumes that you have access to at least four consoles:

- Processor complex's system console
- VM/ESA primary system console
- Console for the production system's virtual machine
- Production system's system console.

In addition, you may have access to other consoles that you may use for logging on service virtual machines.

To eliminate a console, your installation may configure the consoles so that the console for the production system's virtual machine and the production system's system console are the same physical display. You then operate the production system in full-screen mode. See the *VM/ESA: Virtual Machine Operation* book for an explanation of how to enter commands in this environment.

## Using the Processor Complex's System Console

The first console you use is the processor complex's system console. On this hardware console you IPL VM/ESA. If your processor complex provides such a facility, you may also use this console to keep track of the processor complex's activity.

For specific information on using the system console, see your processor operator's guide.

### Additional System Console Support

There are some other uses for the system console. You can use the processor complex's system console as the primary system console to initialize CP when no locally attached 3270 consoles are available. You can use the system console as an emergency message console. You can use the processor complex's system console as a logon terminal during abnormal situations when no other consoles are available.

The processor complex's system console is attached to the processor controller and does not have a hexadecimal device address associated with it. Therefore, if you are using the processor complex's system console, CP supports it as an EBCDIC line mode device with a device address of SYSC.

### Setting Up and Using the System Console

System console support is only available on processors that have the SCLP Operations Management Facility installed.

If the processor has the SCLP Operations Management Facility installed, CP will always enable the system console for use as a logon terminal. Initiate a user ID logon to the system console with the LOGON command.

Initiate system console support for CP initialization by:

- Using the CONS=SYSC SAPL IPL parameter
- Adding SYSTEM\_CONSOLE to the OPERATOR\_CONSOLES system configuration statement.

Initiate system console support as an emergency message console by adding SYSTEM\_CONSOLE to the EMERGENCY\_MESSAGE\_CONSOLES system configuration statement.

Once you have the system up and running, you will notice the following:

- LOGNSYSC is the reserved user ID for the system console during system initialization and userid logon
- There is no status area on the system console
- New messages will indicate the virtual console status
- Various QUERY command output will reflect a SYSC device address for the system console.

## Introduction

If an application uses a DIAGNOSE X'24' or DIAGNOSE X'210' to obtain the real device information for the system console, CP returns that the real device is an undefined line mode terminal. For example,

```
Class - terminal, type - undefined
```

Additionally, when using the system console second level, you will need to use the commands Q VMMSG, VDELETE, and VINPUT. See the *VM/ESA: CP Command and Utility Reference* for more information on these commands.

### Performance Considerations

Since CP supports the system console as an EBCDIC line mode device, your performance while logged on to the system console may be slowed. It is best to do what you need to do from the system console and then disconnect as soon as possible. You should minimize your use of the system console to when no other logon terminal is available and when either:

1. initializing CP
2. during abnormal situations when no other consoles are available.

The volume of messages received during normal operations might flood the system console and have an impact on performance, so it is best not to solely use the system console to operate the system. Continue to use your typical operator's console for message during normal operations.

## Using the VM/ESA Primary System Console

Another console you use is the VM/ESA primary system console. At this console the VM/ESA Control Program (CP) automatically logs on the primary system operator.

This is also the console from which you perform most of the other tasks this book talks about. For example, you enter CP commands from this console to perform such tasks as:

- Bringing up the VM/ESA CP
- Shutting down the VM/ESA CP
- Controlling VM/ESA devices
- Communicating with VM/ESA users
- Responding to VM/ESA errors
- Collecting information about VM/ESA operation.

After CP logs you on as the primary system operator, CP controls the format of the primary system console's screen. If you are unfamiliar with this format, see the *VM/ESA: Virtual Machine Operation* book.

## Using a Console for a Production System's Virtual Machine

Another console you use is one from which you can create and initialize a production system's virtual machine. You use this console only when:

- You log on the production system's virtual machine
- You set up any special running environment it requires
- You use the CP IPL command to load the production system in its virtual machine
- You need to recover the production system.

You only use this console to control the production system's virtual machine. To control the production system itself, use the production system's system console.

When you log on the production system's virtual machine at this console, CP controls the format of the console's screen. If you are unfamiliar with this format, see the *VM/ESA: Virtual Machine Operation* book.

**Note:** For MVS guests, when the system console is responding to VM errors or IPLing the system, the virtual machine console can be used as an IPL and error-recording console. For more information see the *VM/ESA: Virtual Machine Operation* book and the *VM/ESA: Running Guest Operating Systems* book.

## Using a Production System's System Console

The last console you use is a production system's system console. From this console you control the production system, just as if you were running the production system directly on the hardware. At this console you receive and respond to production system messages as you normally do. You also enter production system commands as usual.

This book assumes you know how to operate your production system using production system commands. However, if you need information on using MVS/SP, MVS/XA, MVS/ESA, VM/SP, VM/SP HPO, VM/XA, or VSE commands, refer to the appropriate library.

---

## Operating VM/ESA

To operate VM/ESA, you must be able to:

- Bring up the VM/ESA system

To bring up the VM/ESA system, you must be able to:

- Bring up the VM/ESA Control Program (CP) on an ESA/370 or ESA/390 processor
- Start service virtual machines to provide system services
- Bring up the production system in a virtual machine
- Check the initialization of system resources
- Prepare the system for a possible failure
- Respond to errors during bring-up, if necessary.

- Run the VM/ESA system

To run the VM/ESA system, you must be able to:

- Check the status of the system
- Watch the system for changes and requests
- Control local devices and other hardware
- Control the system's service virtual machines
- Communicate with users.

- Respond to VM/ESA errors
- Shut down the VM/ESA system, including the production system and the service virtual machines

## Introduction

- Collect information about the system, including information about:
  - System events
  - Performance
  - Accounting
  - Hardware errors.
- Perform data management services
- Run utility programs.

The chapters that follow tell you how to use VM/ESA to perform these operation tasks.

---

## Chapter 2. The Stand-Alone Program Loader

This chapter tells you how to use the Stand-alone Program Loader to load CP or to load any stand-alone utility that can be generated in the form of a module.

After reading this chapter, you can:

- Create the Stand-alone Program Loader (write SAPL to disk)
- Run the Stand-alone Program Loader
- Pass IPL Parameters to CP.

---

### Running the Stand-Alone Program Loader

You can use the Stand-Alone Program Loader (SAPL) to load CP or to load any stand-alone utility that can be generated in the form of a module. Examples of such utilities are:

- Stand-alone Program Loader Creation Utility (SALIPL)
- DASD Dump Restore Utility (DDR)
- Device Support Facilities Program (DSF).

For more information on SALIPL, DDR, and DSF, see Chapter 10, “Running Utility Programs” on page 297.

### Creating the Stand-Alone Program Loader

Before SAPL can be used, it must be written to a DASD volume. The section “Running the Stand-Alone Loader Creation Utility (SALIPL)” on page 297 describes how this may be done.

When SAPL is written to a DASD, the following defaults are already set:

- Location of a minidisk on the volume (offset or extent)
- Name of a module to load
- Location in memory where the module is to be loaded into if it is relocatable
- Parameters to pass to the module
- Instructions to the operator.

Generally, the default module will be CP, but it may be a stand-alone utility. If the defaults are acceptable, you only need to IPL from the DASD to load the utility.

#### Overriding Stand-Alone Program Loader Defaults

If you need to change any of the defaults, you must supply the address of a console for SAPL to use. The console specified must accept 3270 CCWs and data streams and have at least 20 lines and 80 columns.

If you are running SAPL on a real processor, you specify the console address by entering the device number of the console into the first four characters of the LOADPARAM on your processor console. Note that SAPL will not run in 370 mode.

If you are running SAPL in a virtual machine, you specify the console address using the LOADPARAM option of the CP IPL command. For example:

```
IPL 18B LOADPARAM EA0
```

## The Stand-Alone Program Loader

In this example, 18B is the DASD volume to load from, and EA0 is the device number of the console to be used.

When the IPL completes, you see a menu screen similar to Figure 1. The defaults are filled in for some of the fields. You can alter all fields except the operator instructions.

```
STAND ALONE PROGRAM LOADER: VM/ESA VERSION n RELEASE n.n
DEVICE NUMBER:  018B      MINIDISK OFFSET:  35      EXTENT:  -
MODULE NAME:    CLOAD     LOAD ORIGIN:      1000

-----IPL PARAMETERS-----
cons=0ea0 fn=maine

-----COMMENTS-----
Secondary parm disks can be found on 18B at offset 185 and on 18A at offsets
35 and 185.

-----

9= FILELIST  10= LOAD  11= TOGGLE EXTENT/OFFSET
```

Figure 1. Stand-Alone Program Loader

The Stand-Alone Program Loader screen contains the following fields:

- DEVICE NUMBER** Specifies the device number of the DASD volume from which SAPL will read. Initially, this will be the same as the device you IPLed, but it can be changed to any volume containing CMS minidisks.
- MINIDISK OFFSET** Specifies the offset from the beginning of the DASD volume to the start of the CMS minidisk from which SAPL is to read. This number is cylinders for count key devices and blocks for fixed block architecture devices.
- EXTENT** Specifies the extent number from 1 to 9 (first to ninth). This field may be used only with volumes that have been formatted using the Device Support Facilities Program (DSF) and have an allocation map containing PARM extents. When a valid extent is entered, the offset corresponding to the extent is displayed in the MINIDISK OFFSET field.
- Note:** Only one of the fields, EXTENT or MINIDISK OFFSET, can be altered at a time.
- Use PF11 to find the currently alterable field.
- MODULE NAME** Specifies the name of a module on the minidisk that will be loaded by SAPL.
- LOAD ORIGIN** Specifies the location in memory (HEX address) into which SAPL will load relocatable modules. For CP, this is the address where the CP module will be loaded and is used to

leave space for the V=R, VRFREE, and RIO370 areas. Any hexadecimal address can be specified. For CP, the address must be at least X'1000' and on a page boundary (for example, the address should end in three zeros).

**IPL PARAMETERS** Specifies the data that will be passed to the loaded program by SAPL. The contents of this field depends entirely on the program loaded by SAPL. For parameters valid for CP, see "IPL Parameters" on page 12.

**COMMENTS** Contains comments such as operator instructions. This field may only be altered by running the SALIPL utility.

There is also a message line after the comments area. Informational messages and error messages appear on the message line.

You will see a list of program function (PF) key numbers and their functions at the bottom of the screen. PF11 indicates if OFFSET or EXTENT is active. PF10 will cause SAPL to try to load a module using the current contents for the fields. PF9 will invoke a list (FILELIST) of files that are on a minidisk that you use with SAPL. Figure 2 is an example of a Stand-alone Program Loader filelist.

STAND ALONE PROGRAM LOADER: VM/ESA VERSION <i>n</i> RELEASE <i>n.n</i>											
FILENAME	FILETYPE	FORMAT	LRECL	RECORDS	BLOCKS	DATE	TIME				
DYN	MODULE	V	65535	59	925	1992/07/07	12:15:28				
SALIPL	MODULE	V	24400	4	7	1992/06/22	15:30:10				
SYSTEM	CONFIG	F	80	190	4	1992/06/17	14:47:19				
HCPSAL	MODULE	V	24400	4	7	1992/06/15	14:32:29				
END	MODULE	F	1024	1896	474	1992/06/01	13:40:19				
DYNF	MODULE	V	65535	56	869	1992/05/22	12:36:18				
DDR	MODULE	V	65535	5	30	1992/05/21	16:21:44				
SALTEST	MODULE	F	7656	1	2	1992/05/21	11:11:22				
LOGO	CONFIG	F	80	48	1	1992/05/18	16:31:48				
LOGO	CONFOLD	F	80	48	1	1991/11/22	14:43:28				
SYSTEM	CONFN	F	80	277	6	1991/08/08	15:40:51				
GOTHIC	LOGO	F	79	16	1	1991/06/18	17:11:12				
UMS	LOGO	V	75	16	1	1991/06/18	17:04:53				
SPOOL	LOGO	F	46	16	1	1991/06/17	18:13:58				
SYSTEM	NETID	F	80	8	1	1991/04/29	11:40:35				
ONLINE	MESSFILE	F	80	1	1	1991/04/29	11:26:11				
SYSTEM	LOGMSG	F	80	1	1	1990/10/03	9:04:22				
3=QUIT	4=	SORT (TYPE)		5=	SORT (DATE)		6=	SORT (NAME)			
						7=	BACK		8=	FORWARD	
								11=		SELECT	

Figure 2. Stand-Alone Program Loader Filelist

The files displayed are initially sorted in reverse order by date and time. You can sort by file name/file type, file type/file name, and date/time by using the PF keys identified at the bottom of the screen. If you press PF11 when the cursor is on a line on the screen that lists a file, you are returned to the main menu and the filename of the selected file is placed in the MODULE NAME file.

### IPL Parameters

Using SAPL, you can pass up to 240 characters of parameters into CP at IPL time. The default contents of the 240-character parameter field can be selected when SAPL is installed on a DASD volume. You can choose to override the defaults by using the full screen option of SAPL.

The following list describes the parameters that CP supports:

**CONS=*addr***

specifies the location of the operator console that CP is to use. An *addr* of SYSC specifies that the system console should be used as the operator console. All OPERATOR\_CONSOles statements in the system configuration file and console addresses specified on the RIOGEN macroinstruction in HCPRIO ASSEMBLE are ignored.

The console address specified will be added to the list of consoles defined on the EMERGENCY\_MESSAGE\_CONSOles statement found in the system configuration file if it has not already been included in that list. For more information, see the description of the EMERGENCY\_MESSAGE\_CONSOles statement in the *VM/ESA: Planning and Administration*. All CONSOLE statements in the system configuration file and console addresses specified on the RIOGEN macroinstruction in HCPRIO assemble are ignored.

**FN=*filename***

specifies the file name of the system configuration file. If you do not specify this parameter, CP uses SYSTEM as the file name.

**FT=*filetype***

specifies the file type of the system configuration file. If you do not specify this parameter, CP uses CONFIG as the file type.

**NOEXITS**

The IPL Parameter NOEXITS is intended to assist you in a situation where your dynamic additions to CP are somehow wrong and are preventing CP from completing system initialization. Use the NOEXITS parameter to tell CP not to process any of these requests from your system configuration file:

- CPXLOAD statement
- ENABLE EXIT statement
- EXTERNAL\_SYNTAX statement
- ASSOCIATE MESSAGES statement
- The ENABLE operand of the ASSOCIATE EXIT statement

Except for examining the statement for syntactic correctness, CP will ignore the statement or the operand. If it was one of your dynamic additions to CP (for example, a CP Exit) that was causing CP not to initialize, using NOEXITS may help you to IPL CP so that you can correct the problem.

**PROMPT**

specifies that you wish to have CP prompt you about startup parameters at IPL time. If you specify this option, CP ignores the selection of the AUTO\_WARM\_IPL operand on the FEATURES statement in the system configuration file or it ignores the bypassing of the questions that would occur if you had used the SHUTDOWN POWEROFF command on a 9221 processor.

The PROMPT parameter is only valid for the SAPL screen. This parameter is not acknowledged during CP bounce processing (SHUTDOWN REIPL or restarting after an abend). Refer to the *VM/ESA CP Command Reference* for additional information on the SET PROMPT command.

**PDNUM=*n***

specifies the number of the parm disk that you wish CP to use. CP reads the allocation map on the IPL volume or the volume indicated on the PDVOL option and skips to the *n*th parm disk. If the allocation map does not contain at least *n* parm disks, CP loads a disabled wait.

**PDOFF=*offset***

specifies the offset at which the parm disk resides in the IPL volume or the volume indicated on the PDVOL option. If the DASD volume does not have at least *offset* cylinders or if there is no CMS formatted minidisk at the specified offset, CP loads a disabled wait.

**PDVOL=*addr***

specifies the real address of the volume on which a parm disk resides that you wish CP to access. If there is no device at address *addr* or if the device is not a DASD volume, CP loads a disabled wait.

**STORE=*nnnnM***

indicates the amount of storage (expressed in megabytes) you wish CP to use. This amount can be less than the real storage that is installed. If you specify an amount that exceeds the actual real storage available on the CPU, CP uses the real storage amount.

**STORE=*nnnnG***

indicates the amount of storage (expressed in gigabytes) you wish CP to use. This amount can be less than the real storage that is installed. If you specify an amount that exceeds the actual real storage available on the CPU, CP uses the real storage amount.

### Order of Precedence

CP scans the parameter list passed to it by SAPL from left to right. If an option is specified more than once in the parameter list, CP uses the last valid occurrence of the option.

## The Stand-Alone Program Loader

---

## Chapter 3. Bringing Up the System

This chapter tells you how to bring up a VM/ESA system and a production system in a virtual machine. It also tells you where to find out how to start up any required service virtual machines.

If you need only a brief summary of the tasks in this chapter, see “Summary of Bringing Up the System” on page 48.

After reading this chapter, you can:

- Bring up a VM/ESA system
- Locate information about how to start up any required service virtual machines
- Log on the production system's virtual machine
- Bring up a production operating system in a virtual machine
- Check to make sure the system has been properly initialized and make adjustments where needed
- Prepare the system for a possible failure
- Respond to errors during bring-up.

---

### Before You Begin

When you bring up a native VM/ESA system, you are initializing the configuration that your installation defined during system generation. (The *VM/ESA: Planning and Administration* book describes, in detail, the system generation process.)

Before bringing up this system, make sure that:

1. The system residence volume is mounted and ready. If you are using a CP nucleus (rather than a module), make sure the SYSRES macro in HCPSYS correctly defines the location of the CP nucleus.
2. The volumes containing the checkpoint and warm start cylinders or pages are mounted if they are not included on the system residence volume.
3. Any volumes containing user minidisks are mounted and ready.
4. The system paging and spooling volumes are mounted and ready.
5. The other devices in the configuration are on, ready, and available to the processor you are using.
6. The VM/ESA system console is available.
7. Your processor is partitioned correctly, if you want it partitioned.
8. The real processor is ready to run in the correct mode, ESA/370 or ESA/390 mode.
9. Your required storage is available.
10. If you are using a processor that requires it, you have selected the correct I/O configuration data set (IOCDs).

## Bringing Up the System

11. If you are planning to perform a cold start, you have mounted the tape that contains the spool files and system data files you previously backed up using the SPTAPE or SPXTAPE command, if any.

Your installation has changed the VM/ESA system configuration file and/or the system generation macros, if required, that define the new I/O configuration to the Control Program (CP).

1. Your installation has run the Input/Output Configuration Program (IOCP) to create a new IOCDs.
2. Your installation has changed the VM/ESA system generation macros that define the new I/O configuration to the Control Program (CP).
3. You select the new IOCDs.
4. If you are planning to use the dynamic I/O capabilities of VM/ESA, you must ensure that:
  - the FEATURES statement has enabled `dynamic_i/o` in the system configuration file.
  - from the system hardware console you have:
    - specified an IOCP extension percentage to allow for additional HSA (Hardware System Area) space,
    - set the "Allow Dynamic Modification" bit.

These are required to exploit this capability.

For information about running the IOCP, see the appropriate publication listed in the bibliography.

Finally, make sure you know the following device numbers:

- The real device number of the device on which VM/ESA resides.  
To bring up VM/ESA, you need to specify this real device number on the processor complex's system console.
- The virtual device number your installation assigns to the device on which your production system resides.  
To bring up your production system, you need to specify this virtual device number on the IPL command.

Now you are ready to load CP into storage.

---

## Bringing Up VM/ESA

To bring up VM/ESA, you must:

1. Load CP into storage
2. Select the type of start you want to perform (WARM, FORCE, COLD, or CLEAN)
3. Set the time-of-day clock
4. Help CP synchronize the time-of-day clocks in your processor complex.

## Loading CP into Storage

To load CP into storage, use your processor complex's system console. If you need information on using this console, see the appropriate publication listed in the bibliography.

## Selecting the Type of Start You Want to Perform

As soon as you load VM/ESA into storage, CP becomes active and:

- Displays messages about errors encountered in IPL parameter processing.
- Displays messages about errors encountered in configuration file processing.
- Displays a message for each CP-owned volume that is offline.

Be sure all required volumes are mounted and online before continuing. If you continue initialization and there are spool volumes offline, you will receive messages indicating the volumes that are offline and the impact their absence will have. You then have an opportunity to end initialization without causing a loss of spool files or to continue initialization.

- Asks you to specify the type of start you want to perform.

In response you may:

- Specify a warm start, force start, cold start, or clean start.

If the automatic warm IPL feature has been enabled using a FEATURES statement in the system configuration file, CP attempts a warm start without changing the TOD clock. If the TOD clock is not set or no warm start data is available, CP will prompt the operator for more information. If AUTO\_WARM\_IPL is disabled, CP goes through all the usual prompts in the IPL process.

- Cancel the process of bringing up VM/ESA.
- Modify the type of start with the DRAIN or DISABLE options.
- Bring up the system without the user directory by specifying the NODIRECT option.
- Bring up the system without autologging any users beyond the operator virtual machine by specifying the NOAUTOLOG option.

If you do not receive CP's prompt for the type of start you want to perform, check the status of any DASD you share with another processor complex. If an operating system running on another processor complex has reserved a shared DASD, CP does not finish initializing until the other system releases the device. To release the device, contact the operator of the other system and follow your installation's normal procedures.

### Warm Starts, Force Starts, Cold Starts, and Clean Starts

VM/ESA provides you with four basic types of starts: warm, force, cold, and clean. The difference among them is in how much of the system's environment CP restores, with a warm start restoring the most and a clean start the least. You save the system's environment by entering the SHUTDOWN command. You restore it by bringing up CP with a warm start. If a warm start fails, contact your system support personnel before you use a force or cold start.

## Bringing Up the System

In order to restore the system's environment, you must save it first. As mentioned, you do this by entering a SHUTDOWN command. When you enter this command, CP saves the following parts of the system's environment:

- Any accounting, EREP, and symptom records in storage.

Accounting, EREP, and symptom record recording service virtual machines normally transfer these records from storage to disk. If these virtual machines are not retrieving, the records remain in storage. The SHUTDOWN command will write any records that are still in storage into the checkpoint area on DASD so that during the next IPL the records can be returned to storage for retrieval.

- System log message.

The system log message communicates information to users when they log on or reconnect.

**Note:** If the FEATURES ENABLE LOGMSG\_FROM\_FILE statement is not specified in the system configuration file, log messages are processed the same as in VM/ESA Release 1.0 or 1.1. If the FEATURES ENABLE LOGMSG\_FROM\_FILE statement is specified, log messages are processed the same as VM/ESA Release 1.0 or 1.1 using the SET Logmsg command.

- Spool file queues.

Spool files are collections of data on disk waiting to be processed by real or virtual readers, printers, or punches. The SHUTDOWN command saves information about the queues that locate these spool files.

**Note:** Spool files may not be restored in the same order following a warm or force start.

- The system data file queues.

The system data file queues hold the following collections of data, called **system data files**: named saved systems (NSSs), discontinuous saved segments (DCSSs), image libraries, user class restructure (UCR) files, message repository files, and system trace files.

- A **named saved system (NSS)** is a copy of an operating system that a user has named and retained in a system data file. The user can load the operating system by its name, which is more efficient than loading it by device number.
- A **discontinuous saved segment (DCSS)** refers to one or more pages of storage that a user has named and retained in a system data file. When a discontinuous saved segment, defined as shareable, is loaded, more than one user can access it.
- An **image library** is a set of modules, contained in a system data file, that define the spacing, characters, and copy-modification data that a printer uses to print a spool file.
- **User class restructure (UCR)** files expand the privilege classes of commands and DIAGNOSE codes. This lets your installation customize the privilege class structure of VM/ESA.
- **Message repository** files contain VM/ESA messages and responses translated into a national language.
- **System trace** files contain records of events that occur within the system. Use these files to determine the source of problems in the system.

The SHUTDOWN command saves information about the queues that locate these system data files.

- The status of unit record devices, displays, and 3270 printers.

When you enter the SHUTDOWN command, you save all these parts of the system's environment. Then, when you bring the system back up with a warm start, CP restores them.

If the SHUTDOWN REIPL command causes a nucleus or module other than the current nucleus or module to be loaded, preferred virtual machine recovery is suppressed. If the same nucleus or module is re-IPLed, preferred virtual machine recovery is attempted.

If you enter SHUTDOWN REIPL, CP attempts to do an automatic warmstart of the specified nucleus or module. Therefore, if a new nucleus is being IPLed:

- It must be the same release of CP.
- It must have the same size V=R area as the current nucleus.
- It must have its warm start and checkpoint cylinders or pages defined in the same location that the current nucleus does.
- It must contain the same versions of control blocks that are used by the checkpoint or warm start process.
- It must contain the same version of the checkpoint and warm start modules.

See the *VM/ESA: CP Command and Utility Reference* book for other restrictions when you re-IPL another nucleus or module.

Unless you have a reason to do otherwise, specify a warm start. Keep in mind that if you do not shut down the VM/ESA system with the SHUTDOWN command, you may not be able to bring it back up with a warm start. The information that the SHUTDOWN command saves is what allows a warm start to work.

During a force start, CP tries to restore most of what it restores during a warm start, but it may not be able to do so completely. Just as in a warm start, CP tries to restore, in this order:

1. Accounting, EREP, and symptom records in storage
2. System log message
3. Spool file and system data file queues.

However, if CP encounters an error during the first step, it immediately goes on to recover the spool file and system data file queues. Unless you specified `FEATURES ENABLE LOGMSG_FROM_FILE` in the system configuration file, the system log message is lost. Any remaining accounting, EREP, and symptom records are lost. Further, if CP encounters an error while recovering a spool file, it immediately goes on to the next file in the queue, and the file on which the error occurred is scheduled to be deleted. When the preliminary phase of spooling initialization is complete, a message providing spool file summary status is displayed, and the operator can then stop system initialization without the loss of any spool files.

## Bringing Up the System

Also, a force start does not restore any of the unit record device characteristics, such as the class to be processed or the image library. Instead, a force start tries to start the unit record devices with the default characteristics specified on the RDEVICE statement in the system configuration file or on the RDEVICE macroinstructions in HCPRIO during system generation. A force start does try to restore the status of all displays and 3270 printers.

Therefore, after a force start, CP may not have completely recovered all of the system's environment. Use a force start only when authorized by the system support personnel after a warm start fails.

If a force start fails, you must perform a cold start. During a cold start, CP tries to recover *only* the system data files. This means that when you perform a cold start, you lose all of your spool files, all accounting, EREP, and symptom records in storage. The system log message is lost if you did not specify the FEATURES ENABLE LOGMSG\_FROM\_FILE statement in the system configuration file. The status of your unit record devices, displays, and 3270 printers may also differ from their status before the restart. Use a cold start only when both a warm start and a force start fail.

The essential points to grasp about warm starts, force starts, cold starts, and clean starts are:

- To save the system's environment before you restart it, use the SHUTDOWN command.
- To restore the system's environment, bring the system back up with a warm start.
- If a warm start fails,
  - Check the DASD volumes.
  - Contact system support personnel.
  - When repeated attempts to perform a warm start fail, try a force start to restore as much of the system's environment as possible.
- If you decide to continue with system initialization even though there are files scheduled to be deleted, remember that those files cannot be recovered.
- If a force start fails, try a cold start.
- A clean start IPLs the system without attempting to recover spool files and system data files that existed prior to system shutdown.

The next section explains how to specify each of the basic types of starts.

## Specifying a Warm Start

When CP asks you to specify the type of start you want to perform, it issues the following prompt:

```
Start ((Warm|Force|COLD|CLEAN) (DRain) (DIsable) (NODIRect) (NOAUTOlog))
      or (SHUTDOWN)
```

Specify a warm start by doing one of the following:

- Enter:  
warm
- Or press ENTER.

Either of these responses causes CP to perform a warm start. After the warm start completes, the system's environment is the same as it was before you shut down the system with the SHUTDOWN command.

If no warm start data is available, CP prompts the operator for more information:

```
Invalid warm start data encountered.
No files have been deleted yet.
To change to a FORCE start, enter FORCE.
To stop processing, enter STOP.
```

If you are performing a warm start and encounter spooling errors, CP advises you of these errors after the preliminary phase of spooling initialization is complete. A message is displayed that gives you the spool file summary status. CP then issues a prompt similar to the following:

```
Spool file errors encountered during initialization.
No files have been deleted yet.
To continue restart and delete the files, enter GO.
To stop so you can check spool volumes, enter STOP.
```

You must now decide whether to continue system initialization (losing the indicated files) or to stop system initialization (without losing any files).

To continue system initialization, enter:

```
go
```

To stop system initialization, enter:

```
stop
```

CP may not be able to perform a warm start for a number of reasons. I/O errors, incorrect data in the warm-start area, or invalid data in the checkpoint area may prevent a warm start from completing successfully.

When a warm start fails, you may be able to correct the problem that caused the failure. You can then perform a warm start successfully without losing any data that might have been lost because of the warm start failure.

A common reason for a warm start failure is that a volume containing spool files that was present during system termination may now be offline. You can attempt to correct this problem by using the following procedure:

1. Reload VM/ESA into storage.

## Bringing Up the System

2. Check the error messages. (Before CP prompts you for the type of start you want to perform, it issues an error message for each CP volume defined in HCPSYS, or the system configuration file, that is not currently online.)
3. If you receive an error message for a volume that should be mounted, you respond to the start prompt by entering:  
shutdown
4. Make sure the appropriate spooling volume is mounted and ready.
5. Reload VM/ESA into storage and retry the warm start.

The checkpoint and warm-start data that was saved during the last system termination or shutdown is not changed when the warm start fails. If a hardware error has caused a warm start to fail one or more times, and you are able to correct the hardware error and reload the system, the warm-start procedure still restores the system's environment.

When repeated attempts to perform a warm start fail, contact your installation's support personnel before you proceed. After the support personnel have performed any necessary diagnosis, make sure all spooling volumes are mounted and ready. Then, go back to the processor complex's system console and reload VM/ESA into storage.

### Specifying a Force Start

When the system is reloaded, CP again prompts you for the type of start you want to perform. If a warm start fails and you are authorized by the system support personnel, enter:

```
force
```

This response causes CP to perform a force start. After the force start completes, much of the system's environment may be the same as it was before you shut down the system with the SHUTDOWN command. But, CP may have lost some data, as explained before.

Also, if CP encounters an error during the force start, it may not automatically start your unit record devices or enable your displays. If you need any of these devices, you must explicitly start or enable them. (To find out how to start or enable a device, see Chapter 5, "Controlling Local Devices" on page 85.)

If you are performing a force start and encounter spooling errors, CP advises you of these errors after the preliminary phase of spooling initialization is complete. A message is displayed that gives you the spool file summary status. CP then issues a prompt similar to the following:

```
Spool file errors encountered during initialization.  
No files have been deleted yet.  
To continue restart and delete the files, enter GO.  
To stop so you can check spool volumes, enter STOP.
```

You must now decide whether to continue system initialization (losing the indicated files) or to stop system initialization (without losing any files).

To continue system initialization, enter:

```
go
```

To stop system initialization, enter:

stop

### Specifying a Cold Start

When the system is reloaded, CP again prompts you for the type of start you want to perform. If a force start failed and you are authorized by the system support personnel, enter:

cold

This response causes CP to perform a cold start.

When you are performing a cold start and the preliminary phase of spooling initialization is complete, CP displays a message that gives you the spool file summary status. This message is always displayed. CP then issues a prompt similar to the following:

```
Spool files will be deleted because of COLD start.
No files have been deleted yet.
To continue COLD start and delete files, enter GO.
To stop COLD start without deleting files, enter STOP.
```

If you want to continue cold-start processing, enter:

go

If you want to end system initialization (without losing any spool files), enter:

stop

**Warning:** The cold-start procedure purges:

- All spool files
- All accounting, EREP, and symptom records in storage
- The system log message.

CP tries to recover the system data files.

Specify a cold start, therefore, only if you *cannot* bring up the system with a warm start or force start.

### Specifying a Clean Start

When the system is reloaded, CP prompts you for the type of start you want to perform. CP issues the following prompt:

```
Start ((Warm|Force|COLD|CLEAN) (DRain) (DISable) (NODIRect) (NOAUTOlog))
      or (SHUTDOWN)
```

Specify a clean start by entering:

clean

This response causes CP to perform a clean start. When clean start is selected, you receive the following prompt:

```
CLEAN start has been selected. This will cause all
spool files and System Data Files (NSS, DCSS, TRF, IMG,
UCR, NLS) to be deleted.
No files have been deleted yet.
To continue CLEAN start and delete files, enter GO.
To stop CLEAN start without deleting files, enter STOP.
```

You must now decide whether to continue system initialization (deleting the indicated files) or to stop system initialization (without deleting any files).

## Bringing Up the System

To continue system initialization, enter:

```
go
```

To stop system initialization, enter:

```
stop
```

**Warning:** The clean start procedure purges:

- All spool files
- All system data files
- All accounting, EREP, and symptom records in storage
- The system log message.

A clean start is desirable in the following scenarios:

- IPLing after replacing existing spool volumes with new volumes.
- First time IPLing with a new warmstart area defined (spool file recovery information is stored in the warm-start area).
- You do not want to restore previously existing system data files.

### Canceling the Bring-Up Process

If you need to cancel the process of bringing up VM/ESA, enter the following response to the start prompt:

```
shutdown
```

You can reload the Control Program when you are ready to bring up the system again. Entering SHUTDOWN to cancel the process of bringing up the system does not affect the existing checkpoint and warm-start data.

### Modifying the Type of Start (DRAIN, DISABLE)

When you bring up VM/ESA, CP reactivates the unit record devices and displays that were active when you last shut down the system. If you do not want to reactivate these devices, you can indicate that you want CP to do one or both of the following:

- Suspend spooling activity to all of the unit record devices that are attached to the system
- Keep the displays that are attached to the system from being enabled.

Because CP does not restore spool files during a cold or clean start, you may want to keep the displays from being enabled. This gives you a chance to restore the files from tape before users log on and try to use the files.

***Suspending Spooling Activity to the Unit Record Devices:*** To suspend spooling activity to the unit record devices, respond to CP's start prompt with the DRAIN option and either WARM, FORCE, COLD, or CLEAN. For example, if you want CP to perform a warm start and suspend all spooling activity to the unit record devices, enter:

```
warm drain
```

To start spooling activity to some or all of these unit record devices, enter the appropriate START commands. (To find out how to start a device, look under the device in Chapter 5, "Controlling Local Devices" on page 85.)

**Keeping Displays from Being Enabled:** If you want to keep the displays from being enabled, respond to CP's start prompt with the DISABLE option and either WARM, FORCE, COLD, or CLEAN. For example, if you want to perform a warm start and keep the displays from being enabled, enter:

```
warm disable
```

When you are ready to enable some or all of these displays, enter the appropriate ENABLE commands. (To find out how to enable a display, see "Making a Display, a 3270 Printer, or Communication Lines Available for User Access" on page 91.)

Similarly, if you want to perform a warm start, suspend spooling activity to the real unit record devices, and keep the displays from being enabled, enter:

```
warm drain disable
```

When you are ready to start or enable some of the devices, enter the appropriate START or ENABLE commands.

### Notes:

1. If you include the DISABLE option, enter the following command to reenab the VM/ESA system console before you do anything else:

```
enable rdev
```

where *rdev* is the real device number of the display you are using as the VM/ESA system console. This command lets you log back on if you get disconnected while you are bringing up VM/ESA.

If you do not enter this command and you get disconnected, you must reload the Control Program to regain control of the VM/ESA system console.

2. The DISABLE option also keeps the 3270 printers from being enabled. To reenab them later, enter the appropriate ENABLE commands. See "Making a Display, a 3270 Printer, or Communication Lines Available for User Access" on page 91.
3. If you do not include the DISABLE option, any display, 3270 printer, or communication lines that were enabled the last time you shut down the system are automatically enabled when you finish bringing it back up.

### Bringing Up the System Without Logging on Users

Usually, CP autologs these seven virtual machines after the operator's virtual machine has been initialized:

- Two accounting virtual machines
- Two EREP virtual machines
- Two symptom record virtual machines
- The start up virtual machine (usually AUTOLOG1).

You can specify the NOAUTOLOG option if you wish to have CP initialize only the operator virtual machine, so you can make some changes to the system before continuing with normal initialization.

### Bringing Up the System Without a User Directory (NODIRECT)

If there is a problem with the VM/ESA user directory (for example, its data is incorrect), CP may not be able to perform a start. When this happens, contact your installation's support personnel before you proceed.

After your installation's support personnel have performed any required diagnosis, go back to the processor complex's system console and reload VM/ESA into storage.

When the system is reloaded, CP again prompts you for the type of start you want to perform. To bring up the system without accessing the user directory, respond to CP's start prompt with the NODIRECT option and either WARM, FORCE, COLD, or CLEAN. For example, if you want to perform a warm start without using the directory, enter:

```
warm nodirect
```

This response prevents CP from trying to access the user directory. When the system comes up, you must recover the user directory before you do anything else. To find out how to recover the user directory, see "Recovering the User Directory" on page 43.

## Setting the Time-of-Day Clock

After you indicate the type of start you want CP to perform, CP does one of two things:

- If you are bringing up the system for the first time since the last initial microprogram load (IML) or power-on reset, or if the time-of-day (TOD) clock is not within the years 1942 - 2041, CP sends you the following prompt so you can set the time-of-day (TOD) clock, enter one of these:

*Set date MM/DD/YY or MM/DD/YYYY or YYYY-MM-DD (valid years are 1942 - 2041)*

Enter the current date in the format that appears in the prompt (a YY of 42 to 99 corresponds to 1942 - 1999, a YY of 00 to 41 corresponds to 2000 - 2041). For example, if the date is January 10, 1998, enter one of these:

```
01/10/98  
01/10/1998  
1998-01-10
```

CP then sends you this prompt:

```
SET TIME HH:MM:SS
```

If your system configuration file contains `TIMEZONE_DEFINITION` and `TIMEZONE_BOUNDARY` statements, CP may determine that one of the following is true:

- The time and date combination you have entered is impossible.

If your system configuration file indicated that on the date you entered, the time zone changes so that at 2:00 a.m. the clock changes to 3:00 a.m. and you entered 2:30 a.m. as the time, CP issues an error message and prompts you for date and time again.

- The time and date combination you have entered is ambiguous.

If your system configuration file indicates that on the date you entered, the time zone changes so that at 2:00 a.m. the clock changes back to 1:00 a.m. and you entered 1:30 a.m., CP displays a list of possible time zones and asks you to choose the timezone that 1:30 a.m. corresponds to.

Because CP asks you to press the TOD ENABLE SET key on the processor complex's system console after you enter the time, you should enter the time you intend to press that key, using the format that appears in the prompt. For example, if you plan to press the TOD ENABLE SET key at 4:15 p.m. and 30 seconds, enter:

```
16:15:30
```

CP then prompts you to press the TOD ENABLE SET key on the processor complex's system console:

```
PRESS "TOD ENABLE SET" KEY AT DESIGNATED INSTANT
```

After you press this key, CP sends you the following prompt:

```
NOW 16:15:30 tmz day-of-week 1998-02-06
CHANGE TOD CLOCK (YES|NO)
```

Where:

*tmz*

specifies the time zone your installation specified on the `TIMEZONE_DEFINITION` statement in the system configuration file or in the `SYSTIME` macroinstruction during system generation.

*day-of-week*

specifies the day of the week

If the TOD clock value is correct, press ENTER or enter NO, and CP continues initializing. If the TOD clock value is not correct, enter YES. CP then repeats the sequence for setting the TOD clock.

- If you are not bringing up the system for the first time since the last IML or power-on reset, CP sends you this prompt:

```
NOW hh:mm:ss tmz day-of-week yyyy-mm-dd
CHANGE TOD CLOCK (YES|NO)
```

Where:

*hh:mm:ss*

specifies the time

## Bringing Up the System

*tmz*

specifies the time zone your installation specified on the TIMEZONE\_BOUNDARY statement in the system configuration file or in the SYSTIME macroinstruction during system generation

*day-of-week*

specifies the day of the week

*yyyy-mm-dd*

specifies the date

CP uses either the time zone differential (in SYSTIME) or an offset (in TIMEZONE DEFINITION) to convert the time you enter into Coordinated Universal Time (UTC) and stores it as the TOD clock.

Unless your installation specified a different time zone on the TIMEZONE\_DEFINITION statement in the system configuration file or on the SYSTIME macroinstruction, CP interprets the time you specify for this prompt as UTC.

If the time and date are correct, press ENTER or enter NO, and CP continues initializing. If either value is wrong, enter YES. CP then prompts you for the correct data.

### Notes:

1. During system generation, unless your installation specified a different time zone on the TIMEZONE\_DEFINITION statement in the system configuration file or in the SYSTIME macroinstruction, CP interprets the time you specify as Coordinated Universal time (UTC).
2. The TOD enable switch doesn't apply to an LPAR environment, the user would hit enter to continue.

If your processor complex has two or more time-of-day clocks and you set or change the time of day, CP sends you the following message:

```
TOD CLOCK SYNC CHECK RECEIVED
```

The message indicates that you must help CP synchronize the clocks. The prompt that is described in the next section immediately follows this message.

## Synchronizing Two or More Time-of-Day Clocks

Your processor complex may contain more than one TOD clock. If so, CP may ask you to press the TOD ENABLE SET key so that it can set all of the TOD clocks to the same time. This is called clock synchronization.

If the clocks need to be synchronized, CP sends you the following prompt:

```
CLOCK SYNCHRONIZATION - PRESS "TOD ENABLE SET" KEY
```

After you press this key on the processor complex's system console, CP synchronizes the clocks.

## What CP Does during Initialization

After you finish setting any TOD clocks on the processor complex, CP continues initializing and logs on the primary system operator. CP also logs on the AUTOLOG1 virtual machine, which your installation may use to perform such initialization tasks as starting up other virtual machines, attaching devices to them, and restoring spool files and system data files from tape. AUTOLOG1 is the default user id. You can change the AUTOLOG1 user ID by using the STARTUP operand on the SYSTEM\_USERIDS statement in the system configuration file.

If a problem with the VM/ESA user directory prevents CP from initializing that directory, CP searches all other system volumes until it locates a valid directory. If there is no alternate directory or CP cannot initialize the new directory, you must reload the system and specify the NODIRECT option. To find out how to do this, see “Bringing Up the System Without a User Directory (NODIRECT)” on page 26.

Even if a problem with the VM user directory does not prevent CP from initializing, it may prevent CP from logging on the primary system operator using the normal directory definition. In this case, CP logs on the primary system operator under the user ID specified on the OPERATOR operand on the SYSTEM\_USERIDS statement in the system configuration file or in the SYSOPR macro in HCPSYS. If you are the primary system operator, you must recover the user directory before you do anything else. To find out how to recover the user directory, see “Recovering the User Directory” on page 43.

During initialization, CP reads the volume identifiers of all the volumes that are mounted and compares them with the system and user minidisk volumes your installation specified during system generation. If any of the volumes that were requested are not mounted (and therefore could not be attached), CP sends you a message. If any of the missing volumes are needed by the system or contain user minidisks, mount and attach them to the system as soon as possible. See “Attaching a System Volume to the System” on page 120.

After CP finishes initializing, other users can log onto VM/ESA. You can also now start up required service virtual machines and bring up the production system.

**Note:** If you have just performed a cold start and not all the system data files (UCR files, NSSs, DCSSs, image libraries, message repository files, or system trace files) are re-created, use the SPTAPE or SPXTAPE command to restore the files to the system as soon as possible. For more information on saving and restoring these files, see “Backing Up Standard Spool Files and System Data Files” on page 273.

---

## Starting Service Virtual Machines

After CP is initialized, you can start the service virtual machines. These virtual machines provide system services and include the:

- Accounting virtual machine
- Error recording (EREP) virtual machine
- Symptom record recording virtual machine
- Virtual machines required by supported licensed programs
- DFSMS/VM\* service virtual machine.

### Starting Accounting, Error, and Symptom Record Recording Virtual Machines

If accounting, error, or symptom record recording is active on VM/ESA, you may need to log on and start the accounting, error, or symptom record recording virtual machines. However, installations usually set up the user directory entries and CMS PROFILE EXECs for these machines so that they start automatically.

For information about how to start the accounting, error, or symptom record recording virtual machines, see “Collecting Accounting Information” on page 239, “Collecting Hardware Error Information” on page 247, or “Collecting Symptom Record Information” on page 260.

### Starting Licensed Program Virtual Machines

If your installation has installed any of the following licensed programs, you need to start the service virtual machines they require:

- RSCS
- VM/Pass-Through
- VTAM Communications Network Applications (VCNA)
- VM/Virtual Telecommunications Access Method (VM/VTAM).

For information about when and how to stop these service virtual machines, see the appropriate publications listed here and in the bibliography:

- *RSCS General Information*
- *VM/Pass-Through Facility General Information*
- *VTAM Communication Network Application (VCNA) General Information.*

### Using Link Modes to Ensure Minidisk Stability for Service Virtual Machines

DFSMS/VM is the foundation for system-managed storage in the VM environment. A DFSMS/VM service machine uses the Interactive Storage Management Facility (ISMF) to reduce the amount of manual work that must be performed when data is migrated to newly installed DASD. ISMF formats new minidisks, updates user directories, and automates other functions, providing both speed and predictability during data migration activities. You can use the DFSMS/VM virtual machine to provide information about storage management tasks. Certain applications are dependent on the stability of a given minidisk. For example, a virtual machine used for moving data from one system to another or for managing data bases requires this minidisk stability.

Enhancements to the CP LINK command, consisting of link access modes, guarantee data security and stability. When any one of these enhanced link modes is in effect for a given minidisk, no other user ID on the executing system or any system in a cross-systems extension (CSE) cluster can acquire write access to the minidisk. The following link modes are provided in addition to read/write access:

- Stable read (SR).

An authorized user who obtains this link mode locks the target minidisk against all write link requests from all users on the executing system. A user attempting to establish W, M, MR, or MW links receives a *not linked* message, indicating the minidisk is locked against all write access requests until the user releases the minidisk.

When there is a critical need to establish a stable link, use the stable mode to access the minidisk.

- Stable write (SW,SM).

An authorized user who obtains this link mode locks the target minidisk against all write link requests from all users on the executing system. A user attempting to establish W, M, MR, or MW links receives a *not linked* message, indicating the minidisk is locked against all write access requests until the user releases the minidisk.

When there is a critical need to establish a stable link, use the stable mode to access the minidisk.

- Exclusive READ (ER).

An authorized user who has obtained this link mode locks the target minidisk against all link requests from all users on the executing system. A user attempting to establish R, RR, W, WR, M, MR, or MW links fails and receives a message indicating the minidisk is temporarily locked against all requests for access.

- Exclusive WRITE (EW).

An authorized user who has obtained this link mode locks the target minidisk against all link requests from all users on the executing system. A user attempting to establish R, RR, W, WR, M, MR, or MW links fails and receives a message indicating the minidisk is temporarily locked against all requests for access.

### Notes:

1. Full-pack minidisks are a special case. A read/write full-pack minidisk and a read/write user's A-disk can share the same volume on an assigned DASD and, at the same time, can be held in EW mode. In this case, SW and EW modes do not stop overlapping and conflicting accesses.

To prevent conflicting access and to provide full data integrity, you must take the following precautions:

- Do not define overlapping minidisks.
  - Do not grant DEVMAINT authority to allow fullpack overlays.
  - Do not use DEFINE MDISK.
2. If any machine in a CSE complex is running at an earlier release than VM/ESA Release 1.1, stable and exclusive links will not be allowed.
  3. If an external security manager (ESM) is installed on your system, you may not be authorized to use the LINK command for all minidisks and all access modes. The ESM may downgrade certain requests for write access to read access. For additional information, contact your security administrator.

---

## Bringing Up a Production System in a Virtual Machine

After you start any service virtual machines that need to be started, you are ready to bring up a production system in a virtual machine.

Although there are many ways to set up the consoles, this book assumes that you have access to the following separate consoles:

- Processor complex's system console

## Bringing Up the System

- VM/ESA primary system console
- Console for the production system's virtual machine
- Production system's system console.

In the following explanation, bringing up the production system requires these consoles:

- Console for the production system's virtual machine.

You use this console to control the production system's virtual machine. Log on the production system's virtual machine, set up its running environment, and enter an IPL command.

- Production system's system console.

This is the system console from which you control the production system. It is dedicated to the production system's virtual machine.

- VM/ESA system console.

If you need to dedicate devices to the production system's virtual machine before you bring it up, you enter the appropriate CP commands from this console.

**Note:** To eliminate a console, your installation may configure the consoles so that the console for the production system's virtual machine and the production system's system console are the same physical display. You then operate the production system in full-screen mode. See the *VM/ESA: Virtual Machine Operation* book for an explanation of how to enter commands in this environment.

To bring up the production system, follow these steps:

1. Log on the production system's virtual machine.
2. Load (IPL) the production system in its virtual machine.
3. Finish bringing up the production system.
4. Optionally, disconnect the production system's virtual machine.

These steps are described in the sections that follow.

## Logging on a Production System's Virtual Machine

To log on a production system's virtual machine to VM/ESA:

1. Make sure the console you will use to log on the production system's virtual machine is enabled.

To find out the console's status, enter:

```
query rdev
```

where *rdev* is the real device number of the display you are using as the console for the production system's virtual machine.

If the status indicates that the display is enabled, go to step 2 on page 33.

If the status indicates that the display is disabled, enter:

```
enable rdev
```

If the status indicates that the display is offline, enter:

```
vary on rdev  
enable rdev
```

2. Go to the console you plan to use to log on the production system's virtual machine. If the device is enabled, you see the VM/ESA logo. If you do not see the logo, go back to step 1.
3. On the VM/ESA logo, enter the logon ID of the production system's virtual machine. The cursor is positioned at the correct place for you to enter the logon ID.

4. When CP prompts you, enter the logon password.

CP responds with the system log message, messages about devices that are being attached, and a message that the production system's virtual machine is logged on.

5. Watch the CP messages to see that all the devices you need to run the production system are attached. If any devices are missing, go back to the VM/ESA system console and enter the appropriate CP commands to attach them to the production system's virtual machine.

Normally, your installation dedicates quite a few devices to the production system's virtual machine. It does this by putting DEDICATE statements in the user directory entry for the production system's virtual machine. During logon, CP issues messages that tell you when these dedicated devices are not attached. You should watch these messages to see that all the devices you need to run the production system are attached. If they are not, you must attach them by entering CP commands. You can find information on these commands in Chapter 5, "Controlling Local Devices" on page 85.

6. If necessary, go back to the console where you logged on the production system's virtual machine. If your installation requires you to set up a special running environment for the production system's virtual machine, enter the appropriate CP commands now.

For example, if you are running an MVS/SP production system, your installation may require you to enter the SET RUN ON command before you bring it up in its virtual machine. For more information about setting up appropriate running environments for particular production operating systems, see the *VM/ESA: Running Guest Operating Systems* book.

### Loading (IPLing) a Production System in a Virtual Machine

You have just logged on a production system's virtual machine at a console and set up its running environment. To load (IPL) the production system, do the following:

1. Decide which of the following ways is most appropriate for you to load the production system:

- If your production system is a VSE system, enter:

```
ipl vdev clear
```

where *vdev* is the virtual device number of the device on which the VSE system resides.

- If you want to pass a console address to the Stand Alone Loader (SAL) or to specify an alternate MVS nucleus, enter:

```
ipl vdev loadparm parameter
```

where *vdev* is the virtual device number of the device on which the production system resides, and *parameter* is the 1- to 8-character load parameter.

**Example—Specifying a Console Address for SAL:** The details of the following example are relevant only if you are IPLing a volume on which the Stand Alone Loader has been installed and you want to specify a console address to activate the fullscreen option of SAL.

If you are IPLing the virtual device B00 on which SAL has been installed and you have your virtual console defined at virtual address 009, you can enter:

```
ipl B00 loadparm 9
```

SAPL determines that a console address has been specified with the LOADPARM option and displays a fullscreen menu on your console. You can choose what object you want SAL to load and where in storage it should be placed by modifying fields on this screen.

**Example—IPLing an Alternate MVS Nucleus:** The details of the following example are relevant only if you are IPLing MVS and wish to specify an alternate nucleus.

If you are IPLing MVS from virtual device 292 and you want to use an alternate nucleus called IEANUC04, rather than the default nucleus IEANUC01, you enter:

```
ipl 292 loadparm 4
```

This passes 4 as data to the MVS Control Program that you are IPLing. MVS takes this data and appends it to IEANUC01 to form the alternate nucleus name, IEANUC04.

- If none of the above apply, enter:

```
ipl vdev
```

where *vdev* is the virtual device number of the device on which the production system resides.

2. Go to the production system's system console and wait for the production system to come up on it. *Do not type anything* on the console where you entered the IPL command until you see the first message on the production system's system console.

**Note:** For MVS guests, when the system console is responding to VM errors or IPLing the system, the virtual machine console can be used as an IPL and error-recording console. For more information see the *VM/ESA: Virtual Machine Operation* book.

## Finishing Bringing Up the Production System in a Virtual Machine

After you see the first message on the production system's system console, bring up the production system normally. From this point on, you enter CP commands from the VM/ESA system console and production system commands from the production system's system console.

Unless VM/ESA abnormally terminates, you do not use the console where you logged on the production system's virtual machine and entered the IPL command again. If you want to use the console for some other virtual machine, you can disconnect the production system's virtual machine by entering at that console:

```
#cp set run on
#cp disconnect
```

The production system continues to run normally.

The SET RUN ON command keeps the production system's virtual machine running and helps prevent it from being logged off by CP. The DISCONNECT command disconnects the console from the virtual machine and allows you to use the console for another purpose. For more information about the interaction of these two commands, see the *VM/ESA: CP Command and Utility Reference* book.

---

## Checking the Initialization of System Resources

At this point, both VM/ESA and all production systems are running. Now make sure that all resources are available as your installation requires. This includes checking your system's devices and programs, as follows:

1. Make sure that all devices are allocated to the right virtual machines.

To check the status of real devices attached to the system, enter one of CP's QUERY commands for real devices from the VM/ESA system console. For more details, see "Checking the Status of Real Devices" on page 36.

2. Make sure that all devices allocated to each production system's virtual machine are available to that production system.

To do this, enter the appropriate commands from the production system's system console.

3. Make sure that all VM/ESA service virtual machines that are supposed to run are running.

To check the status of the accounting, error recording (EREP), and symptom record recording virtual machines, enter the CP QUERY RECORDING command. For more details, see "Finding Out the Status of Accounting" on page 241, "Finding Out the Status of Error Recording" on page 250, or "Finding Out the Status of Symptom Record Recording" on page 262.

To check the status of the licensed program service virtual machines, use the commands appropriate to those products. Supported licensed programs that require service virtual machines include RSCS and VM/Pass-Through.

4. Make sure that all production system applications that are supposed to run are running.

To do this, enter the appropriate commands from the production system's system console.

5. Make sure that all remote lines are operating.

## Bringing Up the System

To check remote lines to VM/ESA, use RSCS commands as appropriate.

To check remote lines to the production system, enter the appropriate production system commands.

## Checking the Status of Real Devices

You can use a CP QUERY command to check the status of your real devices. For example, you can find out which:

- Devices are in use, are available for use, or are offline
- Devices are in use by CP or are dedicated to a virtual machine
- DASDs are system volumes
- Printers are associated with a security label.

To check the status of all of your real devices of a specific type, enter one of the following commands:

```
query dasd all
query tapes all
query ur all
query graf all
query lines all
query ctca all
query swch all
query osa all
```

CP responds with the status of all of your real DASD, tape drives, unit record devices, displays, 3270 printers, communication lines, channel-to-channel adapters, open systems adapters, and dynamic switching devices, respectively. Unit record devices include card readers, printers, and card punches.

**Note:** Since open systems adapter (OSA) devices cannot come online until the OSA hardware is fully initialized, there may be a delay between the completion of system IPL and the availability of the OSA devices.

The status CP displays for a device depends on its type. For example, CP displays different kinds of status for a printer than for a DASD volume. But CP always displays the device's type (such as DASD or tape), its real device number, and one or more keywords that describe its status. Additional information may follow the keywords.

A keyword indicates the specific status of a device. A device also falls into one of three general groups: active, free, or offline. These general groups correspond to operands you may specify on the QUERY command: ACTIVE, FREE, or OFFLINE. An *active* device is either in use by CP or is dedicated to a virtual machine. A *free* device is available to CP, but is not now in use by either the system or a specific virtual machine. An *offline* device is unavailable to CP.

**Note:** The BOXED operand indicates if the device is unavailable. If the device is unavailable, it is usually because of a hardware condition. The System Operator should physically isolate the device from the I/O subsystem. When the condition has been repaired, use the VARY ONLINE command to initiate recovery.

Table 1 on page 38 lists the keywords that appear in responses to QUERY commands for real devices. Use the table to find out the meaning of a keyword and the types of devices for which CP displays it. The table also shows whether the keyword indicates:

- An active, free, or offline device
- A dedicated device or a device in use by CP.

To find out how to change the status of a device, see Chapter 5, “Controlling Local Devices” on page 85.

The ALL operand, in combination with a device type operand, allows you to check the status of all your real devices of a specific type. You can also use other operands on the QUERY commands for real devices. For example, if you want to find out the status of all of the active tape drives, enter:

```
query tapes active
```

If you want to find out the status of all the devices within a specific range of device numbers, enter:

```
query rdev1-rdevn
```

where *rdev1* is the real device number of the first device in the range and *rdevn* is the real device number of the last device in that range.

If you want to know the status of only one device, enter:

```
query rdev
```

where *rdev* is the real device number of the device.

If you want to know the status of the DASD containing a particular volume, enter:

```
query dasd valid
```

where *valid* is the volume identifier. If there is more than one volume with the same identification, CP displays the status of all of the DASDs that contain the volume.

**Note:** In the following discussions, responses will include cylinders for CKD and ECKD\* devices and pages for FBA devices.

To display a list of CP-owned system volumes, enter:

```
query alloc all
```

In response, CP lists all of the CP-owned volumes that contain temporary disk, directory space, paging, or spooling space. For each volume, CP displays the number of cylinders or pages that are allocated, in use, and available for temporary disk, directory space, paging, and spooling space. CP also displays whether the volume contains the active CP directory, and if the volume containing the active IPL nucleus was one of those for which cylinder or page allocation information was displayed.

To display the list of all CP-owned system volumes containing paging space, enter:

```
query alloc page all
```

In response, CP lists all of the CP-owned volumes that contain paging space. For each paging extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of pages, the number of pages in use, the highest page in use, and the percentage of pages in use.

To display the list of all CP-owned system volumes containing spooling space, enter:

```
query alloc spool all
```

## Bringing Up the System

In response, CP lists all of the CP-owned volumes that contain spooling space. For each spooling extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of pages, the number of pages in use, the highest page in use, and the percentage of pages in use.

To display the list of all CP-owned system volumes containing temporary disk space, enter:

```
query alloc tdisk all
```

In response, CP lists all of the CP-owned volumes that contain temporary disk space. For each temporary disk extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of cylinders or pages, the number of cylinders or pages in use, the highest cylinder or page in use, and the percentage of cylinders or pages in use.

To display the list of all CP-owned system volumes containing directory space, enter:

```
query alloc drct all
```

In response, CP lists all of the CP-owned volumes that contain directory space. For each allocation map extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of cylinders or pages, the number of cylinders or pages in use, the highest cylinder or page in use, and the percentage of cylinders or pages in use.

To display the allocation mapping of all CP-owned system volumes, enter:

```
query alloc map all
```

In response, CP lists all of the CP-owned volumes that contain temporary disk, directory, paging, or spooling space. For each extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of cylinders or pages in use, the highest cylinder or page in use, the percentage of cylinders or pages in use, and the allocation type of the extent.

*Table 1 (Page 1 of 3). Status of Real Devices*

<b>Device Status Keyword</b>	<b>Keyword Meaning</b>	<b>Device Type</b>	<b>Type of Status</b>
<b>ASSIGNED SYSTEM</b>	The device is available for a dump, an SPTAPE or SPXTAPE function, or a TRSAVE function.	Tape drive	Active (CP)
<b>ATTACHED TO</b>	The device is dedicated to the indicated virtual machine.	Any	Active (dedicated)
<b>BOXED</b>	The device is unavailable to users.	Any	Boxed
<b>CP OWNED</b>	The device is used by the system for paging, directory, temporary disk space, and spooling activity.	DASD	Active (CP)
<b>CP SYSTEM</b>	The device contains user minidisks.	DASD	Active (CP)
<b>DIALED TO</b>	The device is dedicated to the indicated virtual machine through the DIAL command.	3270 display, communication lines	Active (dedicated)

Table 1 (Page 2 of 3). Status of Real Devices

Device Status Keyword	Keyword Meaning	Device Type	Type of Status
<b>DISABLED</b>	The device is unavailable to users.	Display, 3270 printer, communication lines	Free
<b>DRAINED</b>	The device is unavailable for processing spool files.	Unit record device	Free
<b>DRAINING</b>	The device will become unavailable for processing spool files after finishing the current file.	Unit record device	Active (CP)
<b>ENABLED</b>	The device is available to users but is not in use.	Display, 3270 printer, communication lines	Free
<b>FREE</b>	The device is available but is not in use.	DASD, CTCA, tape drive	Free
<b>INT REQ</b>	The device requires operator intervention.	Unit record device	Active (CP)
<b>INT REQUIRED</b>	The device requires operator intervention.	Any	Active (CP or dedicated)
<b>LOGON AS</b>	A user has logged on to the device.	Display, communication lines	Active (CP)
<b>MOUNT REQ</b>	A printer or card punch is waiting for you to change the paper or cards (mount a new form).	Card punch, printer	Active (CP)
<b>OFFLINE</b>	The device is unavailable to CP.	Any	Offline
<b>PRINTING</b>	The device is printing a spool file.	Printer	Active (CP)
<b>PUNCHING</b>	The device is punching a spool file.	Card punch	Active (CP)
<b>READING</b>	The device is reading a card deck.	Card reader	Active (CP)
<b>SEC</b>	Specifies the security label of files that can be printed on the printer. This is used only when an ESM is installed and security label checking is enabled. If a security label is not assigned to the printer, the SEC field is followed by the word NONE. No files can be printed until the printer is STARTed with a valid security label.	Printer	Active (CP)
<b>SETUP REQ</b>	An impact printer is waiting for you to check the alignment of the paper on the printer.	Printer	Active (CP)

## Bringing Up the System

Table 1 (Page 3 of 3). Status of Real Devices

Device Status Keyword	Keyword Meaning	Device Type	Type of Status
STARTED	The device is available for processing spool files.	Unit record device	Active (CP)
SUBCHOFF	The subchannel for this device is disabled.	Any	Offline
Volume identifier	The device is available but is not in use.	DASD	Free

## Preparing the System for a Possible Failure

The final thing you need to do to finish bringing up the VM/ESA system is to prepare the system for a possible failure. This includes the following tasks:

- Setting up the system abend dump environment
- Making sure CP tracing is active
- Getting ready to take a CP stand-alone dump
- Making sure error recording is on
- Making sure symptom record recording is on
- Making sure CP is logging activity at your operator's console
- Getting ready to recover the production system.

## Setting Up the System Abend Dump Environment

Unless your installation requires you to do otherwise, you should make sure VM/ESA's abend dump environment is set up so that:

- A dump device is defined and is either a DASD or a tape drive
- Any dump CP produces includes only CP's pages
- CP tries to restart VM/ESA after an abend occurs.

**Note:** If you define your dump device as a printer, dump all of real storage, or specify that CP should not restart after an abend occurs, the V=R preferred machine may not recover after a system incident.

To find the current dump environment settings, enter:

```
query dump
```

CP's response indicates:

- The type of dump device (DASD, TAPE, or PRINTER) and its real device number(s), or that the dump device is undefined (PRINTER)
- What portion of real storage is to be included in the dump (V=R, including V=F, CP, or ALL)
- Whether CP tries to restart the system after it takes the dump (IPL or NOIPL)
- If the dump device is a DASD, how much spool space is allocated for a system dump (PAGES).

Make sure the dump device is either DASD or TAPE. If the dump device is PRINTER, if the wrong device is defined, or if the response says ALL or NOIPL, you need to define the correct device or appropriate options.

To set the dump device to a DASD, enter:

```
set dump dasd ip1 cp
```

To set the dump device to a tape, be sure to use the correct device number for your installation. Enter:

```
set dump rdev ip1 cp
```

where *rdev* is the real device number of the tape drive your installation uses for the dump device.

To set the dump device to multiple DASDs or tapes, be sure to use the correct device numbers for your installation. Enter:

```
set dump rdev1 rdev2 rdevn ip1 cp
```

where *rdev1*, *rdev2*, and *rdevn* are the real device numbers of the DASDs or tape drives your installation uses for dump devices. Note that the *rdevs* must be all DASD or all tape.

If you wish to specify a printer as a dump device, or if you need more information on the options you can specify on the SET DUMP command, see the *VM/ESA: CP Command and Utility Reference* book.

## Making Sure CP Tracing Is Active

Unless your installation directs you to do otherwise, make sure CP tracing is active.

When CP tracing is active, CP records information about various system events in one or more CP trace tables in storage. When a system abend occurs, CP includes the trace tables in the abend dump. The detailed history of system activity in the CP trace table helps support personnel diagnose the cause of the abend.

When CP tracing is not active, CP does not record this information, and it is more difficult to diagnose the cause of a system failure. Therefore, you should make sure CP tracing is active.

When you bring up VM/ESA, CP tracing is active. To make sure that CP is tracing all events, enter:

```
query cptrace for all
```

## Bringing Up the System

If CP is tracing all events, it displays the following response:

```
FOR NONSPECIFIC  
ALLCODES ENABLED  
NO SPECIFIC TRACE SET
```

If CP displays something else, you can cause CP to trace all events by entering:

```
set cptrace for specific reset  
set cptrace for all on
```

For more information about the QUERY CPTRACE and SET CPTRACE commands, see the *VM/ESA: CP Command and Utility Reference* book and the *VM/ESA: Diagnosis Guide* book.

## Getting Ready to Take a CP Stand-Alone Dump

Make sure your installation has put the VM/ESA stand-alone dump utility on either tape or DASD. If the stand-alone dump utility is on tape, you should know where the tape is. If it is on DASD, you should know which volume.

In addition to knowing the location of the program, you should know which devices to use with the program. If you do not know which device to use as the IPL device, or if you do not know which devices the program recognizes as dump devices, contact the person at your installation who last generated the stand-alone dump program.

For information about using the stand-alone dump utility, see “Running the Stand-Alone Dump Utility” on page 302.

## Making Sure Error Recording Is Active

CP creates environmental error record editing and printing (EREP) records to record hardware errors. These records can help support personnel diagnose hardware problems. Accordingly, when you bring up VM/ESA, make sure that error recording is active.

To find out how to check the status of error recording and what to do if it is inactive, see “Finding Out the Status of Error Recording” on page 250.

## Making Sure Symptom Record Recording Is Active

CP includes symptom records in every dump. The symptom record service machine can place these records in a separate CMS file. This can help support personnel identify known problems and their fixes without first reading the dumps. Accordingly, when you bring up VM/ESA, make sure that symptom record recording is active.

To find out how to check the status of symptom record recording and what to do if it is inactive, see “Collecting Symptom Record Information” on page 260.

## Making Sure CP Is Logging Operator Console Activity

When you bring up VM/ESA, CP normally records activity at the primary system operator's console in a console log. The console log contains all the commands you enter and all the responses you receive while you are logged on to the operator's virtual machine. It also contains any error or informational messages that CP sends you. If the system abends, CP saves the console log in a spool file, which you can print later. Information in the console log can help support

personnel determine the cause of the abend. Therefore, make sure CP is recording activity at your operator's virtual console in a console log.

To find out whether CP is logging your console's activity, enter:

```
query virtual console
```

On the first line of CP's response, you will see either START or STOP. If it says START, CP is already logging your console activity.

If it says STOP, enter:

```
spool console start
```

CP then starts logging the activity at your operator's console.

For more information on starting and printing a console log, see "Collecting Information about System Events" on page 233.

**Note:** Some installations may not define a virtual console for the primary system operator's virtual machine. If you enter the QUERY VIRTUAL CONSOLE command, and your virtual machine has no virtual console, CP responds that it cannot find your console. In this case, you cannot start a console log unless you enter:

```
define console as vdev
```

where *vdev* is the virtual device number you want to assign to the virtual console.

Once you have defined a virtual console, you can check to make sure CP is logging its activity by using the QUERY VIRTUAL CONSOLE command.

## Getting Ready to Recover a Production System

If CP abnormally terminates, you must know how to recover your production systems. For example, you must know whether a production system is the V=R or V=F preferred machine. If you do not know how to recover a production system, or you do not know whether a production system is the V=R or V=F preferred machine, see Chapter 6, "Responding to Errors" on page 211.

You are now finished bringing up the VM/ESA system.

---

## Responding to Errors during Bring-Up

This chapter has already discussed most of the errors you are likely to encounter. Being unable to perform a warm start is one example. But one other error you may run into requires you to recover the VM/ESA user directory.

## Recovering the User Directory

If there is a problem with the VM/ESA user directory, for example, data is incorrect, CP may not be able to initialize that directory. When this happens, contact your installation's support personnel before you proceed. Then bring up the system without the user directory. See "Bringing Up the System Without a User Directory (NODIRECT)" on page 26. After you do this, CP logs on the primary system operator without trying to use the operator's user directory definition. Instead, CP uses a default definition of the operator's virtual machine.

## Bringing Up the System

If the problem with the user directory does not prevent CP from initializing that directory, it may still prevent CP from using the directory definition to log on to the primary system operator. Again, CP uses a default definition of the operator's virtual machine.

If you are the primary system operator, CP logs you on under these conditions as the default system operator. Because you are the default system operator, your virtual machine has the following characteristics:

- Your logon ID is the one your installation specified on the OPERATOR operand on the SYSTEM\_USERIDS statement in the system configuration file or in the SYSOPR macro in HCPSYS.
- You have all command privilege classes, A through G.
- You have 2047 megabytes (MB) of virtual storage.
- Your virtual console is a virtual 3270 with virtual device number 001.

If you are the default system operator, you are authorized to perform all the tasks you normally perform. However, you are not linked to other virtual machines' minidisks, where data you may need to access is stored. For example, you may need to access the EREP records stored on the error recording virtual machine's A disk.

As the default system operator, you must recover the user directory before you do anything else.

### Preparing to Recover the User Directory

Preparing to recover the user directory involves the following tasks:

- Getting a printed copy of the directory entries for the following minidisks:
  - The minidisk containing the CMS system disk
  - The minidisk containing the directory source file
  - The minidisk containing the system configuration file or the VM/ESA system residence (SYSRES) volume.
- Preventing new users from linking to these minidisks
- Removing existing links to the minidisks
- Setting up your virtual machine.

Before you start to recover the directory, you must:

1. Get a printed copy of the directory entry for:
  - The CMS system disk (usually MAINT 190)
  - The minidisk containing the CMS file that is used to update the directory.

You must also find out the volume identifier and the virtual device number assigned to the DASD pack that contains the object directory. This information is specified on the DIRECTORY control statement (which is the first statement in the directory source file) and is necessary to recover the user directory.

2. Find out the real device number of your virtual console. Enter:

```
query userid
```

where *userid* is your logon ID. CP responds with your logon ID and the real device number of your virtual console.

3. Prevent any new users from logging on. Enter:

```
disable all
```

4. Reenable your virtual console:

```
enable rdev
```

where *rdev* is the real device number of the display you are using for your virtual console.

If you do not enter this command and somehow you are disconnected, you cannot log back on. You will have to reload the system to log on again.

5. Using information in the printed copy of the directory, find out the real device numbers of the DASDs that contain the following minidisks:

- Minidisk containing the CMS system disk (usually MAINT 190)
- Minidisk containing the directory source file
- Minidisk containing the system configuration file or the VM/ESA SYSRES volume.

For each volume, enter:

```
query dasd valid
```

where *valid* is the volume identifier of each volume.

CP's response indicates the real device number, the volume identifier, and the number of links to minidisks contained on the volume. Record the real device numbers and note whether there are links to any of the volumes.

6. If there are no links to any of the volumes, proceed to step 9 on page 46.

Otherwise, find out which users are linked to minidisks on the volumes. Later in this procedure, enter the DEFINE MDISK command for each of the volumes. If there are any links to the volumes, the DEFINE MDISK command does not complete successfully.

To find out which users are linked to minidisks on a volume, enter:

```
query system rdev
```

where *rdev* is the real device number of the DASD on which the volume resides.

CP's response lists all of the users who are linked to minidisks on the volume and the virtual device numbers each user assigned to the minidisks. Note both the users and the virtual device numbers.

7. Ask all users to detach the minidisks from their virtual machines. For example, for each volume, enter:

```
warning all problem with the user directory  
warning all please detach link to valid
```

where *valid* is the volume identifier of the selected volume.

Enter QUERY SYSTEM commands to determine when all users have detached their minidisks on the three volumes.

8. If users do not detach their minidisks in a reasonable amount of time, try to log off each of the users by entering:

```
force userid
```

where *userid* is the ID of a user who still has a link to one of the minidisks.

## Bringing Up the System

If you are unable to log off the users with the FORCE command, contact your support personnel. At this point, you must perform a system restart from your processor complex's system console. A system restart produces a dump that your support personnel may wish to use to diagnose the problem with the FORCE command.

9. Enter the following command to ensure that your virtual console is operating in VM mode:

```
terminal mode vm
```

10. Make sure you have enough storage to IPL CMS and to update the user directory.

Later in the procedure, IPL CMS (as 190). You must have 20MB of virtual storage to do so. This should also be enough storage to allow you to use the DIRECTXA command successfully. If you IPL a named system, (CMS) 16MB of storage may suffice. However, if you IPL 190, then you will need 20MB of storage.

To find out how much storage you have in your virtual machine, enter:

```
query virtual storage
```

If you want to change this amount to 20MB, enter:

```
define storage 20m
```

**Note:** If you cannot define enough storage for your virtual machine, reload the system with the NODIRECT option. See “Bringing Up the System Without a User Directory (NODIRECT)” on page 26. The NODIRECT option gives you (as the default system operator) 2047MB of virtual storage, which should be enough to update the directory.

You are now ready to start the directory update process.

### Updating the User Directory

Updating the user directory requires you to:

- Define required minidisks
- Bring up CMS in your virtual machine
- Change, if necessary, the directory source file
- Use the DIRECTXA command
- Restore normal system operation.

1. Define the required minidisks.

Using the information contained in the printed copy of the directory entries you obtained earlier, define:

- The minidisk containing the CMS system disk
- The minidisk containing the directory source file
- The minidisk containing the system configuration file or the VM/ESA SYSRES volume (this is where the new directory is placed).

**Note:** If you have problems defining any of the minidisks, go back to step 5 on page 45.

*To define the minidisk containing the CMS system disk, enter:*

```
define mdisk as 190 start count valid
```

where *start* is the decimal number that defines the cylinder or block on the real disk that corresponds to the first cylinder or block of the CMS system minidisk;

*count* is a decimal number that specifies the number of cylinders or blocks that make up the minidisk; and *valid* is the volume identifier of the real DASD volume on which the minidisk resides. (Your copy of the directory entry for the CMS system disk indicates the values you must specify for *start*, *count*, and *valid*.)

To define the minidisk containing the directory source file, enter:

```
define mdisk as 191 start count valid
```

where *start* is the decimal number that specifies the cylinder or block on the real disk that corresponds to the first cylinder or block of the minidisk containing the directory source file; *count* is a decimal number that specifies the number of cylinders or blocks that make up this minidisk; and *valid* is the volume identifier of the real DASD volume on which the minidisk resides. (The directory entry for the minidisk containing the CMS file for updating the directory indicates the values you must specify for *start*, *count*, and *valid*.)

To define the minidisk containing the user directory, enter the following command:

```
define mdisk as vdev start count valid
```

where *vdev* is the virtual device number that is assigned the DASD pack on which the directory resides; *start* is the decimal number that defines the cylinder or block on the DASD that is to be considered cylinder/block 0 for this minidisk. *count* is the total number of cylinders or blocks this pack contains; and *valid* is the volume identifier of this pack. (The values you specify for both *vdev* and *valid* must match the device number and volume identifier specified on the DIRECTORY statement in the directory.)

### 2. Bring up CMS in your virtual machine.

After you have defined all three minidisks, enter the following command to bring up CMS in your virtual machine:

```
ipl 190
```

### 3. Change, if necessary, the directory source file.

If you think there is a problem with the CMS files containing the directory source statements, use the CMS XEDIT command to update this source file. For information about changing the directory source statement files, see the *VM/ESA: Planning and Administration* book.

If you think the directory was somehow destroyed and only needs to be recreated, go directly to the next step.

### 4. Use the DIRECTXA command.

When you are satisfied that the directory source file is correct, enter:

```
directxa filename
```

where *filename* is the name of the CMS file containing the source statements for the directory. This file should have a file type of DIRECT. If it does not, specify the file type as well as the file name when you enter the DIRECTXA command.

**Note:** When writing a user directory, DIRECTXA does not overwrite the current directory but does write an alternate user directory. The directory pointer in cylinder 0 or block 1 is then changed to reference this new directory. It is advisable, therefore, to enter the DIRECTXA

## Bringing Up the System

command twice. This assures that the directory you wish to use is available; otherwise, you may lose your directory again.

### 5. Restore normal system operation.

Once you recover the directory, you should do one of the following:

- Log off and log back on using your normal logon ID
- Enter the SHUTDOWN command to shut down the system and then follow normal procedures for bringing it back up.

In either case, once you are logged on under your normal logon ID, enter the following command to enable other users to log on:

```
enable all
```

You must enter this command because you disabled all devices in Step 3 on page 45.

### Notes:

1. You can use this process to recover the VM/ESA user directory at any time. However, if the directory source file is all right, simply enter the DIRECTXA command after you enter the IPL 190 command.
2. If, after you recover the directory, you determine there are still problems with the source file (or if there are problems that need to be fixed before you can recover the directory), you may have to update the directory source file. For information on how to do this, see the *VM/ESA: Planning and Administration* book.

---

## Summary of Bringing Up the System

Figure 3 on page 49 summarizes the procedures for bringing up the VM/ESA system.

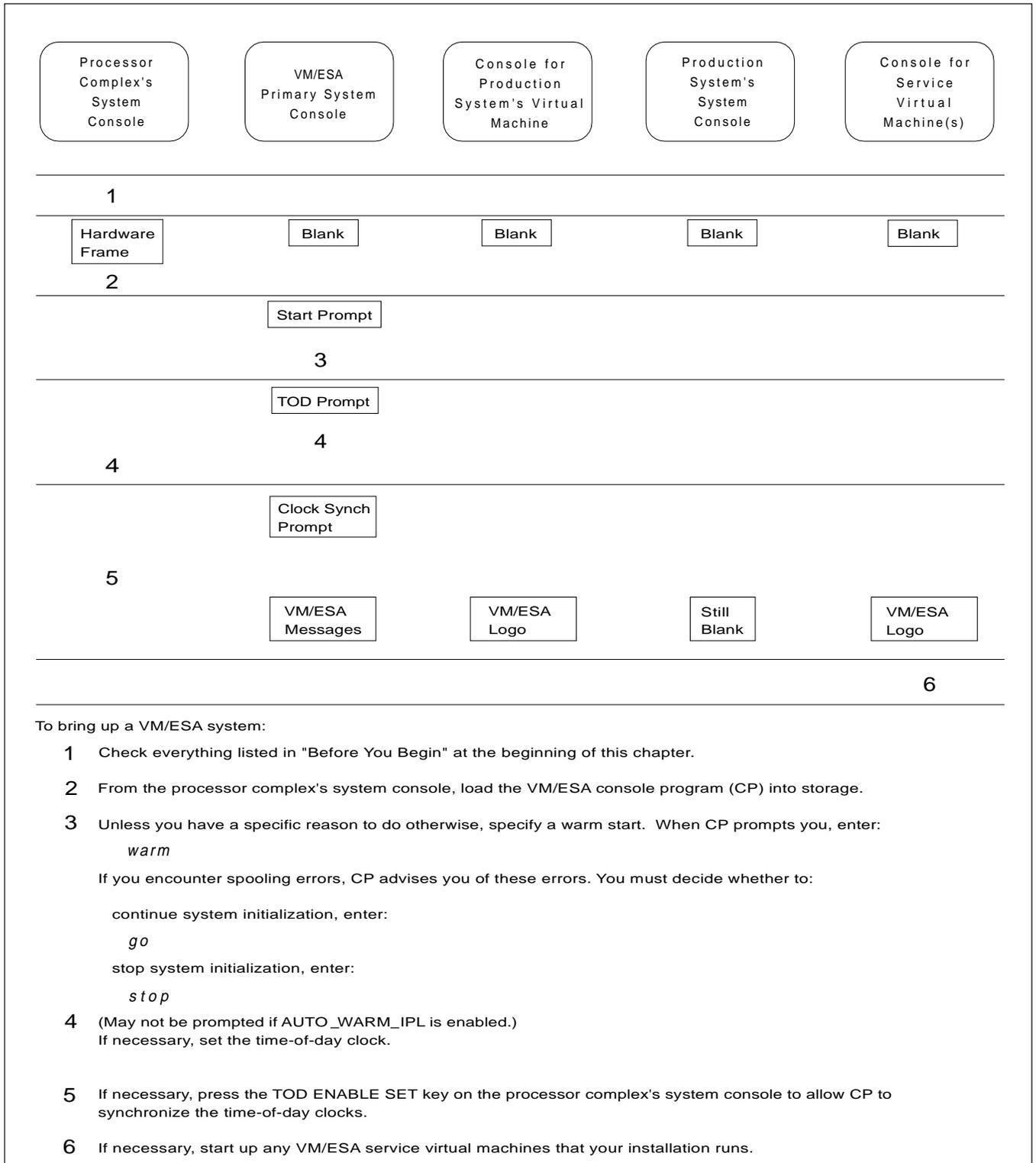


Figure 3 (Part 1 of 4). Summary of Bringing Up the System

## Bringing Up the System

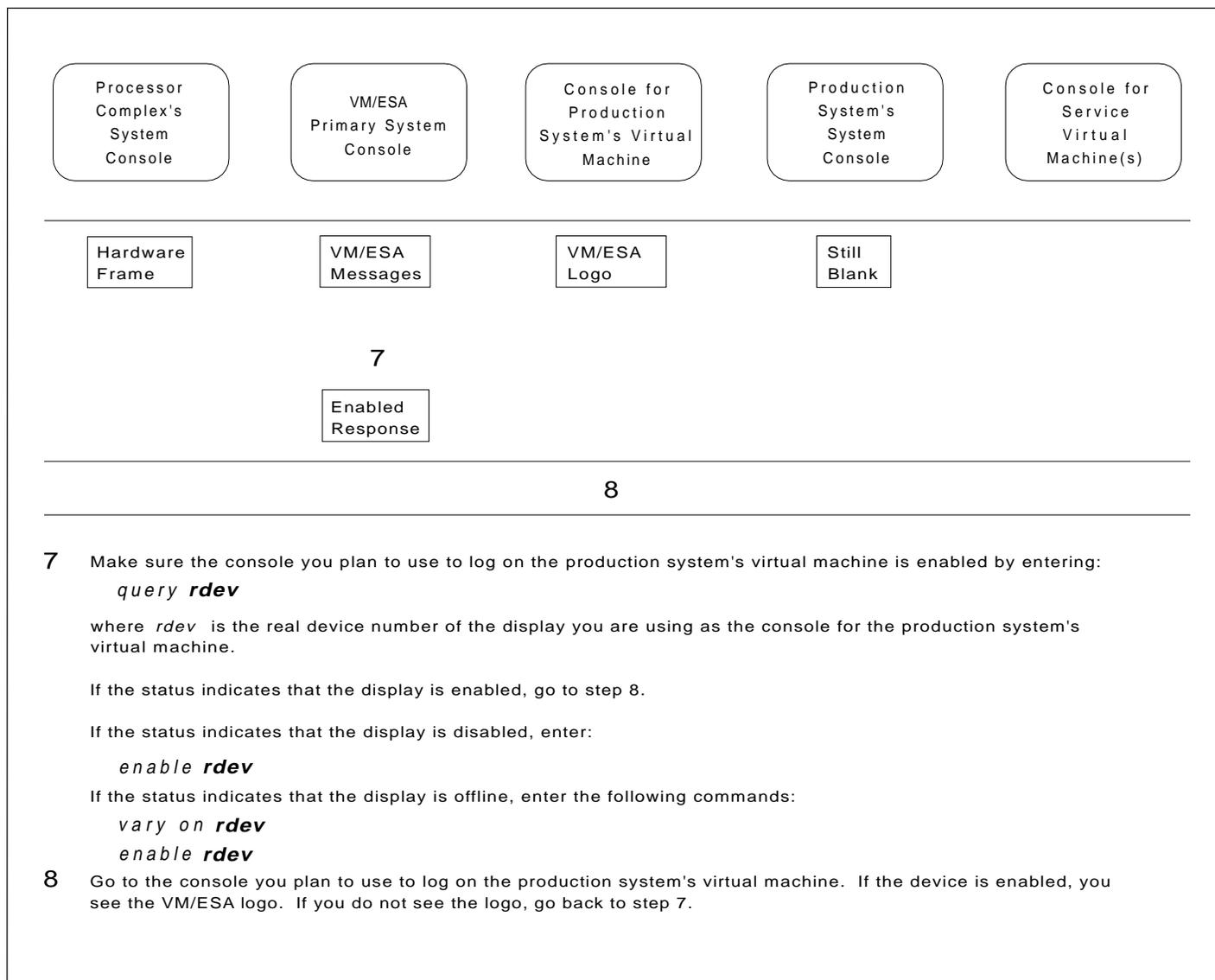


Figure 3 (Part 2 of 4). Summary of Bringing Up the System

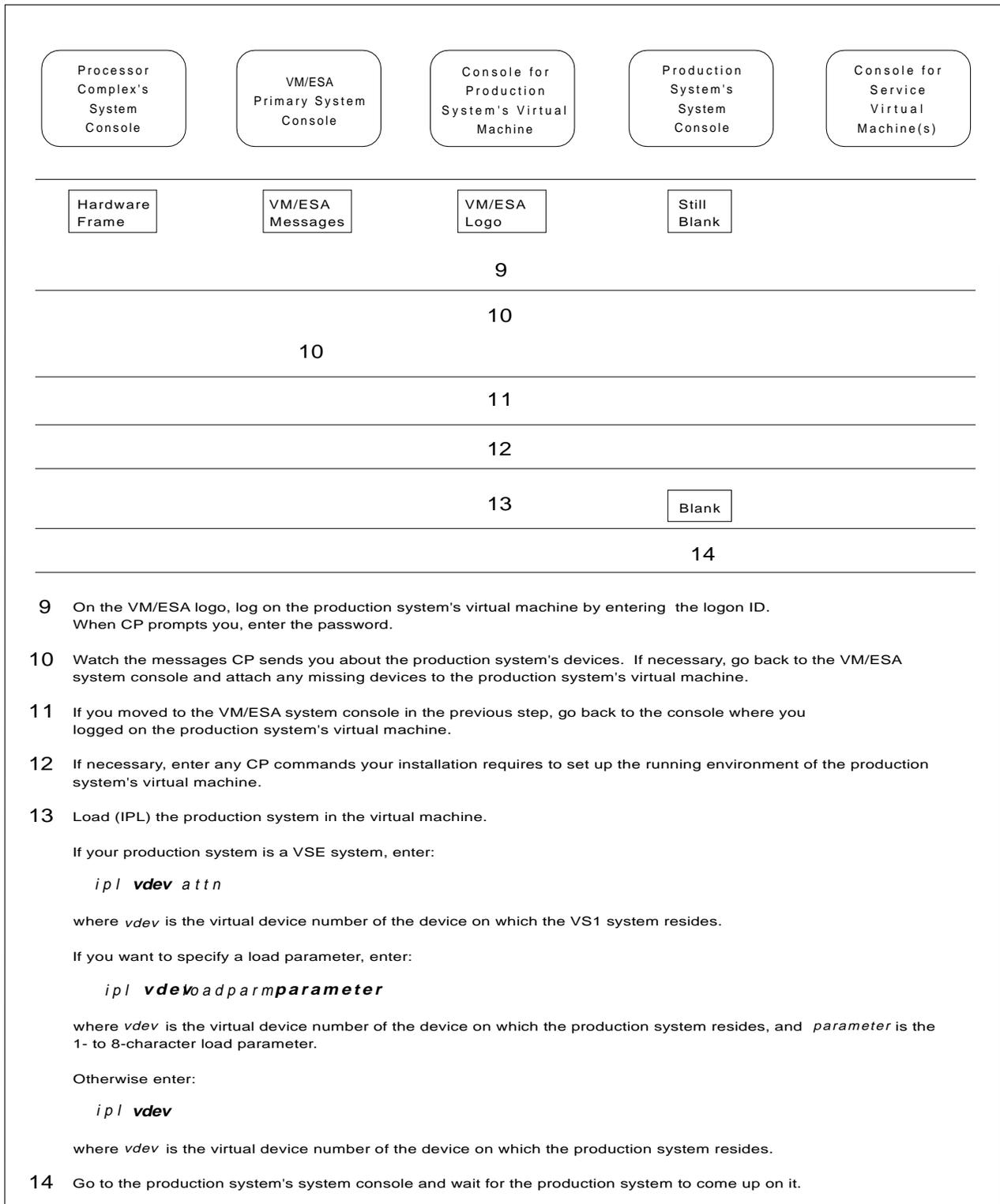


Figure 3 (Part 3 of 4). Summary of Bringing Up the System

## Bringing Up the System

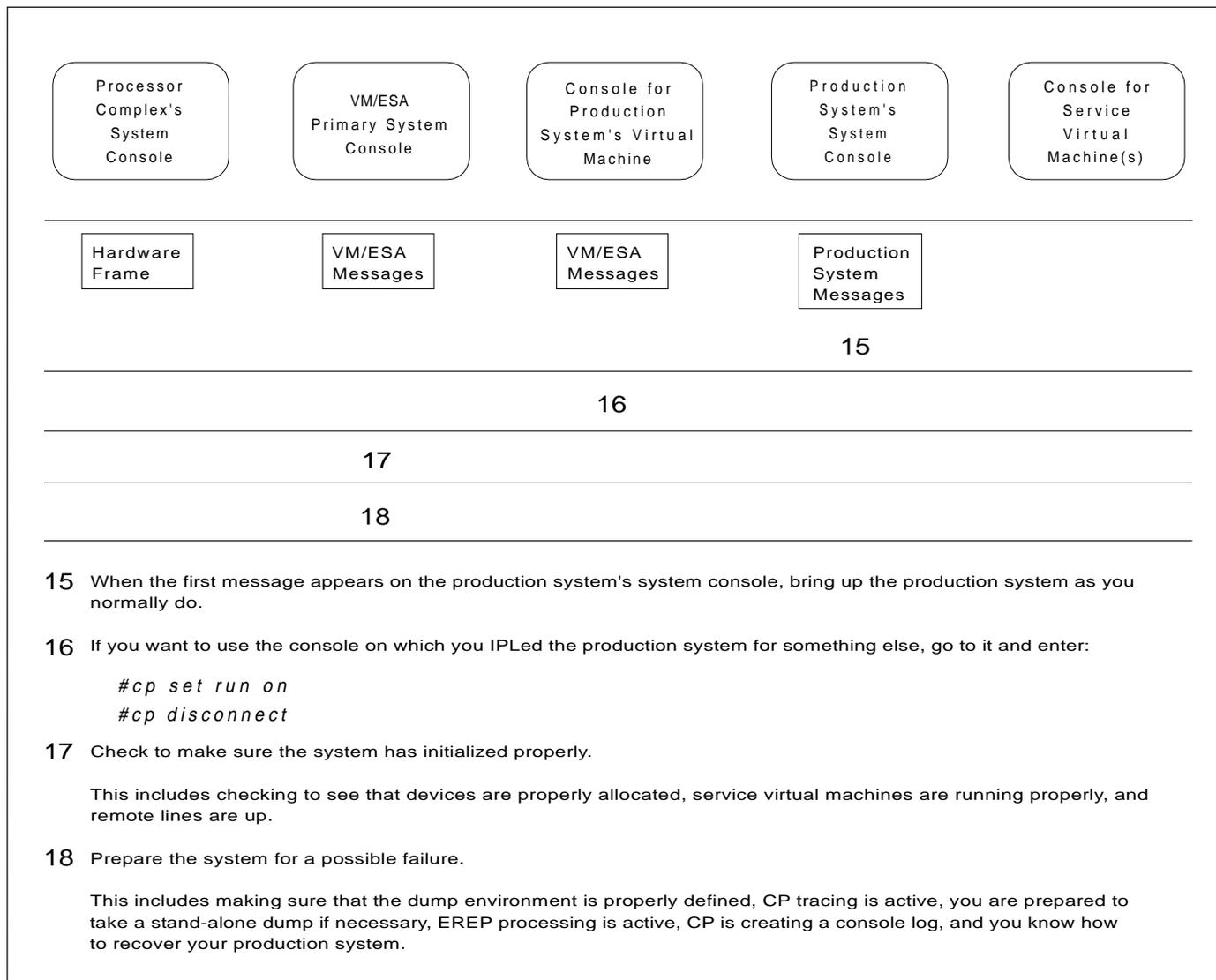


Figure 3 (Part 4 of 4). Summary of Bringing Up the System

---

## Chapter 4. Running the System

This chapter tells you how to run the system under normal conditions. It describes all the tasks required to run the system except controlling local devices. Information about controlling local devices is located in Chapter 5, “Controlling Local Devices” on page 85.

If you need only a brief summary of the tasks in this chapter, see “Summary of Running the System” on page 80.

After reading this chapter, you can:

- Locate information about checking system status
- Check the commands your ID is authorized to use
- Check the status of system users
- Watch the system for changes and requests
- Locate information about controlling local and remote devices
- Control processors and storage
- Control Vector Facilities (if available)
- Control a Cryptographic Facility (if available)
- Control Expanded Storage (if available)
- Locate information about how to control the system's service virtual machines
- Communicate with users of the system.

---

### Checking System Status

As a VM/ESA operator, you are responsible for making sure that the system's resources are available to users. One of the first things you need to know, then, is what the status of the system is.

If you just brought up the system, you should have a good idea. “Checking the Initialization of System Resources” on page 35 discusses checking the status of the system when you first bring it up.

If the system is already running when you come on shift, you need to find out about particular aspects of the system. These include its:

- CP accessed minidisks
- Performance
- Processors
- Vector Facilities (if any)
- Cryptographic Facility (if any)
- Storage
- Expanded Storage (if any)
- Devices
- Service virtual machines
- Users.

You may also want to know the level of VM/ESA you are running.

Most of these items are discussed either later in this chapter or elsewhere in this book. The items discussed elsewhere are:

- System performance (see “Collecting Performance Information” on page 235)

## Running the System

- The status of the system's local devices (see “Checking the Status of Real Devices” on page 36).

The items discussed in this chapter are:

- The status of the system's real processors (see “Controlling Processors” on page 61)
- The status of the system's real Vector Facilities (see “Controlling Vector Facilities” on page 63)
- The status of the system's cryptographic facility (see “Controlling the Cryptographic Facility” on page 65)
- The status of the system's real storage (see “Controlling Storage” on page 66)
- The status of the system's expanded storage (see “Controlling Expanded Storage” on page 69).

The sections that follow tell you how to check the:

- Release level of CP you are running
- Commands and DIAGNOSE codes your ID can use
- Status of the service virtual machines
- Status of the cross system extensions complex (CSE)
- Status of the system users
- Virtual device number of any virtual device.

### Checking the Release Level of CP

To find out information about the level of CP you are running, enter:

```
query cp|level
```

In response, CP displays the software release and service level numbers, the date and time when CP was generated, and the date and time when CP was last IPLed.

### Checking Where CP Was Loaded from and What Parm Disk Was Used

To find the location of system definition information (CP nucleus or CP module) and the parm disk that CP used at IPL time, enter:

```
query cpload
```

In response, CP tells you if CP was loaded from a nucleus installed on the IPL volume and if the system used a parm disk at IPL time. For more information about the QUERY CPLOAD command, see the *VM/ESA: CP Command and Utility Reference* book.

### Finding Out What Commands and DIAGNOSE Codes Your ID Can Use

To find out what commands and DIAGNOSE codes your ID is authorized to use, enter:

```
commands
```

In response, CP displays a list of commands and DIAGNOSE codes that your ID has been authorized to use.

## Checking the Status of the System's Service Virtual Machines

To check the status of the accounting and error recording (EREP) virtual machines, use the CP QUERY RECORDING command. For more details, see “Finding Out the Status of Accounting” on page 241 or “Finding Out the Status of Error Recording” on page 250.

You can exempt service virtual machines from free storage limit detection by using the SET STGEXEMPT command. For more information about the SET STGEXEMPT command, see the *VM/ESA: CP Command and Utility Reference* book.

To check the status of the licensed program service virtual machines, use the commands appropriate to those products. Supported licensed programs that require service virtual machines include RSCS and VM/Pass-Through.

## Checking the Status of the Cross System Extensions Complex (CSE)

If you want to find out if the CSE complex is active, enter:

```
xspool query
```

For specific hardware and software requirements to support the CSE function for VM/ESA, see the *VM/ESA: General Information* book.

## Checking the Status of System Users

Checking the status of system users includes determining:

- How many users are logged on
- The maximum number of users who can log on
- Who is logged on
- The system resources CP has allocated to a user
- If a particular logon ID belongs to the V=R or V=F virtual machine
- A user's scheduling share.

### Finding Out the Number of Users

To find out how many users are logged on to VM/ESA, enter:

```
query users
```

or, when CSE is active and you want responses from all systems in the CSE complex, enter:

```
query users at all
```

CP's response indicates how many users are logged on and how many have entered the DIAL command. (A user enters the DIAL command to gain access to an operating system another user is running in a virtual machine.)

### Finding Out the Maximum Number of Users Who Can Log On

To find out the maximum number of users who can log on to VM/ESA, enter:

```
query maxusers
```

CP's response indicates the maximum number of users allowed to log on.

### Setting the Maximum Number of Users Who Can Log On

To set the maximum number of users who can log on to VM/ESA, enter:

```
set maxusers nnnn
```

where *nnnn* is the maximum number of users allowed.

### Listing the Logon IDs of Users

To list the logon IDs of all users who are logged on to VM/ESA, enter:

```
query names
```

or, when CSE is active and you want responses from all systems in the CSE complex, enter:

```
query names at all
```

CP responds with the logon ID of each logged-on user and the device number where the user is logged on. The device may be a real or logical device. If the user is disconnected, CP displays

DSC

### Finding Out If a Specific User Is Logged On

To find out whether a specific user is logged on, *userid* command (CP) *userid* command (CP) enter:

```
query userid
```

or

```
query users userid
```

or, when CSE is active, enter:

```
query users userid at all
```

where *userid* is the logon ID of that user.

If the user is logged on, CP responds with the logon ID you specified and the device number where the user is logged on. The device may be a real or logical device. If the user is disconnected, CP displays

DSC

### Checking a User's System Resource Usage

To find out what system resources CP has allocated to a user, enter:

```
indicate user userid
```

where *userid* is the logon ID of the virtual machine user you are checking.

CP's response to this command indicates:

- The user's logon ID (USERID).
- Which mode the virtual machine is running in (MACH):

370

XA

ESA

XC

Table 2 on page 57 contains a summary of virtual machine designations with their resulting architecture modes.

<i>Table 2. Virtual Machine Architecture Modes</i>		
<b>Virtual Machine Designation</b>	<b>Resulting Virtual Machine Architecture on an ESA/370 Processor</b>	<b>Resulting Virtual Machine Architecture on an ESA/390 Processor</b>
370	System/370	System/370
XA	ESA/370	ESA/390
ESA	ESA/370	ESA/390
XC	(incorrect request)	ESA/XC

\* ESA/390 is upwardly compatible with ESA/370.

- The user's virtual machine storage size (STOR), in megabytes (MB) or kilobytes (KB).
- Whether the user is running a V=R, V=F, or V=V virtual machine (VIRT).
- The size, in megabytes, of any expanded storage dedicated to the user's virtual machine (XSTORE).
- The virtual device number or name of the named saved system specified on the last IPL command the user entered (IPLSYS).
- The number of devices attached to the user (DEVNUM).
- The number of virtual storage pages in real storage (RES), in the working set (WS), locked (LOCK), or reserved (RESVD).
- The number of pages, owned by the user, residing on DASD.
- The number of page reads (READS) and page writes (WRITES) for this user since logon.
- The number of the virtual processor.
- The user's connect time (CTIME), virtual time (VTIME), and virtual and simulation time (TTIME).
- The number of I/O requests the user has made (IO).

A plus sign (+) indicates that the user has used the start interpretive execution assist. Therefore, the number of I/O requests may actually be larger than shown.

- The number of virtual cards the user has read (RDR) and punched (PCH), and the number of virtual lines the user has printed (PRT) since logon or since entering the last ACNT command.
- If one or more Vector Facilities are installed, the user's virtual Vector Facility time (VVECTIME) and total Vector Facility time (TVECTIME).

The virtual time indicates the user's Vector Facility use since logon. The total time equals the virtual time plus the time CP has used a Vector Facility on behalf of the user.

### Finding Out If a Logon ID Is Running a V=R, V=F, or V=V Machine

To find out if a particular logon ID is running a V=R, V=F, or V=V machine, enter:  
indicate user *userid*

where *userid* is the logon ID of the virtual machine you are checking on. If the response contains VIRT=R, the logon ID is the V=R preferred machine. If the response contains VIRT=F, the logon ID is running as V=F. If the response contains VIRT=V, the logon ID is running as V=V.

### Finding Out If a Logon ID is Subject to Free Storage Limit Detection

To find out if a particular logon ID is subject to free storage limit detection, enter:  
QUERY STGEXEMPT *userid*

where *userid* is the logon ID of the virtual machine you are checking on.

The response will indicate that either the virtual machine is subject to or exempt from free storage limit detection. You can change this condition by using the SET STGEXEMPT command. There may be an additional response saying that free storage limit detection is off for the system. The SET STGLIMIT command can be used to turn free storage limit detection on for the system.

To list the logon IDs of all users currently exempt, enter:

```
QUERY STGEXEMPT ALL
```

For more information about the QUERY STGEXEMPT ALL command, see the *VM/ESA: CP Command and Utility Reference* book.

### Finding Out a User's Scheduling Share

You may need to find out how much of the system's processing power is assigned to a user (the user's scheduling share). To do this, enter:

```
query share userid
```

where *userid* is the user's logon ID. CP's response tells you the:

- Kind of share assigned (ABSOLUTE, ABSCPU, or RELATIVE)
- Amount of the share (an absolute percentage or relative number)
- Number of processors dedicated to the user, if any.

The kind of share assigned may be one of the following:

- ABSOLUTE, which indicates the user's share is a percentage of all the processing power that remains after taking out any dedicated processor and the resources required for CP overhead
- ABSCPU, which indicates the user's share is a percentage of one processor's worth of processing power
- RELATIVE, which indicates that CP assigns a processing share to the user that takes into account the shares of other relative users. CP assigns the relative shares after absolute shares, and absolute shares after dedicated processors and CP overhead.

## Changing the Virtual Device Number of Any Virtual Device

You can change the number of any virtual device in the configuration by using the REDEFINE command. When you use REDEFINE to alter the configuration of the virtual machine, the changes made are temporary and are in effect only for the current session. Responses are sent to the display console to confirm the configuration change request has taken place. If you have entered SET IMSG OFF, these responses do not appear on your console.

**Note:** Virtual paging subsystem devices should not be redefined. The integrity of the user's virtual paging subsystem may be lost if it is redefined.

To redefine the virtual device number, enter:

```
redefine vdev1 as vdev2
```

where

*vdev1*

is the virtual device number of an existing virtual device

*vdev2*

is the new virtual device number.

For example, if 01CF is the current device number of a 3278, the command:

```
redefine 01CF as 01EF
```

redefines device number 01CF as 01EF.

If you change the virtual device number of a multiple-exposure device, you must specify the base exposure as both *vdev1* and *vdev2*. This redefines all exposures.

For example, if 01B0 is the device number of a 2305, the command:

```
redefine 01B0 as 01D0
```

redefines device numbers 01B0 through 01B7 as 01D0 through 01D7, respectively.

**Note:** If the virtual machine is an XA virtual machine, the virtual device numbers specified can be no higher than FFFF. If the virtual machine is a 370 virtual machine, the virtual device numbers specified can be up to FFFF, but the virtual machine can use only virtual device numbers 0 through 1FFF.

The following response confirms the virtual device number has been changed:

```
type vdev DEFINED
```

---

## Watching the System for Changes and Requests

You will spend much of your time watching the system for changes in system availability and for requests from users for resources. In general, you need to watch the:

- VM/ESA system console
- Production system's system console.

### Watching the VM/ESA System Console

On the VM/ESA system console, you receive messages from the operating system and from VM/ESA users.

The operating system sends you messages about hardware errors, software errors, and resource shortages. It also sends you informational messages about such matters as when users log on and log off.

VM/ESA users who need to have tapes or DASD volumes mounted may send messages to make their requests.

Watching the VM/ESA system console lets you respond quickly to system errors and VM/ESA user requests.

### Watching the Production System's System Console

You will probably spend most of your time watching the production system's system console. But this depends on the operating system you are running and its workload. It also depends on whether your production system is part of a larger network of operating systems.

Watching the production system's system console allows you to keep tabs on the part of the system that is doing the most work.

---

### Controlling Local Devices

A large part of your job as a VM/ESA system operator is controlling local devices. The next chapter, Chapter 5, "Controlling Local Devices" on page 85, contains information about controlling the following types of local devices:

- Dynamic switching devices
- 3270 devices and communication lines
- DASDs
- Tape drives
- CTCAs
- OSAs
- Printers
- Punched card devices (card readers and card punches).

It also tells you how to control:

- Channel paths to local devices
- SNA/CCS terminals.

---

### Controlling Remote Devices

If your installation has installed the VM/Pass-Through Facility, users at remote locations can use 3270 displays to log on to VM/ESA. They may also use 3270 printers to print hard copy at their remote sites.

If your installation has installed VM/VTAM or VTAM Communications Network Application (VCNA), users of Systems Network Architecture/Console Communication Services (SNA/CCS) terminals can log on to VM/ESA. To control these devices, you can use the following types of commands:

- CP
- VCNA
- VSCS
- VTAM.

Because you can use SNA/CCS terminals as either local or remote devices, more information about them is in Chapter 5, “Controlling Local Devices” on page 85.

For more information on using the commands, see the appropriate library.

If your production system's configuration includes remote devices, use appropriate production system commands to control them.

---

## Controlling Processors

Sometimes you may need to use CP commands to control the real processors available to VM/ESA. For example, you may need to:

- Find out which processors are active
- Find out how CP is using processors
- Change the availability of processors to the system
- Change the scheduling of processors for users.

### Finding Out Which Processors Are Active

To find out which of your real processors are active, enter:

```
indicate load
```

or, when CSE is active and you want the response from another system in the CSE complex, enter:

```
indicate load at sysname
```

where *sysname* is a specific system in the CSE complex.

CP's response to this command includes the percent of time each processor is running. The processors that the response lists are the active processors.

### Finding Out How CP Is Using Processors

CP uses a real processor in one of the following ways:

- As the *master* processor. The master processor is the processor on which certain CP system work is required to run. It is usually the processor on which you last IPLed the system.
- As an *alternate* processor. In a multiprocessor system, an alternate processor is a processor that is neither the master processor nor a dedicated processor. A uniprocessor system has only one processor, the master processor.
- As a *dedicated* processor. A dedicated processor is a processor that CP reserves for the sole use of a virtual processor belonging to a virtual machine.

To find out how CP is using each real processor in your configuration, enter:

```
query processors
```

In response, CP displays each online processor and its use as a master, alternate, or dedicated processor. If a processor is dedicated, CP also displays the logon ID

of the virtual machine and the address of the virtual processor to which the real processor is dedicated.

## Changing the Availability of Processors to the System

Under normal circumstances, you bring up and run the system with all the processors in the processor complex or partition. But if support personnel at your installation instruct you to do so, you may use the VARY ONLINE PROCESSOR or VARY OFFLINE PROCESSOR commands to control whether a processor is available to VM/ESA.

For more information on these commands, see the *VM/ESA: CP Command and Utility Reference* book.

## Changing the Scheduling of Processors for Users

By scheduling and dispatching their work, CP makes sure that all virtual machines get to use the real processor resources. Your installation can influence the scheduling of a user's virtual machine in several ways:

- By changing the share of the system's processing power assigned to the user
- By changing the temporary boost CP gives users who are working at displays (the system's interactive bias)
- By changing how much time CP gives each user to use real processor resources before CP reassigns the processor to another user (the dispatching time slice)
- By dedicating a processor to a virtual processor belonging to a user (or removing it).

Usually, your installation sets up the scheduling shares for each virtual machine during system generation. CP supplies default values for the system's interactive bias and for the dispatching time slice, which your installation may use. Also, in a multiprocessor system, CP automatically dedicates one or more processors to the V=R preferred machine when you log it on. Thus, when you bring up the VM/ESA system, you usually do not have to adjust any of the scheduling controls.

However, if support personnel at your installation instruct you to do so, you may use one of the following commands:

- SET SHARE—to change a user's scheduling share
- SET SRM IABIAS—to change the system's interactive bias
- SET SRM DSPSLICE—to change the size of the dispatching time slice CP assigns each user
- SET SRM STORBUF—to view main storage as being partitioned when moving users from the eligible to dispatch lists
- SET SRM LDUBUF—to partition the system's paging resources when moving users from the eligible to dispatch lists
- SET SRM MAXWSS—to set maximum working size for users
- DEDICATE—to dedicate a processor to a virtual processor belonging to a virtual machine
- UNDEDICATE—to remove sole use of a processor from a virtual CPU belonging to a virtual machine.

For more information on these commands, see the *VM/ESA: CP Command and Utility Reference* book or the *VM/ESA: Planning and Administration* book.

---

## Controlling Vector Facilities

A Vector Facility is an extension to a processor that performs arithmetic and logical calculations faster than a normal processor does. One, some, or all of the processors in your processor complex may have Vector Facilities associated with them.

Each Vector Facility is associated with one and only one processor. A Vector Facility's address is the same as the address of its associated processor. Some of the commands you use to control Vector Facilities are the same as the commands you use to control processors.

You can use CP commands to:

- Find out the status of Vector Facilities
- List the Vector Facility users
- Change the availability of Vector Facilities to the system
- Change the availability of Vector Facilities to users.

## Finding Out the Status of Vector Facilities

To find out the status of Vector Facilities, enter:

```
query vector
```

In response, for each real Vector Facility associated with an online processor, CP tells you whether it is online or offline.

To find out which Vector Facilities are in use, enter:

```
indicate load
```

or, when CSE is active and you want the response from another system in the CSE complex, enter:

```
indicate load at sysname
```

where *sysname* is a specific system in the CSE complex.

In response, CP displays:

- The percentage of time each Vector Facility is being used (VEC)
- The number of active Vector Facility users and the number of Vector Facilities that are available to be shared (VECTOR).

## Listing the Vector Facility Users

You can use the QUERY VECTOR USERS command to list all of the Vector Facility users. CP considers a virtual machine to be a Vector Facility user when it has used a virtual Vector Facility at least once since the last LOGON, SYSTEM CLEAR, or DEFINE VECTOR command.

To list the logon IDs of all Vector Facility users, enter:

```
query vector users
```

## Running the System

In response, CP displays the total number of Vector Facility users and their logon IDs.

Some Vector Facility users may have used a Vector Facility earlier in their logon session but are not using it now. To find out the users who are using a Vector Facility now (the active and loaded Vector Facility users), you can use the INDICATE VECTOR command.

An *active Vector Facility user* is a virtual machine that is either in the dispatch list or in the eligible list and has used a Vector Facility during its last dispatching time slice. A *loaded Vector Facility user* is a virtual machine that has at least one virtual Vector Facility loaded in a real Vector Facility.

To find out which users are active or loaded Vector Facility users, enter:

```
indicate vector
```

In response, CP lists these two types of Vector Facility users.

First, CP lists the active Vector Facility users. For each virtual processor that used a Vector Facility in its last time slice, CP displays the logon ID and the virtual CPU address.

Second, CP lists the loaded Vector Facility users. For each virtual processor, CP shows the logon ID and virtual processor address, along with the address of the real Vector Facility in which the virtual Vector Facility is loaded.

## Changing the Availability of Vector Facilities to the System

Under normal circumstances, you bring up and run the system with all of the processors in the processor complex or partition. As CP brings each processor online, it also brings online its associated Vector Facility, if there is one. But if support personnel at your installation instruct you to do so, you may use the VARY ONLINE VECTOR or VARY OFFLINE VECTOR commands to control whether a Vector Facility is available to VM/ESA.

For more information on these commands, see the *VM/ESA: CP Command and Utility Reference* book.

## Changing the Availability of Vector Facilities to Users

The availability of a Vector Facility to a user depends on the status of its associated processor. If the processor is a master processor or an alternate processor, the Vector Facility is available for use by all virtual machines. If the processor is dedicated to a virtual machine, its Vector Facility is also dedicated to that virtual machine and is unavailable to other virtual machines.

Normally, you do not have to change the dedication of processors or Vector Facilities. However, if support personnel instruct you to do so, you may use the following commands:

- DEDICATE—to dedicate a processor and its Vector Facility (if any) to a virtual processor belonging to a virtual machine
- UNDEDICATE—to remove sole use of a processor and its Vector Facility (if any) from a virtual processor belonging to a virtual machine.

For more information on these commands, see the *VM/ESA: CP Command and Utility Reference* book.

To find out whether a processor is a master, dedicated, or alternate processor, see “Finding Out How CP Is Using Processors” on page 61.

---

## Controlling the Cryptographic Facility

The cryptographic facility is a hardware feature that provides cryptographic functions for VM/ESA. It is available only in ESA mode and only if a real cryptographic facility is installed on the processor.

You can use CP commands to:

- Find out the status of the cryptographic facility
- Change the availability of the cryptographic facility to users
- Enable or disable a user for cryptographic key entry on bipolar processors
- Enable or disable a user for PKSC modify commands on CMOS processors.

## Finding Out the Status of the Cryptographic Facility

To find out the status of the cryptographic facility, enter:

```
query crypto
```

In response, for each real cryptographic facility associated with an online processor, CP tells you whether it is usable or not usable. CP also tells you the user ID of the virtual machine that is enabled for key entry.

To find out the status of the installed cryptographic facility domains, enter:

```
query crypto domains
```

In response, for each installed domain if the cryptographic facility is online, CP tells you whether the domain is in use and the user ID of the virtual machine to which the domain is allocated.

To find out the status of the installed cryptographic facility CAM queues, enter:

```
query crypto camqs
```

In response, for each installed CAM queue if the cryptographic facility is online, CP tells you whether the CAM queue is in use and the user ID of the virtual machine to which the CAM queue is allocated.

For more information on these commands, see the *VM/ESA: CP Command and Utility Reference* book.

## Changing the Availability of the Cryptographic Facility to Users

The availability of a cryptographic facility to a user depends on the status of its associated processor. If the processor is a master processor or an alternate processor, the associated cryptographic facility is available for use by all virtual machines. If the processor is dedicated to a virtual machine, its cryptographic facility is unavailable to other virtual machines.

Normally, you do not have to change the dedication of processors or the cryptographic facility. However, if support personnel instruct you to do so, you may use the following commands:

## Running the System

- DEDICATE—to dedicate a processor and its cryptographic facility (if any) to a virtual CPU belonging to a virtual machine
- UNDEDICATE—to remove sole use of a processor and its cryptographic facility (if any) from a virtual CPU belonging to a virtual machine.

For more information on these commands, see the *VM/ESA: CP Command and Utility Reference* book.

## Enabling a User for Cryptographic Key Entry

Each cryptographic facility contains up to sixteen cryptographic domains. On bipolar processors, each domain holds a master key which can be entered from a key-entry unit. One user at a time can be enabled for key entry using the following command:

```
set crypto keyentry on userid
```

where *userid* is the user ID of the virtual machine to be enabled for entering keys.

**Note:** Users must be authorized to enter cryptographic keys with the key-entry unit on the cryptographic facility. This authorization is granted by placing the KEYENTRY operand on a user's CRYPTO directory control statement.

For more information on the SET CRYPTO command, see the *VM/ESA: CP Command and Utility Reference* book. For more information on the CRYPTO directory control statement, see the *VM/ESA: Planning and Administration* book.

## Enabling a User for PKSC Modify

One user at a time can be enabled for PKSC modify commands using the following command:

```
set crypto modify on userid
```

where *userid* is the user ID of the virtual machine to be enabled for PKSC modify.

**Note:** Users must be authorized for PKSC modify by placing the MODIFY operand on a user's CRYPTO directory control statement.

For more information on the SET CRYPTO command, see the *VM/ESA: CP Command and Utility Reference* book. For more information on the CRYPTO directory control statement, see the *VM/ESA: Planning and Administration* book.

---

## Controlling Storage

Sometimes you may need to query or control your processor complex's storage. You can use CP commands to:

- Check the allocation of real storage
- Reserve pages for a particular virtual machine
- Lock or release pages in storage
- Examine or change real values in storage.

## Free Storage Limit Detection

The free storage limit detection function keeps track of free storage so that a guest will not be able to bring the system down.

Use the `QUERY STGLIMIT` command to check the state of free storage limit detection for the system. Use the `SET STGLIMIT` command to control the state of free storage limit detection for the system.

Use the `QUERY STGEXEMPT` command to check the state of free storage limit detection for virtual machines. Use the `SET STGEXEMPT` command to control the state of free storage limit detection for virtual machines.

Exempting a user ID will ensure that the user ID is not subject to being stopped or forced due to the amount of free storage it causes CP to use. Exempting a user ID is recommended for special purpose user IDs that are vital to the installation, for example:

- User IDs running trusted code
- User IDs that should never be forced off the system.

If no action is taken, free storage limits will be enforced for all users.

## Checking Storage Allocation

To find the size of your system's storage and how it is allocated, enter:

```
query frames
```

## Running the System

The response to this command indicates, in 4KB (4096-byte) pages, how CP has allocated real storage. The first line of the response shows how much storage:

- Was initialized at IPL
- Is contained in your processor complex (REAL)
- Is usable (USABLE)
- Is offline (OFFLINE).

The second line shows how much of the usable storage CP has allocated for:

- The preferred virtual machines (V=R or V=F)
- The resident CP nucleus (RESNUC)
- Paging (PAGING)
- Trace tables (TRACE)
- The RIO370 area (RIO370).

The last line shows how much of the paging storage is:

- Available for general use (AVAIL)
- Allocated for the pageable portion of the CP nucleus (PAGNUC)
- Locked in real storage (LOCKRS)
- Locked in response to the CP LOCK command (LOCKCP)
- Allocated for dynamic save areas (SAVE)
- Free storage (FREE)
- Currently being used by DIAGNOSE code X'98' (LOCKRIO).

**Note:** Issue the Query VRFREE command to see the amount of V=R recovery storage that is allocated and currently in use.

## Reserving Pages

If support personnel instruct you to do so, you can use the SET RESERVED command to solve certain performance problems.

A virtual machine, especially one running a large operating system, needs a certain minimum number of pages in storage to run efficiently. Your installation can use the SET RESERVED command to ensure that CP reserves that minimum number for the virtual machine.

If you need to find information about reserved pages, you can use the QUERY RESERVED command.

For more information about the SET RESERVED command and the QUERY RESERVED command, see the *VM/ESA: CP Command and Utility Reference* book.

## Locking and Releasing Pages in Storage

If support personnel instruct you to do so, you can use the LOCK command to solve certain performance problems.

If CP is paging certain pages frequently, your installation can lock in storage selected pages of the pageable CP nucleus or selected pages that belong to a virtual machine. Locking pages in storage prevents CP from paging them out.

**ATTENTION:** Locking too many pages in storage can degrade system performance for other users or cause system termination. Accordingly, you should use this command only when support personnel instruct you to do so.

To release locked pages, you can use the UNLOCK command. If support personnel instruct you to, you can also use the UNLOCK command to release the V=R area or the RIO370 area. Once you release the V=R or the RIO370 area, however, you cannot re-create it for another virtual machine until you reload VM/ESA.

For more information about the LOCK and UNLOCK commands, see the *VM/ESA: CP Command and Utility Reference* book.

## Examining and Changing Values in Real Storage

If support personnel instruct you to do so, you can use the DISPLAY HOST STORAGE, DUMP HOST STORAGE, STORE HOST STORAGE, LOCATE CPREAL, and LOCATE CPVIRTUAL commands to examine, dump, change, and locate values in real storage, respectively.

**ATTENTION:** Exercise extreme caution in entering the STORE HOST STORAGE command. Careless storage alterations can cause abnormal terminations of your system, as well as security and integrity problems. Accordingly, you should use this command only when support personnel instruct you to do so.

**Note:** You may not be authorized to issue the STORE HOST STORAGE command if an external security manager (ESM) is installed on your system. For additional information, contact your security administrator.

For more information about these commands, see the *VM/ESA: CP Command and Utility Reference* book.

---

## Controlling Expanded Storage

If your processor complex has expanded storage, you may need to query or control it. You can use CP commands to:

- Find out its status
- Dedicate it to one or more VM/ESA users
- Retain some or all of it for CP's exclusive use
- Remove it from a VM/ESA user or from the production system.

## Finding Out the Status of Expanded Storage

To find out the status of Expanded Storage, enter:

```
query xstore
```

In response, CP displays the size of Expanded Storage in megabytes. If you have partitioned your processor complex, the value displayed is the amount of Expanded Storage available to the partition. Otherwise, it is the amount available to the entire processor complex.

If Expanded Storage is dedicated, CP displays the logon IDs to which Expanded Storage is dedicated. In addition, CP indicates how much Expanded Storage is available.

CP also displays minidisk cache information.

### Dedicating Expanded Storage to a User or Production System

To dedicate a part of Expanded Storage to a VM/ESA user or to the production system for its exclusive use, enter:

```
attach xstore userid nnnnnnnM
```

where:

*userid*

is the logon ID of the user or the production system

*nnnnnnnM*

specifies the size, in megabytes, of the Expanded Storage partition for the virtual machine or the production system.

To dedicate all of Expanded Storage to a VM/ESA user or to the production system, enter:

```
attach xstore userid all
```

where:

*userid*

is the logon ID of the user or the production system

**ALL**

specifies that the Expanded Storage that has not been retained for CP use, or already attached to other users, attaches exclusively to the virtual machine or the production system.

If you have dedicated Expanded Storage to the production system, enter, at the production system's system console, any commands that the production operating system requires to use expanded storage.

**Example — Dedicating Expanded Storage to the Production System:** The Expanded Storage on your processor complex should be dedicated to the production system, MVSESA. When you enter:

```
query xstore
```

CP tells you that some Expanded Storage is available. To dedicate the maximum possible to the production system, enter:

```
attach xstore mvsesa all
```

### Retaining Expanded Storage for CP's Use

To keep a part of Expanded Storage for CP paging, enter:

```
retain xstore nnnnnnnM
```

where *nnnnnnnM* specifies the size, in megabytes, of real Expanded Storage partition for CP exclusive use.

To retain all of Expanded Storage, enter:

```
retain xstore all
```

where ALL specifies that the Expanded Storage is retained for CP exclusive use.

If you don't want any retained Expanded Storage, enter:

```
retain xstore none
```

where NONE specifies that none of Expanded Storage is retained for CP use.

If you want to change the minidisk cache parameters to best balance I/O and paging performance, enter:

```
retain xstore mdc
```

where MDC indicates that the minidisk cache parameters are being changed.

## Removing Expanded Storage from a User or Production System

VM/ESA users usually remove Expanded Storage from their virtual machines by entering a DETACH XSTORE command. However, if you need to remove Expanded Storage from a VM/ESA user, be sure to contact the user first.

Removing Expanded Storage from the production system is the opposite of dedicating it. At the production system's system console, enter any commands that the production operating system requires to release the expanded storage from use.

Once you have contacted the user or have released the storage from the production system, you can remove the Expanded Storage. Enter:

```
detach xstore userid
```

where *userid* is the logon ID of the user or the production system.

---

## Controlling the System's Service Virtual Machines

Your installation may run one or more of the following service virtual machines:

- Accounting virtual machine
- Error recording (EREP) virtual machine
- Symptom record recording virtual machine
- Virtual machines required by supported licensed programs
- Batch virtual machine.

For information about operating the accounting, error recording, and symptom record recording virtual machines, see “Collecting Accounting Information” on page 239, “Collecting Hardware Error Information” on page 247, or “Collecting Symptom Record Information” on page 260.

For information about operating the CMS batch virtual machine or supported licensed programs in their virtual machines, see the appropriate publication listed in the bibliography.

---

## Communicating with Users

A final task essential to operating a VM/ESA system is communicating with users. As the primary system operator, to communicate with users you must be able to:

- Answer questions users ask.

You must be prepared to answer user questions about system availability and whether particular programs or devices are up. Users may also ask you about things that represent their work, such as jobs, spool files, and logon IDs.

You need to enter appropriate CP commands or production system commands to answer these questions.

## Running the System

- Inform users of scheduled changes to system availability.

To plan their use of the system, users need to know what the installation's planned changes are. Examples include what the weekend schedules are, when migration to new devices will take place, and when new software will be installed.

You can communicate your installation's planned changes by updating the VM/ESA system log message.

- Inform users of unscheduled changes to system availability.

When you must shut down the system without notice, as when a hardware error occurs, you should inform both your VM/ESA and production system users.

You can communicate such unscheduled changes to VM/ESA users by using the CP `WARNING` command. On the production system's system console, use appropriate production system commands to communicate with your production users.

- Remind users of an impending shutdown.

Again, you can use the CP `WARNING` command to tell VM/ESA users that you are about to shut down the system. On the production system's system console, use appropriate production system commands to communicate with your production users.

- Send informational messages to users.

To send messages without the urgency of a warning, you can use the CP `MESSAGE` command to communicate with VM/ESA users. On the production system's system console, use appropriate production system commands to communicate with your production users.

To communicate with VM/ESA users, you must use VM/ESA commands to:

- Create and change the system log message
- Send messages or warnings to users.

To communicate with production system users, you must use production system facilities similar to the log message and message commands.

---

## Creating and Changing the System Log Message

All VM/ESA users should know certain information about the system and its availability. Putting this information in the system log message brings it to the attention of all users as soon as they log on or reconnect.

If you specified `FEATURES ENABLE LOGMSG_FROM_FILE` in your system configuration file, CP searches for log message information on CP-accessed minidisks. Otherwise, you have to specify the contents of the log message using the `SET LOGMSG` command.

## Creating and Changing Log Message Files on CP-Accessed Minidisks

When a user logs on to the system, CP searches for specific files on the minidisks that are accessed at that time. You can specify which minidisks CP should access by placing CP\_ACCESS statements in the system configuration file or executing CPACCESS commands.

Depending on the features enabled in the system configuration file and the capabilities of the terminal used by the user that is logging on, CP searches for the following files on the lowest CP-accessed minidisk.

Table 3. Log Messages

Types of Log Message	SBCS File	DBCS File
system log message	SYSTEM LOGMSG	SYSTEM LOGDBCS
account log message	account LOGMSACC	account LOGDBACC
ACI group log message	acigroup LOGMSACI	acigroup LOGDBACI
user log message	userid LOGMSUSR	userid LOGDBUSR

**Note:** Account ID, ACI group, and user ID based log message files are only displayed if the corresponding support is enabled on the FEATURES statement of the system configuration file.

If the user's terminal is DBCS capable, CP attempts to find the relevant DBCS files mentioned in the table above. Should a DBCS file be missing, CP instead uses the contents of the corresponding SBCS file. If the user's terminal is not DBCS capable, CP attempts to find the SBCS file mentioned in the table above. In either case, if the SBCS file is not present on any CP-accessed minidisk, the corresponding part of the log message is omitted. If CP cannot find any of the files mentioned in the table, the user receives the following response:

There is no logmsg data

For example, let us assume that your system configuration file contains the following statement:

```
Features Enable LOGMSG_From_File ,
              Show_Account Yes ,
              Show_ACIGroup No ,
              Show_UserId Yes
```

Let us also assume that CP responds as follows to a QUERY CPDISKS command:

```
Label  Userid  Vdev Mode Stat Vol-ID Rdev Type   StartLoc  EndLoc
CF1    MAINT   0CF1 A   R/O  ESARES 0A0F CKD     2400     2449
CF1    MAINT   0CF2 B   R/O  ESARES 0A0F CKD     2450     2499
```

If a virtual machine called TESTER, with an account ID of 3GWTEST defined in its user directory entry, is logging on through a non-DBCS terminal, CP searches for the following files on its accessed minidisks:

- SYSTEM LOGMSG
- 3GWTEST LOGMSACC
- TESTER LOGMSUSR.

## Running the System

If all three files exists, their contents will be displayed on the user's terminal. Assume that there exists a file called SYSTEM LOGMSG on MAINT's CF1 disk containing the following records:

```
*****
*
*   The system will be shutting down early this evening   *
*
+   Contact Bob at extension 7665 if you need the system   *
+   later tonight.                                         *
+
*****
```

Assume that there exists a file called 3GWTEST LOGMSACC on MAINT's CF1 disk containing the following records:

```
*
*   Remember that all testing must be completed by June 1st *
*
*****
```

Finally, assume that there exists a file called TESTER LOGMSUSR on MAINT's CF2 disk containing the following records:

```
*
*   Access MAINT's 390 disk if you want to use the new     *
*   level of CMS.                                           *
*
*****
```

When user TESTER first logs on to the system, CP displays all records in the files that begin with an asterisk (\*):

```
LOGMSG - 15:58:39 EDT Thursday 06/11/92
*****
*
*   The system will be shutting down early this evening   *
*
*****
*
*   Remember that all testing must be completed by June 1st *
*
*****
*
*   Access MAINT's 390 disk if you want to use the new     *
*   level of CMS.                                           *
*
*****
```

The LOGMSG header record reflects the date and time the first file displayed in the log message was modified.

Should user TESTER issue a QUERY LOGMSG command, CP displays all records in the log messages files regardless of whether they begin with an asterisk or not:

```

LOGMSG - 15:58:39 EDT Thursday 06/11/92
*****
*
*   The system will be shutting down early this evening   *
*
*   Contact Bob at extension 7665 if you need the system  *
*   later tonight.                                         *
*
*****
*
*   Remember that all testing must be completed by June 1st *
*
*****
*
*   Access MAINT's 390 disk if you want to use the new    *
*   level of CMS.                                         *
*
*****

```

You can use the CPLISTFILE and CPTYPE commands to display the contents of the various parts of the log message or you can issue commands like:

- QUERY LOGMSG SYSTEM
- QUERY LOGMSG ACCOUNT 3GWTEST
- QUERY LOGMSG USER TESTER

to display the various parts of the log message on your terminal.

## Changing the Log Message

To change the contents of any of the log message files, follow these steps:

- Issue a CPRELEASE command instructing CP to release its access to the minidisk on which the file resides.
- Use the CP LINK and CMS ACCESS commands to gain access to the minidisk.
- Edit the file you wish to change.
- The CMS RELEASE and CP DETACH commands to release the minidisk and DETACH it from your virtual machine.
- Enter a CPACCESS command to re-establish CP's access to the minidisk.

Once you instruct CP to release its access to the minidisk, CP cannot read any files on the minidisk until it has been accessed again. We suggest, therefore, that you keep the log message files on two disks. When you wish to update the log message files, you can simply issue CPRELEASE for the first disk (CP will still have access to the second disk), make your changes, and enter CPACCESS to put the changes into effect. Next, enter CPRELEASE for the second disk, copy the changed log message files to the first disk, and issue CPACCESS to have CP access the second disk. Putting this information in the system log message brings it to the attention of all users as soon as they log on or reconnect.

To use the system log message to communicate with VM/ESA users, you must be able to:

- Create a new system log message

- Change an existing system log message.

### Creating a New System Log Message

To create a new system log message, enter:

```
set logmsg nn * text
```

where *nn* is the line number of the message in which this text is to appear. For example, if *nn* is 2, the text appears in the second line of the message. In addition to a header line that indicates when the log message was last updated, a system log message can contain up to 50 lines of information. Each line may contain up to 76 characters, including blanks.

**Example—Creating a New System Log Message:** If you enter:

```
set logmsg 1 * system was cold started at 10:34 1/19/91
set logmsg 2 * all files were purged
```

users receive the following system log message the next time they log on:

```
LOGMSG - 10:37:28 EDT WEDNESDAY 01/23/91
* SYSTEM WAS COLD STARTED AT 10:34 1/22/91
* ALL FILES WERE PURGED
```

**Note:** If you do not include the asterisk when you enter the SET LOGMSG command, users must enter the QUERY LOGMSG command to receive the message; they do not automatically receive it when they log on. You can therefore create a log message with:

- Basic messages (on lines with asterisks in the first position)
- More detailed messages (on lines without asterisks).

If you create a log message with both basic and more detailed messages, the log message is short when users log on but complete when they enter the QUERY LOGMSG command.

If you shut down the VM/ESA system, CP saves the system log message. Then, if you bring up the system using a warm start, the log message contains the same information it had before you shut down. If you did not shut down the system with the SHUTDOWN command, or if you bring up the system with a force or cold start, you may have to create a new system log message.

### Changing an Existing System Log Message

To change a specific line in an existing log message, enter the following command to find out its line number:

```
query logmsg
```

In response to this command, CP displays the log message. A log message contains:

- A header line that indicates the time the log message was last updated.

A sample header line might look like this:

```
LOGMSG - 10:37:28 EDT WEDNESDAY 01/23/91
```

- Up to 50 lines containing the line number and the log message text.

CP displays one line for each nonnull log message line. If all of the lines are null, CP sends you a message saying that there is no LOGMSG data. In addition, CP displays line numbers for nonnull log message lines only if you have class B privileges.

Once you know the line number of a specific line, you can enter a SET LOGMSG command to change it to the new text.

To delete a specific line from an existing log message, enter:

```
set logmsg nn null
```

where *nn* is the line number of the message you want to delete.

**Example 1—Changing Lines in an Existing Log Message:** Assume you have a 12-line system log message and you want to change the line that gives the time you plan to shut down today. When you enter the QUERY LOGMSG command, you find that the line you want to change is the fifth line. To change line five of the log message, enter:

```
set logmsg 5 * system will shutdown today at 1700
```

In response to this command, CP replaces line 5 of the log message with this new line. It displays the log message header and all 12 lines when a user logs on or enters the QUERY LOGMSG command.

**Example 2—Deleting Lines in an Existing Log Message:** Assume you have a 12-line system log message and you want to delete the last three lines. To delete lines 10, 11, and 12 of the log message, enter:

```
set logmsg 10 null
set logmsg 11 null
set logmsg 12 null
```

In response to this command, CP deletes the lines. When a user logs on or enters the QUERY LOGMSG command, CP displays the log message header and the new nine-line log message.

When you change the system log message, send a message to all logged-on users. The message should say that the log message has changed and that they can enter the QUERY LOGMSG command to display the new one. When a user enters the QUERY LOGMSG command, CP displays the updated log message on the user's display screen. (For information on sending messages, see "Sending Messages to VM/ESA Users.")

**Note:** If you have a CMS virtual machine, you can create a CMS EXEC file to make it easier to update the system log message. For information on how to create a CMS EXEC file, see the correct VM/ESA CMS book.

### Deleting the Entire System Log Message

To delete the entire system log message, enter:

```
set logmsg null
```

In response to this command, CP deletes the log message. When you enter a QUERY LOGMSG command, CP displays only the header line.

## Sending Messages to VM/ESA Users

In addition to including information in the system log message, you can communicate with VM/ESA users by sending a:

- General information message to all logged-on users
- General information message to a specific user
- Warning message to all logged-on users

- Warning message to a specific user.

### Notes:

1. The MESSAGE and WARNING commands are limited by the length of the input area. If the entire text of a message does not fit in this area, enter another command with the remaining text.
2. If an external security manager (ESM) is installed, you may not be authorized to use the MESSAGE or WARNING commands. However, messages sent to or from the system operator and messages sent with the ALL option are not subject to authorization checking by the ESM. For additional information, contact your security administrator.
3. If CP does not issue your message the way you entered it, it may be because you are including special line-editing symbols in the text of your message. For example, if logical line editing is in effect, the # symbol is your logical line-end symbol; if you include a # in your message text, CP cuts off your message.

To prevent CP from interpreting these symbols as logical line-editing functions, enter:

```
set linedit off
```

CP then issues your messages as you enter them.

### **Sending a General Information Message to All Users**

To send a general information message, such as "Query log for weekend schedule," to all logged-on users, enter:

```
message all query log for weekend schedule
```

or, when CSE is active and you want all users logged on all systems in the CSE complex to receive the message, enter:

```
message all at all query log for weekend schedule
```

The following message appears on the display screen of all users able to receive the message:

```
hh:mm * MSG FROM OPERATOR: QUERY LOG FOR WEEKEND SCHEDULE
```

where *hh:mm* indicates the time the message was sent.

Each user receives the message right away unless:

- An action is pending at the user's display  
In this case, the user receives the message when the action completes.
- The user is running in full-screen mode or has entered the SET MSG OFF command.  
In these cases, the user does not receive the message and you receive an error message.
- The user is not logged on.

### **Sending a General Information Message to a Specific User**

Sometimes you need to send only a general information message to a specific user. For example, if you need to inform user VMUSER1 that he is not authorized to use pack RC015, which he just asked you to mount, enter the following command:

```
message vmuser1 you are not authorized to use pack rc015
```

As soon as user VMUSER1 has no action pending at his display, the message appears on his display screen (provided he is not running in full-screen mode or has not entered the SET MSG OFF command). Only VMUSER1 receives this message.

### **Sending a Warning Message to All Users**

Occasionally, you may have a system problem that requires you to take some action, such as pressing the STOP button on the system console, that could disrupt a user's virtual machine operation. When this happens, enter the following command, instead of MESSAGE ALL, to inform all users of the situation:

```
warning all system error - pressing stop in 2 minutes
```

or, when CSE is active and you want all users logged on all systems in the CSE complex to receive the message, enter:

```
warning all at all system error - pressing stop in 2 minutes
```

In response, CP displays the message on all users' display screens within the next 60 seconds (provided they are not running in full-screen mode and have not entered the SET WNG OFF command). This should give them time to save what they are currently working on.

**Note:** If you use the MESSAGE command to send a warning, a user with an action pending does not receive it until that action completes, which may be too late.

### **Sending a Warning Message to a Specific User**

Sometimes you may have to send a high-priority message to a specific user. For example, user MVSOPR1 may submit a high-priority file that needs to be processed on printer 00E, but the printer is dedicated to user VMUSER1. Before you reassign the printer to user MVSOPR1, you may want to send user VMUSER1 the following warning message:

```
warning vmuser1 system needs printer 00e - draining in 5 minutes
```

If he is not running in full-screen mode and has not entered the SET WNG OFF command, user VMUSER1 receives this message within the next 60 seconds and should stop sending files to this printer for processing.

## **Updating the Production System's Log Message**

To update your production system's log message (if any), enter the appropriate production system commands from your production system console.

### Sending Messages to Production System Users

To send messages to your production system users, enter the appropriate production system commands from your production system console.

---

### Summary of Running the System

To run a VM/ESA system, you need to:

1. Check the status of the system.

This includes checking its performance, processors, Vector Facilities, cryptographic facility, storage, Expanded Storage, devices, service virtual machines, and users.

The items to check are:

- System performance (see “Collecting Performance Information” on page 235)
- The status of the system's real processors and their scheduling (see “Controlling Processors” on page 61)
- The status of the system's real Vector Facilities (see “Controlling Vector Facilities” on page 63)
- The status of the system's cryptographic facility (see “Controlling the Cryptographic Facility” on page 65)
- The status of the system's real storage (see “Controlling Storage” on page 66)
- The status of the system's Expanded Storage (see “Controlling Expanded Storage” on page 69)
- The status of the system's local devices (see “Checking the Status of Real Devices” on page 36)
- The status of the accounting and error recording (EREP) virtual machines (enter the CP QUERY RECORDING command)
- The status of the licensed program virtual machines (see the publications listed in the Bibliography).

To check the status of users, use the following CP commands:

- QUERY USERS—to find out how many users are logged on and dialed
- QUERY NAMES—to find out which users are logged on, as well as the real or logical device number of the display to which each user is logged on
- QUERY *userid*—to find out if a specific user is logged on
- INDICATE USER *userid*—to find out a user's system resource use
- INDICATE USER *userid*—to find out if a logon ID belongs to the V=R, V=F, or V=V virtual machine
- QUERY SHARE *userid*—to find out a user's scheduling share and if a processor is dedicated to the user's virtual machine
- QUERY MAXUSERS—to find out the maximum number of users allowed to log on to the system.

2. Watch the system for changes and requests.

This includes watching the VM/ESA system console and the production system's system console.

### 3. Control local devices.

To control local devices, see Chapter 5, "Controlling Local Devices" on page 85.

### 4. Control remote devices.

- To control remote devices, use VM/Pass-Through commands.
- To control SNA/CCS terminals, see Chapter 5, "Controlling Local Devices" on page 85. Use VCNA, VSCS, or VTAM commands.

### 5. Control processors and their scheduling.

To control processors or their scheduling, use the following CP commands:

- INDICATE LOAD—to find out which processors are active
- QUERY PROCESSORS—to find out how CP is using processors
- VARY ONLINE PROCESSOR—to make a processor available to the system
- VARY OFFLINE PROCESSOR—to make a processor unavailable to the system
- SET SHARE—to change a user's scheduling share
- SET SRM IABIAS—to change the system's interactive bias
- SET SRM DSPSLICE—to change the size of the dispatching time slice that CP assigns each user
- SET SRM STORBUF—to partition main storage
- SET SRM LDUBUF—to partition the system's paging resources when moving users from the eligible to the dispatch lists
- DEDICATE—to dedicate a processor to a virtual machine
- UNDEDICATE—to remove sole use of a processor from a virtual machine.

### 6. Control Vector Facilities.

To control Vector Facilities, use the following CP commands:

- QUERY VECTOR—to find out the status of Vector Facilities
- INDICATE LOAD—to find out which Vector Facilities are being used
- QUERY VECTOR USERS—to list the logon IDs of Vector Facility users
- INDICATE VECTOR—to list the active and loaded Vector Facility users
- VARY ONLINE VECTOR—to make a Vector Facility available to the system
- VARY OFFLINE VECTOR—to remove a Vector Facility from the system
- DEDICATE—to dedicate a processor and its associated Vector Facility to a virtual machine
- UNDEDICATE—to remove sole use of a processor and its associated Vector Facility from a virtual machine.

### 7. Control the cryptographic facility.

To control the cryptographic facility, use the following CP commands:

- QUERY CRYPTO—to find out the status of the cryptographic facility
- DEDICATE—to dedicate a processor and its associated cryptographic facility to a virtual machine
- UNDEDICATE—to remove sole use of a processor and its associated cryptographic facility from a virtual machine
- SET CRYPTO KEYENTRY—to enable or disable a user for cryptographic key entry on bipolar processors.
- SET CRYPTO MODIFY—to enable or disable a user for PKSC modify commands on CMOS processors.

### 8. Control storage.

To control storage, use the following CP commands:

- QUERY FRAMES—to find out how real storage is allocated
- SET RESERVED—to reserve pages for a virtual machine
- LOCK—to lock pages in storage
- UNLOCK—to release pages in storage
- LOCATE CPREAL—to search through CP's real storage
- LOCATE CPVIRTUAL—to search through CP's virtual storage
- DISPLAY HOST STORAGE—to display values in real storage
- DUMP HOST STORAGE—to dump areas in real storage
- STORE HOST STORAGE—to change values in real storage.

### 9. Control Expanded Storage.

To control the Expanded Storage on your processor complex (if any), use the following CP commands:

- QUERY XSTORE USER—to find out the status of Expanded Storage
- ATTACH XSTORE *userid*—to dedicate Expanded Storage to a virtual machine
- DETACH XSTORE *userid*—to remove Expanded Storage from a virtual machine.

### 10. Control the system's service virtual machines.

To control the accounting and error recording virtual machines, see “Collecting Accounting Information” on page 239 or “Collecting Hardware Error Information” on page 247, respectively.

To control RSCS and the VM/Pass-Through Facility, use commands appropriate to each product.

### 11. Communicate with users.

To communicate with VM/ESA users, use the following CP commands:

- QUERY LOGMSG—to display the system log message
- CPACCESS — to give CP access to new logmsg files

- CPRELEASE— to remove CP access to logmsg files
- SET LOGMSG *nn \* text*—to change the system log message so that every user sees the text of this line at logon
- SET LOGMSG *nn text*—to change the system log message so that users must enter QUERY LOGMSG to read the text of this line
- SET LOGMSG *nn NULL*—to delete a line from the system log message
- SET LOGMSG NULL—to delete the entire system log message
- MESSAGE ALL *text*—to send a message to all users
- MESSAGE *userid text*—to send a message to a specific user
- WARNING ALL *text*—to send a warning message to all users
- WARNING *userid text*—to send a warning message to a specific user.

To communicate with production system users, use the appropriate production system commands and facilities.

## Running the System

---

## Chapter 5. Controlling Local Devices

This chapter tells you how to use VM/ESA commands to control devices connected to your processor complex. After reading this chapter, you can control:

- Channel paths to devices
- Dynamic switching devices
- Displays, 3270 printers, and communication lines
- Systems network architecture (SNA/CCS) terminals
- Direct access storage devices (DASDs)
- Tape drives
- Channel-to-channel adapters (CTCAs)
- Printers and printer spool file queues
- Punched card devices (card readers and card punches) and reader and punch spool file queues.

**Note:** VM/ESA also provides the ability to change the real I/O configuration. CHPIDS, CONTROL UNITS, and DEVICES can be added, deleted, and modified dynamically without an IPL or POR (Power On Reset).

---

### How This Chapter Is Organized

This chapter begins with an overview of how devices are used by VM/ESA. Following the overview are sections that tell you how to control channel paths and each type of local device:

- “Channel Paths and Programs” on page 86
- “Dynamic Switching Devices” on page 89
- “Displays, 3270 Printers, and Communication Lines” on page 89
- “SNA/CCS Terminals” on page 97
- “Direct Access Storage Devices (DASDs)” on page 99
- “Tape Drives” on page 127
- “Channel-to-Channel Adapters (CTCAs)” on page 137
- “Printers” on page 143
- “Card Punch Devices” on page 179.

As part of the sections on printers and punched card devices, this chapter also describes how to manage spool files. When you need information about a spool file in a printer, reader, or punch queue, see the appropriate section:

- “Controlling Spool Files in the Print Queue” on page 169
- “Controlling Spool Files in the Reader Queue” on page 184
- “Controlling Spool Files in the Punch Queue” on page 199.

For a summary of the commands you use to control devices, see Appendix A, “Common Operator Commands for VM/ESA” on page 317.

---

### Overview of Local Devices

As a VM/ESA operator, you need to understand how VM/ESA uses devices that are available to it. You will be controlling devices that:

- Support the system itself.

## Controlling Local Devices

These are the DASDs that contain the CP nucleus, the user directory, paging and spooling space, and temporary disk space. These devices contain space or data that VM/ESA needs in order to run.

This category also includes the dump device, which may be printers, DASDs, or tape. The dump device contains space that VM/ESA needs to produce a CP abend or stand-alone dump.

- Provide services for virtual machines.

This category includes real spooling devices, which process the printer, punch, and reader spool files that users create. Also, channel-to-channel adapters allow virtual machine users to access remote systems, send data to remote systems, and provide communications for loosely coupled multiprocessing systems. The IBM\* Enterprise Systems Connection Architecture\* (ESCON\*) I/O interfaces allow communication of data by using dynamic switching devices that connect multiple control units and ESCON channels designed to operate on fiber optic cables. This support provides reduced cable bulk, removes distance limitations on attachment of devices, improves security, and optimizes performance of devices and channels.

- Support the production system's virtual devices.

These are devices that are dedicated to the production system's virtual machine for its exclusive use. Any type of device may be dedicated to the production system: dynamic switching devices, displays, 3270 printers, communication lines, DASDs, tape drives, CTCAs, printers, and punched card devices.

- Support VM/ESA users' virtual devices.

Most devices that VM/ESA users use are not dedicated to them for their exclusive use. These include displays, 3270 printers, and communication lines that VM/ESA users use, and the DASDs that contain their minidisks.

However, you may dedicate devices to VM/ESA users, especially if they are running test machines.

---

## Channel Paths and Programs

A *channel path* connects a device to a processor complex's channel subsystem through a control unit or by direct attachment. The I/O configuration data set (IOCDS) that you select during system initialization defines the channel paths on the processor complex, the control units attached to the channel paths, and the I/O devices assigned to the control units.

The IOCDS defines the physical availability of a channel path to a device. VM/ESA allows you to control its logical availability. If a channel path is offline to a device, it is logically unavailable to that device. This means that CP prevents I/O to the device from using the channel path, even though the channel path may be physically available.

To control the channel paths logically available to devices, you must be able to:

- Find out channel path status
- Change the logical availability of a channel path to a device.

A *channel program* is one or more channel command words that control a specific sequence of data channel operations. Execution of the specific sequence is initiated by a single Start I/O instruction.

You can stop execution of an active channel program on a specified real device by using the HALT command.

**Warning:** Use the HALT command only in extreme cases and only after careful consideration. Indiscriminate use of HALT can cause unwanted results.

To stop execution of an active channel program, enter:

```
halt rdev
```

where *rdev* is the device number of the real device you want to stop.

After entering HALT, you should enter the QUERY (real devices) command to determine the status of the device. If the device is in an intervention-required state, you should make the device ready.

The following response indicates that CP has accepted the command and initiated action to halt the device:

```
HALT INITIATED TO type rdev
```

The following response indicates that HALT was issued to an idle device and that CP has not accepted the command:

```
HALT NOT INITIATED BECAUSE type rdev IS NOT ACTIVE
```

## Finding Out Channel Path Status

To find out channel path status by device, enter:

```
query paths to rdev
```

where *rdev* is the real device number of the device.

In response, CP lists all the channel paths that are physically available to the device and indicates whether the channel paths are logically online or offline.

To display the status of the machine's channel paths, enter:

```
query chpids
```

To find out channel path status by channel path, enter:

```
query chpid nn
```

where *nn* is the identifier of the channel path.

In response, CP lists all of the devices to which the channel path is physically available and, for each device, indicates whether the channel path is logically online or offline.

### Changing Channel Path Availability to a Device

Usually, your installation sets up the I/O configuration of your system before you bring up VM/ESA, in such a way that you do not have to change the availability of channel paths to devices. However, under certain error conditions, it can be useful to remove channel paths to devices temporarily while errors are being corrected. For example, when an error occurs that prevents a channel path from being used, you can remove the channel path from any devices to which it is physically available.

In addition, if devices are connected to multiple control units, you can isolate a control unit that needs service without affecting operation. In this case, you can remove the channel paths involving the control unit without affecting other channel paths.

To remove a channel path from a device:

1. If the device is in use by a virtual machine, *make sure the channel path is not in use.*

For example, if the device is in use by the production system, enter at the production system's system console any commands the production operating system requires to release the channel path from use.

IBM strongly recommends that you perform this step first to bring to an orderly end any I/O operations using the channel path that have been initiated by the virtual machine.

2. Enter:

```
vary offline path nn from rdev
```

where

*nn* is the identifier of the channel path.

*rdev*

is the real device number of the device.

In response, CP removes the channel path logically from the device. You can now remove the path physically without affecting CP operations.

To make a channel path available to a device, enter:

```
vary online path nn to rdev
```

where

*nn* is the identifier of the channel path.

*rdev*

is the real device number of the device.

In response, CP makes the channel path logically available to the device.

**Note:** If the path to a device is varied offline by the configuration manager, you must use the FORCE option of the VARY PATH command to vary the path online. If the FORCE option is not used, you receive a "request rejected" message. For more information about the VARY PATH command, see the *VM/ESA: CP Command and Utility Reference* book.

If the device status of the device you are attempting to logically vary the path on is SUBCHOFF, then you must first vary the subchannel online. An attempt to vary on a path to a device that is in the SUBCHOFF state will fail with a message. For more information about the VARY SUBCHANNEL command, see the *VM/ESA: CP Command and Utility Reference* book.

You may then either restore use of the channel path to the appropriate virtual machine yourself, or notify the operator of the virtual machine that the channel path is again available for use.

---

## Dynamic Switching Devices

Dynamic switching devices connect control units with ESCON channels designed to operate on fiber optic cables. To control dynamic switching devices you must be able to:

- Find out their status
- Make them available to the system
- Make them available for access by VM/ESA users
- Dedicate them to the production system
- Remove them from the production system
- Remove them from access by VM/ESA users
- To make them unavailable to the system

These tasks for dynamic switching devices, as well as for other devices, are described in the following section, “Displays, 3270 Printers, and Communication Lines.”

---

## Displays, 3270 Printers, and Communication Lines

To control displays, 3270 printers, or communication lines, you must be able to:

- Find out their status
- Make them available to the system
- Make them available for access by VM/ESA users
- Dedicate them to the production system
- Remove them from the production system
- Remove them from access by VM/ESA users
- To make them unavailable to the system
- Set up a 3270 printer to print a copy of a display screen
- Determine if a security label is associated with the printer.

**Note:** You may operate the IBM 5080 Graphics System as a dedicated display.

## Finding Out the Status of These Devices

To find out the status of a specific display, 3270 printer, or communication line enter:

```
query rdev
```

where *rdev* is the real device number of the device. To find out the status of all the displays and 3270 printers in your VM/ESA system, enter:

```
query graf all
```

To find out the status of all the communication lines in your VM/ESA system, enter:

```
query lines all
```

## Controlling Local Devices

To find out the status of all the dynamic switching devices in your VM/ESA system, enter:

```
query swch all
```

Table 4 lists the keywords that appear in responses to QUERY commands for displays, 3270 printers, communication lines, and dynamic switching devices. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active, free, or offline device
- Whether the keyword indicates a dedicated device or a device in use by CP.

Table 4. Display, 3270 Printer, Communication Line, and Dynamic Switching Device Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ATTACHED TO</b>	The device is dedicated to the indicated virtual machine.	Active (dedicated)
<b>DIALED TO</b>	The device is dedicated to the indicated virtual machine through the DIAL command.	Active (dedicated)
<b>DISABLED</b>	The device is unavailable to users.	Free
<b>ENABLED</b>	The device is available to users but is not in use.	Free
<b>INT REQUIRED</b>	The device requires operator intervention.	Active (CP or dedicated)
<b>LOGON AS</b>	A user has logged on to the device (display only).	Active (CP)
<b>OFFLINE</b>	The device is unavailable to CP.	Offline
<b>SEC</b>	Specifies the security label of files that can be printed on the printer. This is used only when an external security manager is installed and security label checking is enabled. If a security label is not assigned to the printer, the SEC field is followed by the word NONE. No files can be printed until the printer is STARTed with a valid security label.	Active (CP)
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled

## Making a Display, a 3270 Printer, or Communication Lines Available to the System

If a display, 3270 printer, or communication line is offline, you must make it available to the system in order to use it. To make it available to the system, enter:

```
vary online rdev
```

where *rdev* is the real device number of the device.

Now you may either make it available for access by VM/ESA users, or you may dedicate it to the production system.

## Making a Display, a 3270 Printer, or Communication Lines Available for User Access

To make a display, 3270 printer, or communication line available for access by VM/ESA users, do the following:

1. Make sure the device status says DISABLED. Enter:

```
query rdev
```

where *rdev* is the real device number of the device.

If the device status says OFFLINE, first follow the procedure described under “Making a Display, a 3270 Printer, or Communication Lines Available to the System” on page 90.

If the device status says DISABLED, go to the next step.

2. Enter:

```
enable rdev
```

where *rdev* is the real device number of the device.

If the device is a display or communication lines, a VM/ESA user may now use it to log on to the system. If it is a 3270 printer, a VM/ESA user may now use it to get a hard copy of his display screen. See “Setting Up a 3270 Printer to Print a Copy of a Display Screen” on page 95.

**Example 1—Making a Display Available for User Access:** VM/ESA user VMUSER1 is unable to log on display 4C3. When you enter:

```
query 4c3
```

CP tells you that display 4C3 is offline. To make it available for access by VMUSER1:

1. Enter:

```
vary online 4c3
```

2. Enter:

```
enable 4c3
```

VMUSER1 should now be able to log on VM/ESA or enter the DIAL command to gain access to an operating system running in a virtual machine.

**Example 2—Making a 3270 Printer Available for User Access:** VM/ESA user VMUSER1 has logged on display 4C3 and now needs access to 3270 printer 4C4. When you enter:

```
query 4c4
```

CP tells you that 3270 printer 4C4 is offline. To make it available for access by VMUSER1:

1. Enter:

```
vary online 4c4
```

2. Enter:

```
enable 4c4
```

VMUSER1 should now be able to use 3270 printer 4C4.

## Controlling Local Devices

### **Example 3—Making Communication Lines Available for User Access:**

VM/ESA user VMUSER1 is unable to log on communication line 4C5. When you enter:

```
query 4c5
```

CP tells you that communication line 4C5 is offline. To make it available for access by VMUSER1:

1. Enter:

```
vary online 4c5
```

2. Enter:

```
enable 4c5
```

VMUSER1 should now be able to log on VM/ESA.

## Dedicating These Devices to the Production System

To dedicate a display, 3270 printer, or communication line to the production system for its exclusive use:

1. Make sure the device status says DISABLED. Enter:

```
query rdev
```

where *rdev* is the real device number of the device.

If the device status says OFFLINE, first follow the procedure described under “Making a Display, a 3270 Printer, or Communication Lines Available to the System” on page 90.

If the device status says GRAF *rdev* LOGON AS or GRAF *rdev* DIALED TO, you must wait until it is no longer in use.

If the device status says ENABLED, first follow the procedure described under “Removing These Devices from the Production System” on page 93.

If the device status says DISABLED, go to the next step.

2. Enter:

```
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the device.

*userid*

is the logon ID of the production system.

*vdev*

is the virtual device number you want to assign to the device.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

3. At the production system's system console, enter any commands that the production operating system requires in order to use the device.

**Example 1—Dedicating a Display to the Production System:** The display 4C1 should be dedicated to the production system, MVSESA, as virtual device BC1. When you enter:

query 4c1

CP tells you that display 4C1 is offline. To dedicate it to the production system, MVSESA:

1. Enter:  
    vary online 4c1
2. Enter:  
    attach 4c1 mvsesa bc1
3. At the MVSESA system's system console, enter appropriate MVS/SP commands to make sure the display is usable.

**Example 2—Dedicating a 3270 Printer to the Production System:** The 3270 printer 5E1 should be dedicated to the production system, VSEAF1, as virtual device CE1. When you enter:

query 5e1

CP tells you that 3270 printer 5E1 is offline. To dedicate it to the production system, VSEAF1:

1. Enter:  
    vary online 5e1
2. Enter:  
    attach 5e1 vseaf1 ce1
3. At the VSEAF1 system's system console, enter appropriate VSE commands to make sure the 3270 printer is usable.

**Example 3—Dedicating Communication Lines to the Production System:** The communication line 6E1 should be dedicated to the production system, HPO370, as virtual device DEL. When you enter:

query 6e1

CP tells you that communication line 6E1 is offline. To dedicate it to the production system, HPO370:

1. Enter:  
    vary online 6e1
2. Enter:  
    attach 6e1 hpo370 del
3. At the HPO370 system's system console, enter appropriate VM/SP HPO commands to make sure the display is usable.

## Removing These Devices from the Production System

Removing a display, 3270 printer, or communication line from the production system is the opposite of dedicating it:

1. At the production system's system console, enter any commands that the production operating system requires in order to release the device from use.
2. Enter:  
    detach rdev userid

## Controlling Local Devices

where:

*rdev*

is the real device number of the device.

*userid*

is the logon ID of the production system.

A VM/ESA user may now use the display, communication line, or 3270 printer; or you may dedicate it to another virtual machine.

**Example 1—Removing a Display from the Production System:** To remove display 4C1 from the production system, MVSESA:

1. At the MVSESA system's system console, enter appropriate MVS/SP commands to make sure the display is not in use.

2. Enter:

```
detach 4c1 mvsesa
```

**Example 2—Removing a 3270 Printer from the Production System:** To remove 3270 printer 5E1 from the production system, VSEAF1:

1. At the VSEAF1 system's system console, enter appropriate VSE commands to make sure the 3270 printer is not in use.

2. Enter:

```
detach 5e1 vseaf1
```

**Example 3—Removing Communication Lines from the Production System:** To remove communication line 6F1 from the production system, HPO370:

1. At the HPO370 system's system console, enter appropriate VM/SP HPO commands to make sure the display is not in use.

2. Enter:

```
detach 6f1 hpo370
```

## Removing a Display, a 3270 Printer, or Communication Lines from User Access

Removing a display, 3270 printer, or communication line from user access prevents a VM/ESA user from using it to enter the LOGON or DIAL commands. To remove a display, 3270 printer, or communication line from user access:

1. Make sure it is not in use. Enter a QUERY command for the device to find out if it is.

If it is in use, ask the user to log off. Make sure the status says ENABLED before you go to the next step. Otherwise, the DISABLE command does not remove the device from user access.

2. Enter:

```
disable rdev
```

where *rdev* is the real device number of the device.

The display, 3270 printer, or communication line is now unavailable for user access to VM/ESA. You may now dedicate the device to the production system or make it unavailable to the system.

**Warning:** If you enter a DISABLE ALL command, immediately enter:

```
enable rdev
```

where *rdev* is the real device number of your primary system console. Doing this prevents CP from locking you out of the system if you accidentally get logged off or disconnected.

If you enter a DISABLE ALL command, CP disables all inactive displays, 3270 printers, communication lines, 328x printers, and SNA/CCS terminals. After each user logs off or disconnects, CP also disables that user's display. If you, as the primary system operator, log off or get disconnected, CP disables your display as well. In this circumstance, you can only log on again if one of the following is true:

- A still logged-on user with the right privilege class enters the ENABLE command to reenable your display
- You reload CP on the processor complex's system console.

However, if you immediately reenable your display, you avoid this situation.

## Making a Display, a 3270 Printer, or Communication Lines unavailable to the system

Making a display, 3270 printer, or communication line unavailable to the system is the opposite of making it available. p: To make it unavailable to the system:

1. Make sure it is not in use. Enter a QUERY command for the device to find out if it is.

If the status indicates that a user is logged on the display or communication line or is using the 3270 printer, follow the procedure at "Removing a Display, a 3270 Printer, or Communication Lines from User Access" on page 94. The status should read DISABLED before you go to the next step.

If the status indicates that it is dedicated to the production system, follow the procedure at "Removing These Devices from the Production System" on page 93. The status should read DISABLED before you go to the next step.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the device. The display, 3270 printer, or communication line is now unavailable to VM/ESA.

## Setting Up a 3270 Printer to Print a Copy of a Display Screen

You can set up a PF key on your display to copy its screen to a 3270 printer. To do this:

1. Make sure the 3270 printer is enabled.

If it is not, use the commands described under "Making a Display, a 3270 Printer, or Communication Lines Available to the System" on page 90. When you enter the QUERY command for the device, the status should read ENABLED before you go to the next step.

2. Enter:

```
set pfnn copy rdev
```

## Controlling Local Devices

where:

*nn* is the number of one of the PF keys on your display.

*rdev*

is the real device number of the 3270 printer.

When you press the PF*nn* key, a copy of your display screen goes to the 3270 printer you specified.

### Notes:

1. Some displays have a PRINT key that allows you to copy the contents of your display screen to a 3270 printer attached to the same control unit without intervention by CP. Although using the SET PF COPY command is similar, it is not the same as this hardware function.
2. Communication lines do not support the PF COPY command.

## Transferring Files from a 3270 Printer

The TRANSFER command transfers files from the printer queue of another user. If an ESM is installed, you may not be authorized to use the TRANSFER command. For additional information, contact your security administrator.

To transfer spool files from a printer, enter:

```
transfer prt class c|userid1|all to|from all|*|userid2 rdr|prt|pun
```

where:

**CLASS *c***

is the class of the spool files you want to transfer.

*userid1*

is the user whose files are to be transferred or reclaimed.

**ALL**

specifies the transfer of all files in the queue.

**TO|FROM \***

indicates to or from your own userid.

*userid2*

identifies the user to whom the files are transferred.

**Example 1—Transferring a Spool File from the Printer to a User:** A spool file with spoolid 0123 needs to be transferred from the print queue to the reader queue of USERX. To transfer the spool file, enter:

```
transfer prt 0123 to userx
```

**Example 2—Transferring Spool Files from the Printer to Your Reader:** Spool files on your printer queue need to be transferred to your reader queue. To transfer the spool files, enter:

```
transfer prt all to * rdr
```

**Example 3—Transferring Class B Files from the Printer Queue to Your Reader:** Class B files on your printer queue need to be transferred to your reader queue. To transfer the class B files, enter:

```
transfer prt class B to * rdr
```

**Example 4—Reclaiming Spool Files Sent to Other Reader Queues:** You need to reclaim spool files sent to the reader queues of other users and place them on your printer queue.

To do this, enter:

```
transfer prt all from all rdr
```

---

## SNA/CCS Terminals

An SNA/CCS terminal is any terminal accessing VM/ESA that is managed by a VTAM service machine.

Systems Network Architecture (SNA) is a logical structure containing formats, protocols, and operational sequences through which you can transfer information units and control the configuration and operation of networks. It allows the VTAM service machine to control the appearance of a VM/ESA terminal screen attached to the SNA network.

Terminals managed by the VTAM service machine may be:

- Local or remote
- SNA or non-SNA.

They may use communication lines or EBCDIC character sets and be graphic or TTY-type terminals. To find out the status of an SNA/CCS terminal, you may need to use CP commands, VCNA commands, VSCS commands, or VTAM commands. See VM/VTAM publications for the specific terminals supported.

In order to control an SNA/CCS terminal, you must be able to:

- Make it available for access by VM/ESA users
- Remove it from access by VM/ESA users.

## Making a SNA/CCS Terminal Available for User Access

To make a SNA/CCS terminal available for access by VM/ESA users, enter:

```
enable sna userid
```

where *userid* is the user ID of the VTAM service machine that owns the SNA/CCS terminal.

A VM/ESA user may now use it to communicate through SNA.

**Example—Making a SNA/CCS Terminal Available for User Access:** A SNA/CCS terminal user wants to access VM/ESA through VTAM service machine VSERV1. To make it available for access, enter:

```
enable sna vserv1
```

All SNA/CCS terminals owned by VTAM service machine VSERV1 can now access VM/ESA.

### Removing an SNA/CCS Terminal from User Access

Removing a SNA/CCS terminal from user access prevents a user from using it to access VM/ESA. To remove a SNA/CCS terminal from user access, enter:

```
disable sna userid
```

where *userid* is the user ID of the VTAM service machine that owns the SNA/CCS terminal.

All SNA/CCS terminals controlled by the VTAM service machine are now unable to access VM/ESA.

**Warning:** If you enter a DISABLE ALL command, immediately enter:

```
enable rdev
```

where *rdev* is the real device number of your primary system console. Doing this prevents CP from locking you out of the system if you accidentally get logged off or disconnected.

If you enter a DISABLE ALL command, CP disables all inactive displays, 3270 printers, 328x printers, and all SNA/CCS terminals. After each user logs off or disconnects, CP also disables that user's display. If you, as the primary system operator, log off or get disconnected, CP disables your display as well. In this circumstance, you can only log on again in one of the following circumstances:

- A still logged-on user with the right privilege class enters the ENABLE command to reenables your display
- You reload CP on the processor complex's system console.

However, if you immediately reenables your display, you avoid this situation.

---

## Direct Access Storage Devices (DASDs)

DASD volumes contain much of your installation's data. Accordingly, you must spend a lot of your time controlling DASDs.

In this book, *DASD* refers to any direct access storage device. *Cached DASD* refers to a DASD that is attached to a storage control unit that contains a high-speed storage buffer called a *cache*. Examples of such control units include the 3880 Model 11, 21, 13, and 23 and the 3990 Models 3 and 6 Storage Controls.

*Caching* (writing to or reading from cache storage) can improve system performance. However, paging I/O is typically a poor candidate for cached DASD, therefore disable the cache for paging volumes or place the paging volumes elsewhere. You may need to perform more tasks to control cached DASDs than to control noncached DASDs.

Many of the DASD volumes in your VM/ESA system may be shared by different operating systems. These operating systems may run in production and test virtual machines, on other processor complexes, or both. Sharing data in this way affects the way you control the DASD volumes. Accordingly, the next sections focus on shared DASD operation. "Controlling DASDs" on page 104 then describes the main DASD operation tasks.

## Operating with Shared DASD Volumes

Your VM/ESA system probably includes a number of shared DASD volumes. Therefore, you should:

- Be aware of the effect of sharing DASDs on your operation of the system
- Understand how VM/ESA permits sharing of DASD volumes
- Be familiar with the facilities available for controlling the sharing of DASD volumes, when necessary.

### How Sharing DASDs Affects System Operation

Many installations run more than one system on more than one processor complex. In these installations, the systems generally share DASDs with each other. If this is true at your installation, you should make sure you know when DASDs are in use by more than one system.

The production system you are running in a virtual machine under VM/ESA may share one or more of its DASDs with one or more operating systems. These operating systems may run in virtual machines under VM/ESA, on other processor complexes, or both. When this is true, you must be careful when you switch a DASD volume from one virtual machine to another. You must also be careful when you remove the volume from VM/ESA's control (when you vary it offline) or when you shut down the system.

Normally, being careful means you must make sure that the DASD volume is unavailable for use by the other system. Before you detach or vary offline a DASD volume, or enter the SHUTDOWN command, contact the operators of the other systems and follow your installation's normal procedures.

### Understanding Shared DASD Support

VM/ESA allows your installation to share DASD volumes safely through reserve/release support. Understanding this support may help you to control shared DASDs.

**Note:** Sharing DASD volumes can also be achieved through the cross system link function in a CSE complex. For further information, see the *VM/ESA: Planning and Administration* book.

The purpose of reserve/release support, in general, is to preserve data integrity while still allowing several operating systems to use the same DASD volume. Preserving data integrity guarantees that the results of operations on data are correct. Reserve/release guarantees this by allowing only one operating system at a time to access data on a DASD volume. Serializing access to data in this way prevents one system from reading data that another system is changing at the same time. Without this serialization, the results of operations on such data could not be guaranteed to be correct.

Serializing access to data allows several operating systems to use the same DASD volume. If the operating systems are running on different processor complexes, the access is serialized through real reserve/release support. If the operating systems are running in different VM/ESA virtual machines, the access is serialized through virtual reserve/release support. If a DASD volume is shared by *both* kinds of operating systems, its data integrity is preserved by concurrent virtual and real reserve/release support.

### Real Reserve/Release Support

Real reserve/release support makes use of a hardware function available on all the DASDs VM/ESA supports. To communicate with DASDs and other devices, operating systems use channel command words (CCWs). To serialize access to DASDs, operating systems use particular CCWs called reserve/release CCWs. A reserve CCW exclusively reserves a DASD volume for the issuer. A release CCW releases the volume, allowing another operating system to reserve the device. To share a DASD volume among a VM/ESA virtual machine and operating systems running on other processor complexes, your installation must set up the volume so that its sharing invokes CP's real reserve/release support.

To invoke real reserve/release support, your installation must dedicate the device to a virtual machine. Your installation dedicates the device by coding a DEDICATE statement in the user directory. Alternatively, you may invoke the support by entering the ATTACH command.

### Virtual Reserve/Release Support

Virtual reserve/release support is a software function of CP. When a DASD volume is shared only among operating systems running in VM/ESA virtual machines, CP can itself perform the serialization of access to data on the volume. In this case, CP virtually reserves and releases the device and does not invoke the hardware reserve/release function. To share one DASD volume strictly among virtual machines, your installation must set up the volume so that its sharing invokes CP's virtual reserve/release support.

To invoke virtual reserve/release support, your installation must set up the volume as a virtually shareable minidisk. A *minidisk* is a virtual disk that contains either a portion or all of a real DASD volume. Your installation defines a virtually shareable

minidisk by coding in the user directory an MDISK statement with the V option on the access mode.

You can use the same method to define a virtual disk in storage as shareable using virtual reserve/release support. A virtual disk in storage is a minidisk that is allocated in system storage instead of being mapped to a real DASD volume.

### Concurrent Virtual and Real Reserve/Release Support

So far we have looked at real reserve/release and virtual reserve/release. Real reserve/release support allows your installation to share a DASD volume that is dedicated to one virtual machine with operating systems that run on other processor complexes. By contrast, virtual reserve/release support allows your installation to share a DASD volume only among operating systems running in VM/ESA virtual machines. To accomplish both kinds of sharing for the same volume requires concurrent virtual and real reserve/release support.

Concurrent virtual and real reserve/release support involves first the hardware and then the software reserve/release function. To share a DASD volume among operating systems in virtual machines *and* operating systems on other processor complexes, your installation must define the volume so that it invokes CP's virtual and real reserve/release support at the same time.

To invoke this concurrent support, your installation must set up the volume as a virtually shareable full-pack minidisk that is also shareable to CP. A *full-pack minidisk* is a virtual disk that contains all of a real DASD volume. Your installation defines a virtually shareable full-pack minidisk by coding in the user directory an MDISK statement with the V option on the access mode. Your installation defines the volume as shareable to CP by specifying:

- The SHARED operand on the SET RDEVICE (DASD) statement in the system configuration file
- The SHARED operand on the device's statement in HCPRIO
- The SET SHARED ON command.

### Controlling the Sharing of DASD Volumes

As mentioned before, your installation can set up shared DASD volumes during system generation. You usually do not have to change that setup. But if your installation requires it (for example, if the number of test and production operating systems at your installation changes regularly), you may change the sharing of DASD volumes between systems.

To control the sharing of DASD volumes, you must be able to:

- Find out which DASDs are shared
- Change the way DASDs are shared
- Handle reserve/release errors.

### Finding Out Which DASDs Are Shared

To find out which DASDs in your system are shared among multiple real and virtual systems:

1. Find out which DASDs are defined as virtually shareable full-pack minidisks.

To do this, contact the person who maintains the VM/ESA user directory at your installation.

## Controlling Local Devices

2. Find out which DASDs are defined as shareable to CP. Enter:

```
query dasd system
```

CP responds with the status of all active DASD in use by the system (the command excludes dedicated DASDs). If the status of a device is SHARED, the device is shareable to CP.

If cross system linking is enabled, enter:

```
xlink check validn
```

where *validn* identifies the volume or volumes to be checked in order to determine if they are under cross system link control.

3. Compare the first list to the second list.

Devices that appear on both lists meet the requirements for concurrent virtual and real reserve/release. These devices are eligible to be shared between operating systems running within VM/ESA virtual machines running on other processor complexes.

**Note:** CP issues real reserve/release CCWs only to a shared device that is also defined and in use as a full-pack minidisk.

To find out whether a particular DASD volume is shared among multiple real and virtual systems:

1. Find out if the DASD is defined as a virtually shareable full-pack minidisk.

To do this, contact the person who maintains the VM/ESA user directory at your installation.

2. Find out if the DASD is defined as shareable to CP. Enter:

```
query rdev
```

Where *rdev* is the real device number of the DASD. Again, if the status for the device is SHARED, the device is eligible to be shared among multiple real and virtual systems. But if the device is not also defined and in use as a full-pack minidisk, CP does not issue real reserve/release CCWs when accessing it.

### Changing a DASD's Shared Status

Your installation may share DASD volumes with operating systems on other processor complexes during certain times of day but not others. For performance reasons, your installation may wish to make DASD volumes shareable to CP only when needed; that is, only when the DASD must be shared with other processor complexes. Accordingly, you may use the SET SHARED command to change the shared status of a DASD volume.

**Note:** For a DASD volume to be shareable between real and virtual systems:

- Your installation must have defined it during system generation as a full-pack minidisk that is virtually shareable.
- The device must now be in use as a full-pack minidisk.

Also, note that you may enter the SET SHARED ON command for any DASD volume, but if the volume is not in use as a full-pack minidisk, CP does not issue real reserve/release CCWs to the device.

To make a DASD volume shareable by multiple real and virtual systems, enter:

```
set shared on for rdev
```

Where *rdev* is the real device number of the DASD. You may also specify a range of up to 256 devices. In response, if the device is a full-pack minidisk, CP issues real reserve/release CCWs when accessing the device.

You may also use the SET SHARED OFF command to remove real reserve/release support of the device, but you should do so with extreme caution and only after careful consideration. Before you enter the SET SHARED OFF command, contact the operator of any other system that shares the device and make sure the system is not using it. Follow your installation's normal procedures.

**ATTENTION:** Using the SET SHARED OFF command for a device could cause a data integrity exposure if an operating system on another processor complex is still using the device.

For more information about the SET SHARED command, see the *VM/ESA: CP Command and Utility Reference* book.

### Handling Reserve/Release Errors

Under certain error conditions, an operating system may hold a real reserve to a DASD volume for an abnormally long time. To find out if this is occurring, you may use the QUERY DASD RESERVE command.

To display the status of all reserved DASD, enter:

```
query dasd reserve
```

In response, CP displays the status of reserved DASD, if any. One of the following responses may indicate a problem with the device:

```
RESERVED BY userid or SYSTEM
```

This response tells you that either CP or an operating system running in the indicated virtual machine holds the reserve to the device.

```
RESERVE PENDING FOR userid or SYSTEM
```

This response indicates that an operating system running on another processor complex holds the reserve.

If you receive one of these responses and the condition persists, follow your installation's normal procedures to release the device.

If you must release a device that CP has reserved for a virtual machine, you may use the RESET RESERVE command.

**ATTENTION:** Using the RESET RESERVE command causes the device to become immediately available to another sharing system. Use the RESET RESERVE command with extreme caution and only after careful consideration.

For more information about the RESET RESERVE command, see the *VM/ESA: CP Command and Utility Reference* book.

### Controlling DASDs

To control DASDs, you need to be able to:

- Find out a DASD's status
- Locate a specific DASD volume
- Dedicate a DASD to a VM/ESA user or to the production system
- Remove a DASD from a VM/ESA user or from the production system
- Mount a disk pack for a VM/ESA user or for the production system.

To control system volumes, you must be able to:

- Attach a system volume to the system
- Detach a system volume from the system
- Check the usage of system volumes
- Check the format of a system volume and if necessary format and allocate it
- Change the volume identifier or label on a DASD volume.

You also need to be able to:

- Define a DASD as a dump device
- Inspect the physical condition of a DASD volume
- Copy one DASD volume to another.

Some storage subsystems (such as the IBM 3990 Models 3 and 6 Storage Control) provide nonvolatile storage (NVS), a DASD fast write function, and a dual copy function as well as regular caching. If you have a storage subsystem that provides those functions, you need to know how to activate, display the status of, and deactivate them.

Before you start, you should be aware of the effect of sharing VM/ESA DASD volumes with other operating systems. If you are not familiar with operating VM/ESA with shared DASD, see "Operating with Shared DASD Volumes" on page 99.

**Note:** The following information includes a discussion about the cache subsystem, nonvolatile storage (NVS), and DASD fast write. To manipulate data within the 3990 Models 3 or 6 subsystem, you must activate the DASDFW, CACHE, and NVS features. To do this, enter the following three commands:

```
set cache subsys on
set nvs on
set dasdfw on
```

### Managing Nonvolatile Storage

Nonvolatile storage (NVS) is random access storage with an electronic backup. This maintains system data integrity for DASD fast write data not yet written to DASD in the event of a storage subsystem power failure. NVS must be activated to exploit the DASD fast write function.

To make nonvolatile storage available or unavailable for a particular 3990 subsystem, enter:

```
set nvs subsystem on rdev
```

where:

**subsystem**

is optional, is the default, and specifies the entire storage subsystem, regardless of which device within the subsystem is affected.

**on** specifies that the nonvolatile storage is made available to the subsystem.

**off** specifies that the nonvolatile storage is made unavailable to the subsystem.

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers for devices in the subsystem.

**Notes:**

1. SET NVS is only valid for cache storage subsystems containing nonvolatile storage. If the specified subsystem does not have nonvolatile storage, an error message is generated.
2. Making nonvolatile storage unavailable to the subsystem causes all modified DASD fast write data in the subsystem to be destaged.

To display the current state of the nonvolatile storage for a particular 3990 subsystem, use the QUERY NVS command. To query the current state of NVS, enter:

```
query nvs rdev
```

where *rdev* is the real device number, a list of real device numbers, or a range of real device numbers of devices in the subsystem being queried.

**Note:** QUERY NVS is only valid for cache storage subsystems containing nonvolatile storage. If the specified subsystem does not have nonvolatile storage, an error message is generated.

**Finding Out a DASD's Status**

To find out the status of a specific DASD, enter:

```
query rdev
```

where *rdev* is the real device number of the DASD. To find out the status of all the DASDs in your VM/ESA system, enter:

```
query dasd all
```

DASD fast write provides the appearance of speedier access to data residing on DASD in 3990 models 3 or 6 storage subsystems. It causes I/O operations to appear to complete more quickly by presenting device-end status with channel-end status as soon as the data is received by the control unit. If nonvolatile storage is turned on, the data is saved in nonvolatile storage; this eliminates the possibility of data loss because of power failure. The data is transferred from NVS to the backing-storage device by the control unit.

To display the current state of the DASD fast write function for a device attached to cache storage subsystems, enter:

```
query dasdfw rdev
```

where *rdev* is the real device number, a list of real device numbers, or a range of real device numbers of the devices being queried.

**Note:** QUERY DASDFW is only valid for cache storage subsystems that support the DASD fast write function. If the specified subsystem does not support DASD fast write, CP generates an error message.

Table 5 lists the keywords that appear in responses to QUERY commands for DASD. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active, free, or offline DASD
- Whether the keyword indicates a dedicated DASD or a DASD in use by CP.

Table 5. DASD Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ATTACHED TO</b>	The DASD is dedicated to the indicated virtual machine.	Active (dedicated)
<b>CP OWNED</b>	The DASD is used by the system for paging and spooling activity and for temporary disk space and directory space.	Active (CP)
<b>CP SYSTEM</b>	The DASD contains user minidisks.	Active (CP)
<b>FREE</b>	The DASD is available but is not in use.	Free
<b>INT REQUIRED</b>	The DASD requires operator intervention.	Active (CP or dedicated)
<b>OFFLINE</b>	The DASD is unavailable to CP.	Offline
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled
<i>Volume identifier</i>	The DASD is available but is not in use.	Free

### Finding Out a DASD's Hardware Status

Most DASDs have lights that indicate their hardware status, but some do not. To find out the hardware status of a DASD that has no indicator light, enter:

```
query rdev status
```

where *rdev* is the real device number of the DASD. CP's response tells you that the device is operational, not operational, or offline, or that an equipment check or a channel error has occurred for the device.

### Changing a DASD's Status

The DASD fast write function can be activated or deactivated for devices in a 3990 subsystem. To turn the DASD fast write function on or off, enter:

```
set dasdfw device on rdev
```

where:

#### **device**

is optional, is the default, and specifies that the DASD fast write function is to be activated or deactivated for the specified devices.

**on** indicates the DASD fast write function is to be activated for the specified device; **OFF** indicates the DASD fast write function is to be deactivated for the specified device.

**forceoff**

indicates the DASD fast write function is to be unconditionally deactivated for the specified device, regardless of any internal subsystem errors.

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers of devices to be activated or deactivated for the DASD fast write function.

**Note:** SET DASDFW is only valid for cache storage subsystems that contain nonvolatile storage and support the DASD fast write function. If the specified subsystem does not support this function, CP generates an error message.

ATTENTION: The FORCEOFF option is intended only for recovery purposes. It should be used only when absolutely necessary, because data may be lost.

The FORCEOFF option should be used only after the SET DASDFW OFF command has been used, but the subsystem could not deactivate the DASD fast write function due to internal errors.

**Finding Out a DASD's Caching Status**

Some DASDs may be attached to storage control units that contain a high-speed storage buffer called a *cache*. Normally, to ensure good performance, you should make sure that these cached DASDs can use the cache. For caching to be available for use, the cache must be available to the subsystem and, if applicable, activated for the device.

To check the caching status of a cached DASD, enter:

```
query cache rdev
```

where *rdev* is the real device number of the DASD. In response, CP displays information about the caching status of the device. The information displayed depends on the storage control model to which the DASD is attached. Table 6 on page 108 shows the keywords that appear when the cache is available to the device.

The cache fast write function improves the performance of access to data residing on DASD in 3990 model 3 and 6 storage subsystems. It causes I/O operations to appear to complete more quickly by presenting device-end status with channel-end status as soon as the data is received by the control unit. However, this data is *not* saved in nonvolatile storage. Cache fast write should be used only for data that does not need to be saved across a system abend, system re-IPL, or storage subsystem failure; that is, data that does not need to be written to the backing storage device.

The QUERY CACHEFW command allows you to display the current state of the cache fast write function for the subsystem. To display the current state of the cache fast write function, enter:

```
query cachefw rdev
```

where *rdev* is the real device number, a list of real device numbers, or a range of real device numbers of the devices in the subsystems being queried.

**Note:** QUERY CACHEFW is only valid for cache storage subsystems supporting the cache fast write function. If the specified subsystem does not support cache fast write, CP generates an error message.

Table 6. DASD Caching Status

Storage Control Model	Keywords Displayed when the Cache is Available to the Device
3880-11	SUBSYSTEM STORAGE
3880-13	CACHE AVAILABLE FOR SUBSYSTEM CACHE ACTIVATED FOR DEVICE
3880-21	CACHE AVAILABLE FOR SUBSYSTEM
3880-23	CACHE AVAILABLE FOR SUBSYSTEM CACHE ACTIVATED FOR DEVICE
3990-3,6	CACHE AVAILABLE FOR SUBSYSTEM CACHE ACTIVATED FOR DEVICE CACHE FAST WRITE AVAILABLE FOR SUBSYSTEM CACHE FAST WRITE ACTIVATED FOR DEVICE

### Changing a DASD's Caching Status

For performance reasons, a cached DASD should normally have use of the subsystem's cache. For the DASD to have use of the cache, the cache must be both available to the subsystem and, if applicable, activated for the device. The commands you use to change a DASD's caching status depend on the storage control model to which the DASD is attached.

For a particular 3990 subsystem, the SET CACHEFW command allows you to activate or deactivate the cache fast write function. To activate cache fast write, enter:

```
set cachefw subsystem on rdev
```

where:

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers of the devices in the subsystem.

**on** indicates that the cache fast write function is to be activated for the subsystem.

To deactivate cache fast write, enter:

```
set cachefw subsystem off rdev
```

where:

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers of the devices in the subsystem.

**off** indicates that the cache fast write function is to be deactivated for the subsystem.

**Notes:**

1. SET CACHEFW is only valid for cache storage subsystems supporting the cache fast write function.
2. If the subsystem cache is unavailable when you enter SET CACHEFW ON, cache fast write data access begins when the cache is made available.
3. When you enter SET CACHEFW OFF, the cache fast write data for all devices in the subsystem is destaged to the appropriate DASD.
4. If the subsystem is not in the correct mode to accept the SET CACHEFW ON command, certain error messages may result. For information about these messages, see the *VM/ESA: System Messages and Codes* book.

To transfer cache fast write data to backing storage (on an addressed device), use the COMMIT command. To do this, enter:

```
commit device rdev
```

where:

**device**

is optional, is the default, and emphasizes that only data for the specified devices is to be written to DASD.

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers affected by COMMIT.

**Note:** COMMIT is only valid for cache storage subsystems supporting the cache fast write function. If the subsystem containing the specified device does not support this function, CP generates an error message.

Table 7 shows the commands to use to make the cache available to a DASD.

*Table 7. DASD Caching Commands*

Storage Control Model	Commands to Make the Cache Available to a DASD
3880-11	None
3880-13	set cache subsystem on <i>rdev</i> set cache device on <i>rdev</i>
3880-21	None
3880-23	set cache subsystem on <i>rdev</i> set cache device on <i>rdev</i>
3990-3,6	set cache subsystem on <i>rdev</i> set cache device on <i>rdev</i> set cachefw subsystem on <i>rdev</i>

In response, CP makes the cache available to the subsystem and, if applicable, activates the cache for the device. For 3880 Models 13 and 23 and 3990 Models 3 and 6 both settings are required for the DASD to have use of the cache.

## Controlling Local Devices

Your installation may at times wish to discontinue use of the cache by the device and by the subsystem. For example, your installation may wish to measure differences in performance with and without the cache. In these situations, you may use the SET CACHE command to discontinue use of the cache by a device.

For 3880 Models 13 and 23 and 3990 Models 3 and 6 to discontinue use of the cache by a device, enter:

```
set cache device off rdev
```

where *rdev* is the real device number of the DASD. In response, CP deactivates caching by the device. The availability of the cache to the subsystem is unchanged. The settings for other devices in the subsystem are also unchanged. They take effect when you again make the cache available to the subsystem.

### Managing Pinned Data

Data that the 3990 Models 3 and 6 Storage Control cannot destage from cache or NVS because of hardware failures is pinned data. To identify the data tracks of one or more DASD that are pinned in the subsystem, use the QUERY PINNED command. To do this, enter:

```
query pinned device rdev
```

where:

**device**

is the default and displays the pinned tracks for the specified device.

**subsystem**

displays the total amount of subsystem cache and NVS containing pinned data.

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers of the devices in the subsystems being queried.

Once the pinned data is identified, you can discard that pinned data and free up the cache or NVS for other data.

ATTENTION: The data is discarded, not transferred to backing storage.

To discard the pinned data, enter:

```
discard pinned all|cachefw rdev
```

where:

**all** discards all pinned data for the specified device.

**cachefw**

discards only pinned cache fast write data for the specified device.

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers for the devices that contain data to be discarded.

**Note:** DISCARD is only valid for cache storage subsystems that support cache fast write, DASD fast write, and dual copy functions. If the specified subsystem does not support these functions, CP generates an error message.

## Querying Fenced Components

Fencing is the isolation (by partitioning) of failing components of a DASD subsystem by hardware, licensed internal code, or system software on a 3990 Models 3 and 6 storage subsystem. Once the component is fenced it is no longer available for any I/O activity until it is unfenced.

To display the fenced components, if any exist, enter:

```
query fences rdev
```

This tells you if the subsystem is running in a degraded mode that requires service. To unfence the fenced components use ICKDSF.

## Transferring Data to Backing Storage

To terminate the use of the facilities of the 3990 Models 3 or 6 Storage Control, you should transfer data residing exclusively in cache or NVS to backing storage on a subsystem basis. To transfer all data, enter:

```
destage subsystem rdev
```

where:

### **subsystem**

is optional, is the default, and specifies that the data for the entire storage subsystem be destaged, regardless of which device within the storage subsystem received the command.

*rdev*

is the real device number, a list of real device numbers, or a range of real device numbers of the devices receiving the destage order.

**Note:** DESTAGE is valid only for cache storage subsystems supporting cache fast write, DASD fast write, and dual copy functions. If the specified subsystem does not support these functions, CP generates an error message.

## Using the Dual Copy Function

Dual copy lets the 3990 Models 3 and 6 Storage Control create a duplicate copy of the data on a volume and store it on a different device in the same subsystem. The two physical devices, the primary device and the secondary device, make up a duplex pair. Both devices must have the same track and cylinder format and the capacity of the secondary device must be equal to or greater than the primary device. Dual copy and DASD fast write can be used at the same time.

I/O operations are directed to the primary device. For write operations, after the subsystem writes the data to the primary device, channel-end and device-end are presented and the storage control later completes the write operation from the cache to the secondary device. The write operation to the secondary device is transparent to the host. For read operations, if the data is not in the cache, the 3990 Models 3 and 6 Storage Control attempts to read it from the primary device. If the read fails on the primary device, then the storage control attempts to read the data from the secondary device of the duplex pair.

Dual copy provides these important advantages:

1. Protects data on a critical volume from a single device failure.
2. Is transparent to the application program.

## Controlling Local Devices

3. Switches operations automatically to the secondary device if a failure occurs on the primary device. The switching is transparent to the application.
4. Provides for nearly continuous operations by providing a backup copy if loss of access occurs to one of the devices in the duplex pair.
5. Ensures that the second copy is logically identical with the primary copy.

Dual copy has four device states:

### **Simplex**

A “single copy” volume. Dual copy is not active.

### **Duplex Pending**

A temporary state. This state occurs when the subsystem is doing a copy to synchronize the duplex pair. When the copy is complete, the device enters the duplex state. If the copy does not complete successfully, the device enters the suspended duplex state.

When in the duplex pending state only the primary device is functional to the host systems.

### **Duplex**

This state has two devices, the primary and the secondary which contain identical data. Only the primary device is functional to the host systems.

### **Suspended Duplex**

A state caused by one of two events: (1) a host program (either CP or a guest system) requests the state of the duplex pair to be changed to suspended, or (2) the 3990 Models 3 or 6 are unable to synchronize the contents of the two devices, and has stopped duplicate writes.

The host program can put the pair into suspended duplex state when the host error recovery procedure detects a permanent error. The host issues a channel program that causes a state change to suspended duplex.

If one of the two devices fails, the 3990 Models 3 or 6 itself can put the pair into suspended duplex state.

When in the suspended duplex state only the primary device is functional to the host systems.

Any event or command that suspends or reinstates the dual copy operation can cause the physical primary and secondary devices to swap. When using the term *primary device*, keep in mind that the devices might have swapped—the device originally identified as primary may no longer be the same physical device.

***Ungrouping Storage Paths:*** Duplex pairs cannot be created if the paths for the devices that are online to sharing host systems are grouped.

If you attempt to create a duplex pair with devices that have grouped paths, the duplex pair *will not* be created and these messages will be generated:

The person issuing the CP command will receive the following message:

```
HCPERP296E Status is not as required - rdev; duplex pair
could not be established, code = 17.
```

The system operator will receive the following message:

```
HCPERP500I DASD rdev AN OPERATION WAS TERMINATED  
BECAUSE A COMMAND REJECT ERROR OCCURRED
```

There are two ways to ungroup paths for devices that you wish to use as a duplex pair. You can ungroup the paths by:

- Varying the devices offline from other host systems.  
Before a duplex pair can be created, the devices that are to be duplexed should be varied offline from other systems to ungroup the paths.
- Doing a System Reset from the system console.  
Even though a sharing host may be idle (that is, no operating system currently IPLed), the paths may still be grouped. By doing a System Reset from the system console, *all* paths to that system will become ungrouped.

The CP DUPLEX command can be used to establish, re-establish, and terminate duplex pairs for CP volumes, including minidisk (full-pack) volumes, as well as DASD dedicated to guest operating systems and CMS users.

For example, to establish a duplex pair in which real device 0200 is the primary volume and 0201 is the secondary volume, you would enter:

```
duplex 0200 on 0201
```

By default, DUPLEX copies the entire contents of the primary volume to the secondary volume so that their contents are synchronized. Subsequent changes to device 0200 would automatically be made to device 0201. Use the QUERY DUPLEX command to display the status of duplex pairs:

```
query duplex 0200
```

The QUERY DUPLEX response indicates the duplex status. When the volumes are synchronized and regular disk activity is in progress, the QUERY DUPLEX response is:

```
Duplex pair (0200,0201) - active
```

The QUERY VIRTUAL DUPLEX command can be used to display the duplex status of virtual devices. Suppose, for example, a user's virtual 0301 device was defined as a few cylinders on real device 0200, which we just duplexed. The user could determine the duplex status by entering:

```
query virtual duplex 0301
```

QUERY VIRTUAL DUPLEX responses are similar to those displayed for QUERY DUPLEX.

To end the duplex relationship, enter:

```
duplex 0200 off
```

Support for guest use of dual copy is provided for DASD that are dedicated to a guest and for DASD that are shared among guests as full-pack minidisks. If you want to let the guest control the duplexing of full-pack minidisks, the minidisks must be defined to CP by using the DEVNO operand of the MDISK directory control statement. Minidisks defined in this way are known to CP by their device numbers

## Controlling Local Devices

(DEVNO) rather than by volume serial number (VOLSER). CP cannot use the volume serial number because guests that form and dissolve duplex pairs can create duplicate volume serial numbers. If CP were to use duplicate volume serial numbers, data integrity problems could result. For more about using dual copy with guests, see *VM/ESA: Virtual Machine Operation*.

See the *VM/ESA: CP Command and Utility Reference* for more about the DUPLEX, QUERY DUPLEX, and QUERY VIRTUAL DUPLEX commands.

### Delayed Responses to CP Commands

Delayed responses result when a CP command associated with DASD subsystems causes a channel program to be issued to a device or subsystem. In most instances, these operations complete in a short time and the command response is immediately presented. However, for the 3990 Models 3 or 6 subsystems, some of these operations do not complete immediately.

The CP commands that can result in delayed responses are:

- COMMIT
- DESTAGE
- DUPLEX
- SET CACHE ON|OFF SUBSYSTEM
- SET CACHE OFF DEVICE
- SET CACHEFW OFF
- SET DASDFW OFF
- SET NVS ON|OFF.

The responses to these commands are delayed as follows:

- If the command completes immediately, the normal command response is displayed.
- If the command does not complete immediately, the following response is displayed:  
Command started: *command rdev*.
- If the command completes successfully, the normal command response is displayed.
- If the command completes unsuccessfully because of errors during asynchronous processing, the following response is displayed:  
Command failed: *command rdev*.
- If the cache storage subsystem does not notify CP when it has completed a command, the normal completion responses are not generated. Command processing stops after CP displays the following response:  
Command results lost: *command rdev*.
- If the originator of the command is not the system operator, the following response is issued to the system operator when the command completes:  
*Normal command response by userid*

To determine the status of commands entered but not yet completed, enter:  
query pending commands *rdev*.

The following response is displayed for each pending CP command:

Command pending: *command rdev*.

To determine the status of all commands that are pending for a device, enter:

```
query pending commands allusers rdev.
```

where

```
allusers
```

causes the following response to be displayed for each pending command:

```
Command pending for userid command rdev.
```

### Collecting Information about Subsystem Resources

The remote service access word (RSAW) is used by remote service personnel to gain access to subsystem resources for problem determination and maintenance. As the system operator, you are responsible for obtaining the RSAW for remote service personnel. To generate and display the RSAW for storage clusters in the DASD subsystem, enter:

```
query rsaw cluster 0|1|all rdev
```

where:

#### **cluster 0|1|all**

indicates the storage clusters containing the RSAW to be obtained.

*rdev*

is the real device number of one of the devices in the subsystem.

If CLUSTER ALL is specified, the following response is issued for each storage cluster:

```
rdev rsaw is nnnn for cluster n, serial number sssss.
```

If the support facility is unavailable and CLUSTER ALL is specified, the following response is issued for each storage cluster:

```
rdev subsystem support facility is unavailable.
```

If the remote service is not enabled and CLUSTER ALL is specified, the following response is issued for each storage cluster:

```
rdev remote service is not enabled.
```

The Storage Subsystem Support Facility supports subsystem error recovery, maintenance, diskette drive operations, and the operator panel. The Support Facility generates the RSAW recognizes it to allow remote maintenance attachment.

### Commands to Offline Devices

The 3990 Models 3 and 6 and the 3880 Storage Controls report subsystem level changes and asynchronous message availability on any device in the subsystem. A device can be online or offline to CP. You can enter the following commands to both online and offline devices:

- QUERY CACHE
- SET CACHE
- QUERY DASDFW
- SET DASDFW
- DISCARD
- QUERY DUPLEX
- QUERY PINNED

- QUERY RSAW.

**Note:** For the QUERY CACHE and SET CACHE commands, offline device support only applies to devices attached to the 3880 Model 13, 3880 Model 23, and the 3990 Models 3 and 6.

### Status Not as Required Messages

The subsystem must be in the appropriate state to process a particular command. If it is not in the appropriate state, the command fails with a command rejection in format 0, message F. If a CP subsystem management command fails, CP displays the appropriate “status not as required” message (0296E). With the addition of 3990 Models 3 and 6 Storage Control, there are eight new messages and a general message that reports the reason code with the “status not as required” message. This message has several formats:

- Nonvolatile storage is not available
- FORCEOFF is invalid in the current state
- Recovery action for pinned data is required
- Unlike channel types cannot be grouped
- A Diagnostic Control command failed
- The control unit had insufficient message buffer space
- Pinned tracks are not identifiable because their location and data are in failed nonvolatile storage
- Device is undergoing media maintenance
- Duplex pair could not be established, code = code.
- A duplex state error occurred, code = code.
- code=nn

For more information about these messages see the *VM/ESA: System Messages and Codes* book.

### Managing State-Change-Pending

If a 3990 Models 3 or 6 Storage Control receives an I/O request it cannot process for an extended amount of time, it fails the request with a state-change-pending unit check. The 3990 Models 3 and 6 present a state change interrupt to notify the operating system of a change from the not-ready to the ready state or to signal a change to subsystem storage status, duplex DASD status, nonvolatile storage status, DASD fast write status, or cache fast write status.

If CP detects a state-change-pending unit check for a DIAGNOSE I/O request or for a non-high-priority CP I/O request, CP enqueues the request until the pending state change is completed. In all other cases, CP sends the error to the requesting guest and to the system operator.

Virtual state-change interrupts are sent to those guests who received the associated state-change-pending unit check. The real guest is kept out of SIE I/O Assist until the virtual state-change interrupt is sent to the guest.

## Locating a Specific DASD Volume

To locate a particular DASD volume and find out the status of the DASD on which it is mounted, enter:

```
query dasd valid
```

where *valid* is the volume identifier of the DASD you want to locate.

## Dedicating a DASD to a VM/ESA User

If a DASD is offline and you need to dedicate it to a VM/ESA user, do the following:

1. Make sure the user is authorized to access data on the device. Follow your installation's normal procedures.

2. Enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the DASD.

*userid*

is the user's logon ID

*vdev*

is the virtual device number the user asked you to assign to the DASD.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

For a cached DASD, CP assigns a default level of subsystem control to the user, depending on the nature of the user's virtual machine:

- For the V=R preferred machines and V=F machines, CP assigns the SYSCTL level of subsystem control. This allows the virtual machine to issue CCWs that control DASD subsystem and device resources.
- For V=V virtual machines, CP assigns the DEVCTL level of subsystem control. This allows the virtual machine to issue CCWs that control device resources but not subsystem resources.

When you dedicate a cached DASD to the preferred (V=R or V=F) virtual machine, CP automatically assigns the SYSCTL level of subsystem control for the device to the virtual machine. However, a user who controls a V=V virtual machine may request a different level of subsystem control than the default DEVCTL.

If the user requests the SYSCTL level of subsystem control, follow the procedure above but add the SYSCTL operand to the ATTACH command:

```
attach rdev userid vdev with sysctl
```

In response, CP dedicates the device to the user and lets the user's virtual machine successfully issue CCWs that control both subsystem and device resources.

If the user requests the NOCTL level of subsystem control, follow the procedure above but add the NOCTL operand to the ATTACH command:

```
attach rdev userid vdev with noctl
```

## Controlling Local Devices

In response, CP dedicates the device to the user and prevents the user's virtual machine from successfully issuing CCWs that control either subsystem or device resources.

For more information on the subsystem control operands of the ATTACH command, see the *VM/ESA: CP Command and Utility Reference* book.

### Dedicating a DASD to the Production System

If a DASD is offline and is supposed to be dedicated to the production system for its exclusive use, do the following:

1. Enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the DASD.

*userid*

is the logon ID of the production system

*vdev*

is the virtual device number you want to assign to the DASD.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

2. At the production system's system console, enter any commands that the production operating system requires in order to use the device.

For a cached DASD, CP assigns a default level of subsystem control to the production system, depending on the nature of the production system's virtual machine:

- For the preferred (V=R or V=F) virtual machine, CP assigns the SYSCTL level of subsystem control, which allows the virtual machine to issue CCWs that control DASD subsystem and device resources.
- For any other (V=V) virtual machine, CP assigns the DEVCTL level of subsystem control, which allows the virtual machine to issue CCWs that control device resources but not subsystem resources.

When you dedicate a cached DASD to the preferred (V=R or V=F) virtual machine, CP automatically assigns the SYSCTL level of subsystem control for the device to the virtual machine. However, you may assign a different level of subsystem control than the default (DEVCTL) to a production system that runs in a V=V virtual machine.

To assign the SYSCTL level of subsystem control to a production system that runs in a V=V virtual machine, follow the procedure above, but add the SYSCTL operand to the ATTACH command:

```
attach rdev userid vdev with sysctl
```

In response, CP dedicates the device to the production system and lets the virtual machine successfully issue CCWs that control both subsystem and device resources.

To assign the NOCTL level of subsystem control to a production system that runs in a V=V virtual machine, follow the procedure above, but add the NOCTL operand to the ATTACH command:

```
attach rdev userid vdev with noctl
```

In response, CP dedicates the device to the production system and prevents the virtual machine from successfully issuing CCWs that control either subsystem or device resources.

For more information on the subsystem control operands of the ATTACH command, see the *VM/ESA: CP Command and Utility Reference* book.

**Example—Dedicating a DASD to the Production System:** DASD 8B0 should be dedicated to the production system, MVS01, as virtual device 8B0. When you enter:

```
query 8b0
```

CP tells you that DASD 8B0 is offline. To dedicate it to the production system, enter:

```
vary online 8b0
attach 8b0 mvs01
```

At the MVS01 system's system console, enter appropriate VSE commands to make sure the volume is usable.

### Removing a DASD from a VM/ESA User

Removing a DASD from a VM/ESA user is the opposite of dedicating it:

Enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the DASD.

*userid*

is the logon ID of the user.

Now you may vary the DASD offline or dedicate it to another virtual machine. To vary the volume offline, enter:

```
vary offline rdev
```

where *rdev* is the real device number of the DASD. The DASD is now unavailable to VM/ESA.

### Making a DASD unavailable to the Production System

Removing a DASD from the production system is the opposite of dedicating it:

1. At the production system's system console, enter any commands that the production operating system requires to release the device from use.
2. Contact the operator of any other system that shares the volume and make sure the system is not using it. Follow your installation's normal procedures.
3. Enter:

```
detach rdev userid
```

## Controlling Local Devices

where:

*rdev*

is the real device number of the DASD.

*userid*

is the logon ID of the production system.

Now you may vary the DASD offline or dedicate it to another virtual machine. To vary the volume offline, enter:

```
vary offline rdev
```

where *rdev* is the real device number of the DASD. The DASD is now unavailable to VM/ESA.

**Example—Removing a DASD from the Production System:** To remove DASD 8B0 from the production system, MVS01:

1. At the MVS01 system's system console, enter appropriate VSE commands to make sure the volume is not in use.
2. Make sure the volume is not in use by any other system.
3. Enter:

```
detach 8b0 mvs01
```

### Attaching a System Volume to the System

CP needs DASD space to perform a number of system functions. Your system administrator or system programmer defines *CP-owned* system volumes to contain space for such functions as:

- CP nucleus
- Checkpoint/warm start data
- User directory
- Paging
- Spooling
- Temporary disks
- User minidisks.

Your system administrator may also define other system volumes whose status says CP SYSTEM. This second set of system volumes may be used for dedicated DASD or for user minidisk space.

If either type of system volume is offline, you must attach it to the system for CP to use it. To attach it to the system, enter:

```
vary online rdev  
attach rdev system valid
```

where:

*rdev*

is the real device number of the DASD.

*valid*

is the volume identifier.

The volume is now available to CP to use for system functions.

**Note:** If the status of the volume says FREE, you need to enter only the ATTACH SYSTEM command.

## Detaching a System Volume from the System

Removing a system volume from VM/ESA is the opposite of attaching it:

1. Enter:

```
detach rdev system
vary offline rdev
```

where *rdev* is the real device number of the DASD.

The DASD is now unavailable to CP for user minidisk space or CP functions.

## Displaying a List of CP-Owned Volumes

To display a list of CP-owned DASD volumes, enter:

```
query cpowned
```

In response, CP displays information on all CP-owned volumes and gaps in the volume list. For more information about the QUERY CPOWNED command, see the *VM/ESA: CP Command and Utility Reference* book.

To display a list of CP-owned system volumes and the type of areas allocated on each volume, enter:

```
query alloc all
```

In response, CP lists all of the CP-owned volumes that contain temporary disk, directory, paging, or spooling space. For each volume, CP displays the number of cylinders or pages allocated, in use, and available for temporary disk, directory, paging, and spooling space. CP also indicates whether a volume contains the active CP directory.

To display the list of all CP-owned system volumes containing paging space, enter:

```
query alloc page all
```

In response, CP lists all of the CP-owned volumes that contain paging space. For each paging extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of pages, the number of pages in use, the highest page in use, and the percentage of pages in use.

To display the list of all CP-owned system volumes containing spooling space, enter:

```
query alloc spool all
```

In response, CP lists all of the CP-owned volumes that contain spooling space. For each spooling extent on each volume, CP displays the starting cylinder or page and ending cylinder and page, the total number of pages, the number of pages in use, the highest page in use, and the percentage of pages in use.

To display the list of all CP-owned system volumes containing temporary disk space, enter:

```
query alloc tdisk all
```

In response, CP lists all of the CP-owned volumes that contain temporary disk space. For each temporary disk extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of cylinders or pages, the number of cylinders or pages in use, the highest cylinder or page in use, and the percentage of cylinders or pages in use.

## Controlling Local Devices

To display the list of all CP-owned system volumes containing directory space, enter:

```
query alloc drct all
```

In response, CP lists all of the CP-owned volumes that contain directory space. For each extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of cylinders and pages, the number of cylinders and pages in use, the highest cylinder or page in use, and the percentage of cylinders or pages in use. The response from this command also indicates which volume contains the active directory.

To display the allocation mapping of all CP-owned system volumes, enter:

```
query alloc map all
```

In response, CP lists all of the CP-owned volumes that contain temporary disk, directory space, paging, or spooling space. For each extent on each volume, CP displays the starting cylinder or page and ending cylinder or page, the total number of cylinders or pages, the number of cylinders or pages in use, the highest cylinder or page in use, the percentage of cylinders or pages in use, and the allocation type of the extent.

### Checking System Volume Use

To find out how many users are using system volumes, enter:

```
query system all
```

CP's response shows the number of users either linked to minidisks or using temporary disk space on each CP-owned and CP SYSTEM system volume. CP also details the kind of use for each user.

### Checking the Allocation and Format of a System Volume

Before you attach a DASD volume to VM/ESA for system use, make sure that it is allocated and formatted correctly. To find out whether it is allocated correctly, you may use the CPFMTXA utility or the Device Support Facilities program (ICKDSF). However, using ICKDSF is the recommended method to perform all maintenance on DASD volumes for CP use. For more information on using ICKDSF to format, label, or allocate DASD volumes, see the *Device Support Facilities User's Guide and Reference* book. For details on the CPFMTXA utility, see the *VM/ESA: CP Command and Utility Reference* book.

To find out whether a system volume is allocated correctly using the CPFMTXA utility, do the following:

1. Make the device available to the system and dedicate it to your virtual machine.

Enter:

```
vary online rdev  
attach rdev to * as vdev
```

Where:

*rdev*

is the real device number of the DASD.

*vdev*

is the virtual device number you want to assign to the device.

\* (*asterisk*)

indicates that you want CP to dedicate the device to your own virtual machine.

2. To find out whether the volume is already allocated for use with VM/ESA, enter:

```
cpfmtxa vdev valid allocate
```

where:

*vdev*

is the virtual device number you assigned to the DASD.

*valid*

is the volume identifier of the volume that is mounted on this device.

When using CPFMTXA, ICKDSF is invoked and you will receive ICKDSF messages. Normally, ICKDSF first displays the current allocation of the volume. Under the headings of TYPE, ICKDSF displays the type of space and its cylinder or page range, respectively. ICKDSF may display under TYPE any of the following types of space:

- Directory (DRCT)
- Paging (PAGE)
- User minidisk, nucleus, checkpoint, or warm start (PERM)
- PARM space
- Spooling, dumps, system data files, or paging overflow (SPOL)
- Temporary disk (TDSK)
- Invalid allocation map (BAD).

CPFMTXA then prompts you to enter new allocation data.

3. Enter:

```
end
```

In response, CPFMTXA again displays the current allocation (unchanged), it tells you that the allocate operation and the CPFMTXA utility are complete.

If no errors occur and the volume contains no invalid allocation map (BAD) cylinders, the volume is in VM/ESA format.

If I/O errors are reported, error messages are issued, or the volume contains invalid allocation map (BAD), see “Formatting and Allocating a System Volume” before contacting support personnel for help in formatting and allocating the volume.

### Formatting and Allocating a System Volume

If a VM/ESA system volume has the wrong format or has not been formatted, your installation can format it for system use. Your support personnel must provide you with the appropriate input.

Before you format and allocate a system volume, you may wish to use the Device Support Facilities program (ICKDSF) to inspect the DASD volume for defective tracks and to assign alternate tracks if required. For more information on using this program, see “Running the Device Support Facilities Program” on page 315, or refer to the *Device Support Facilities User's Guide and Reference* book.

**Note:** Although in most instances the CPFMTXA utility can be used for such maintenance procedures, it is recommended that instead, the Device Support Facilities program (ICKDSF) be used in all CP volume

## Controlling Local Devices

maintenance. This is because some DASD devices require the use of the ICKDSF program. In fact, when CPFMTXA is invoked, VM/ESA will call the ICKDSF program. Only if ICKDSF is available will the system continue with the original command.

Use the CPFMTXA utility or invoke ICKDSF directly to format DASD. For convenience, this section illustrates the use of the CPFMTXA utility. The responses and messages may vary slightly depending on the given scenario.

For more details on the CPFMTXA utility, see the *VM/ESA: CP Command and Utility Reference* book.

To format and allocate a system volume using the CPFMTXA utility:

1. Vary the device online and attach it to your virtual machine. Enter:

```
vary online rdev
attach rdev to * as vdev
```

where:

*rdev*

is the real device number of the DASD.

*vdev*

is the virtual device number you want to assign to the device.

\* (*asterisk*)

indicates that you want CP to dedicate the device to your own virtual machine.

2. Run CPFMTXA. Enter:

```
cpfmtxa vdev valid
```

where:

*vdev*

is the virtual device number you assigned to the DASD.

*valid*

is the volume identifier you want to assign to the volume that is mounted on this device.

CPFMTXA tells you that it will erase the cylinders or pages on the disk and asks you if you want to continue. If you answer NO, it does not format the disk. If you answer YES to the continuation prompt, ICKDSF formats the volume.

**Note:** If ICKDSF is not on an accessed disk, formatting does not take place.

3. Enter the input your support personnel supplies.

For example, if cylinders 0 through 200 are to be used as spooling space, cylinders 201 through 400 as paging space, and the remaining cylinders as temporary disk space, enter:

```
spol 0-200
page 201-400
tdsk 401-end
end
```

For FBA type DASD page expressions rather than cylinders would be used in the above example.

4. After the volume is allocated, enter:

```
detach rdev from userid
attach rdev to system as valid
```

where:

*rdev*

is the real device number of this DASD.

*userid*

is your logon ID.

*valid*

is the volume identifier of the volume that is mounted on this device.

These commands remove the volume from your virtual machine and attach it to the system.

**Note:** If you are adding the volume for checkpoint and warm-start data, paging, spooling, dump, nucleus, directory, or temporary disk space, your installation must have defined the volume identifier of the device using either the CP\_OWNED statement in the system configuration file or the SYSCPVOL macroinstruction in HCPSYS. If your installation did not define the volume identifier, CP has no reference to the volume and does not use it for checkpoint and warm-start data, paging, spooling, dump, nucleus, directory, or temporary disk space.

To find out whether CP is using the volume for these CP functions, enter:

```
query system rdev
```

where *rdev* is the real device number of the DASD you just attached to the system. If CP's response includes the words "ATTACHED CPVOL," CP is using the volume. If the response includes the words "ATTACHED SYSTEM," however, CP is not using the volume for the CP functions listed earlier.

### Changing the Volume Identifier of a System Volume

The name of a system volume resides in a 6-character field called the *volume identifier*. The volume identifier resides in a longer record called the volume label. If you need to change the volume identifier of a system volume, you may use the CPFMTXA utility or the Device Support Facilities program (ICKDSF). However, using ICKDSF is the recommended method for all maintenance on DASD volumes for CP use. For more information on using ICKDSF for CP maintenance procedures, see the *Device Support Facilities User's Guide and Reference* book. For more details on the CPFMTXA utility, see the *VM/ESA: CP Command and Utility Reference* book.

For convenience, this section shows the use of the CPFMTXA utility. The responses and messages may vary slightly depending on the given scenario.

## Controlling Local Devices

To change the volume identifier of a system volume using the CPFMTXA utility, do the following:

1. Make the device available to the system and dedicate it to your virtual machine.

Enter:

```
vary online rdev  
attach rdev to * as vdev
```

where:

*rdev*

is the real device number of the DASD.

*vdev*

is the virtual device number you want to assign to the device.

\* (*asterisk*)

indicates that you want CP to dedicate the device to your own virtual machine.

2. To change the volume identifier, enter:

```
cpfmtxa vdev valid label
```

where:

*vdev*

is the virtual device number you assigned to the DASD.

*valid*

is the new volume identifier you want to assign to the volume.

In response to this command, ICKDSF changes the volume identifier of the system volume to the new one you specified.

### Changing the Label of a DASD Volume for the Production System

If you need to change the label of a production system's DASD volume, use the Device Support Facilities (ICKDSF) program. For more information, see "Running the Device Support Facilities Program" on page 315 or refer to the *Device Support Facilities User's Guide and Reference* book.

### Defining a DASD as a Dump Device

To prepare the system for a possible failure, you may need to define a DASD as a dump device. To find out how to do this, see "Preparing the System for a Possible Failure" on page 40.

### Inspecting the Physical Condition of a DASD Volume

If you need to inspect a DASD volume for defective tracks, use the device support facilities program. For more information, see "Running the Device Support Facilities Program" on page 315.

## Copying One DASD Volume to Another

If you need to copy one DASD volume to another, use the DASD dump restore utility that IBM provides with VM/ESA. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

---

## Tape Drives

Tapes contain much of your installation's data. Accordingly, you must spend a lot of your time controlling tape drives.

Some of the tape drives in your VM/ESA system may be shared by operating systems running on other processor complexes. Sharing tape drives in this way affects the way you control them. Accordingly, the next section focuses on shared tape-drive operation. “Controlling Tape Drives” on page 128 follows with the main tape-drive operation tasks.

## Operating with Shared Tape Drives

The only tape drives VM/ESA allows you to share with other systems are IBM 3480 and follow on Magnetic Tape Subsystems. VM/ESA does not support the sharing of other tape drives.

VM/ESA allows your installation to share 3480s or follow on tape drives safely through assign/unassign support. Assign/unassign support for tape drives is similar in purpose to reserve/release support for DASDs; it guarantees data integrity while still allowing several operating systems to use the same device. Assign/unassign allows only one operating system at a time to access a tape drive. This prevents one system from reading data on a tape that another system is changing at the same time.

Assign/unassign support makes use of a hardware function available only on 3480 and follow on tape drives. To serialize access to 3480 and follow on tape drives, operating systems use particular channel command words (CCWs) called assign/unassign CCWs. An assign CCW exclusively reserves a tape drive for the issuer. An unassign CCW releases the drive, allowing another operating system to reserve it. Assign/unassign CCWs replace the physical partitioning switches that are present on IBM tape subsystems of earlier design.

When you dedicate a 3480 or follow on tape drive to a VM/ESA virtual machine, you assign the tape drive to the virtual machine by default. You may also specify the NOASSIGN option to dedicate the tape drive without trying to assign it to the virtual machine.

The assignment of the tape drive can also be established when the drive is made available to the system (vary online). By specifying the ASSIGN option on the VARY ONLINE command, CP will assign the drive to the system when the device is brought online. When the drive is eventually dedicated (attached) to a virtual machine, no attempt will be made to assign the drive. When the drive is detached from the virtual machine it will not be unassigned. This method of tape management reduces the chance of the drive becoming "assigned elsewhere" when being reattached to different virtual machines. When the ASSIGN option is specified on the VARY ONLINE command and the drive is found to be "assigned elsewhere", the drive will not be brought online. Simply issuing the VARY ONLINE command without the ASSIGN option (the default), will bring the device online.

## Controlling Local Devices

You can still specify the NOASSIGN option to the dedicate, which will cause an UNASSIGN to be issued to the drive. Once a dedicate with the NOASSIGN option has been specified, the assign that was acquired at vary online is no longer in effect for this drive. Future dedicates will now assign the drive upon attachment to the virtual machine (the default).

If you must release a drive that CP has assigned for a virtual machine or the virtual machine has left unassigned, you may use the RESET ASSIGN command.

**ATTENTION:** The RESET ASSIGN command is intended for use in the removal of spurious assignments from a real device. You should use this command **only** when you know that the virtual machine user of the device, if any, is hung or has otherwise failed, and is thus unable to complete the work being done on the device. Use of this command on a device being actively used can allow the device to be accessed by another real system with shared access to the device, potentially destroying the active work.

## Controlling Tape Drives

To control tape drives, you need to be able to:

- Find out a tape drive's status
- Make a tape drive available to the system
- Dedicate a tape drive to a VM/ESA user or to the production system
- Remove a tape drive from a VM/ESA user or from the production system
- Remove a tape drive from the system
- Mount a tape for a VM/ESA user or for the production system
- Dump data on DASD to tape, restore data to DASD from tape, and copy one tape to another.

### Finding Out a Tape Drive's Status

To find out the status of a specific tape drive, enter:

```
query rdev
```

where *rdev* is the real device number of the tape drive.

To find out the status of all the tape drives in your system, enter:

```
query tapes all
```

Table 8 on page 129 lists the keywords that appear in responses to QUERY commands for tape drives. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active, free, or offline tape drive
- Whether the keyword indicates a dedicated tape drive or a tape drive in use by CP.

Table 8. Tape Drive Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ASSIGNED SYSTEM</b>	The tape drive is processing a dump, an SPTAPE or SPXTAPE function, or a TRSAVE function.	Active (CP)
<b>ATTACHED TO</b>	The tape drive is dedicated to the indicated virtual machine.	Active (dedicated)
<b>FREE</b>	The tape drive is available but is not in use.	Free
<b>INT REQUIRED</b>	The tape drive requires operator intervention.	Active (CP or dedicated)
<b>OFFLINE</b>	The tape drive is unavailable to CP.	Offline
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled

### Making a Tape Drive Available to the System

If the status of a tape drive is offline, you must make it available to the system in order to use it. To make it available to the system, enter:

```
vary online rdev
```

or, to make it available and assigned to the system, enter:

```
vary online rdev assign
```

where *rdev* is the real device number of the tape drive.

You may now dedicate it to a VM/ESA user or to the production system.

You may get an error message that the tape drive was not varied online because it was assigned elsewhere. You can still bring the device online by reissuing the command without the ASSIGN option (the default).

### Dedicating a Tape Drive to a VM/ESA User

If a tape drive is offline and you need to dedicate it to a VM/ESA user, enter:

```
vary online rdev
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the user's logon ID.

*vdev*

is the virtual device number that the user asked you to assign to the tape drive.

If you want the drive assigned to the system during VARY ONLINE, enter:

```
vary online rdev assign
```

You may get an error message that the tape drive was not varied online because it was assigned elsewhere. You can still bring the device online by reissuing the command without the ASSIGN option (the default).

## Controlling Local Devices

If the tape drive is a 3480 or follow on, you may get an error message that the tape drive was not attached because it was assigned elsewhere. If the virtual machine is running an operating system that handles assign/unassign support, you can dedicate the tape drive by entering:

```
attach rdev userid vdev noassign
```

In response, CP dedicates the tape drive without trying to assign it to the virtual machine.

**Note:** CMS does not support use of a shared virtual tape device. Refer to the *VM/ESA: CMS User's Guide* book. If the tape drive you are trying to dedicate to a CMS virtual machine is assigned elsewhere, find another free tape drive and dedicate it without the NOASSIGN option.

### Dedicating a Tape Drive to the Production System

If a tape drive is offline and you want to dedicate it to the production system for its exclusive use, do the following:

1. Enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the production system.

*vdev*

is the virtual device number you want to assign to the tape drive.

**Note:** If *rdev* and *vdev* are the same, you can enter:

```
attach rdev userid
```

If you want the drive assigned to the system during VARY ONLINE, enter:

```
vary online rdev assign
```

You may get an error message that the tape drive was not varied online because it was assigned elsewhere. You can still bring the device online by reissuing the command without the ASSIGN option (the default). If the tape drive is a 3480 or follow on, you may get an error message that the tape drive was not attached because it was assigned elsewhere. In this case, dedicate the tape drive by entering:

```
attach rdev userid vdev noassign
```

If the tape drive you are trying to dedicate is assigned to a system that does not support the assign/unassign CCWs, find another free tape drive and dedicate it without the NOASSIGN option.

2. At the production system's system console, enter any commands that the production operating system requires to use the device.

**Example—Dedicating a Tape Drive to the Production System:** Tape drive 5C0 should be dedicated to the production system, VM/ESA, as virtual device 5C0. When you enter:

```
query 5c0
```

CP tells you that tape drive 5C0 is offline. For example, to dedicate it to the production system, enter:

```
vary online 5c0  
attach 5c0 vmsp
```

At the VM/ESA system console, enter appropriate VM/ESA commands to make sure the tape drive is usable.

### Transferring Control of a Tape Drive

You can transfer ownership of dedicated tape drives among users running on the same system by using the GIVE command. You are most likely to use the GIVE command when the service virtual machine is considered the owner of the tape drive and other virtual machines want to borrow that tape drive.

**Note:** Through the GIVE command, a privileged user can also transfer control of a tape device from a second user to a third.

The system operator, as a privileged user, obtains dedicated use of a tape drive by entering the ATTACH command. Once you have obtained the tape drive, you can transfer ownership of that tape drive by entering the GIVE command. (You can also transfer the tape drive from a program by using the CP DIAGNOSE X'08' interface.) To reclaim ownership of the tape drive once the receiver is finished with it, you specify the RETURN option with the GIVE command. If you give the tape drive with the RETURN option, you should also specify whether the tape should be rewound and unloaded or left in its current position. You do this with the UNLOAD and LEAVE options, respectively. You can also specify whether the receiver is to have read/write or read/only access to the given tape drive.

The receiver logically owns the tape drive until it is detached with the DETACH command or until the receiver logs off the system. If the virtual machine that has received the tape drive has class B authorization, and the tape drive was given without the RETURN option, the receiver can give the tape drive to a third party. If the RETURN option was specified, the second GIVE is rejected, and CP issues a message.

**Note:** In an installation with more than one tape server virtual machine, one of the servers may omit the RETURN option. In this situation, one server machine can give a tape drive to another without the RETURN option; the second server machine can then become the owner of the tape drive and can give it to a virtual machine that requests a tape drive.

To cancel a return request for the tape drive, you (as the giver) can use the DETACH command, specifying the reserved virtual device number, or you can log off your virtual machine. Even if you log off and log on again before the receiver detaches the tape drive, the device is not returned to you. When the receiver enters the DETACH command, the tape drive is returned either to the giver or to the system, depending on the current RETURN status of the tape drive.

When a class B user enters the DETACH command to remove a tape drive, the LEAVE or UNLOAD option specified on DETACH overrides any option specified on the GIVE command.

If an abend occurs while a V=R guest is receiving or giving a tape drive, the tape drive is returned to the V=R guest once guest recovery occurs. All record of the GIVE command is lost, and the tape drive remains attached to the V=R guest.

**Example 1—Transferring a Tape Drive with Read/Write Access:** The receiver wants to receive control of a tape drive with read/write access. You (the giver) want the tape returned in its current position. To transfer the tape you can take the following steps:

1. You log on the service virtual machine and verify that all tape drives are dedicated to it.
2. The receiver logs on and requests a tape.
3. You mount the tape and read and verify the label.
4. You attach the tape to the receiver by entering:

```
give vaddr1 to receiver as vaddr2 return leave
```

where:

*vaddr1*

is the virtual address of the tape to be transferred.

*vaddr2*

is the virtual address of to the target virtual machine.

The tape is returned to you and left in the current position. By specifying RETURN and LEAVE, you verify the integrity of the label.

5. The receiver accesses the tape (and reads and writes).
6. When finished with the tape, the receiver detaches the tape by entering:

```
detach virtual vdev
```

where:  
**virtual**  
indicates a virtual device is to be detached.  
*vdev*  
is a virtual device number, a list of virtual device numbers, or a range of virtual device numbers to be detached from the virtual machine.
7. Control of the tape drive returns to you with the tape left in its current position.
8. You rewind the tape and read the label to make certain the receiver did not write over the label.
9. Unload the tape.

**Example 2—Transferring a Tape Drive with Read Only Access:** The receiver wants control of a tape drive. For the particular application, read only access is necessary. You want the tape returned and rewound. To transfer the tape you may do the following:

1. You log on the service virtual machine and verify that all tape drives are dedicated to it.
2. The receiver logs on and requests a tape.
3. You mount the tape and read and verify the label.
4. You attach the tape to the receiver by entering:

```
give vaddr1 to receiver as vaddr2 return unload r/o
```

where:

*vaddr1*

is the virtual address of the tape to be transferred.

*vaddr2*

is the virtual address of the target virtual machine.

R/O attaches the tape to the receiver in read only mode; any attempts to write to the tape drive result in an error.

5. The receiver accesses the tape (and reads from it).
6. The receiver, when finished with the tape, detaches the tape by entering:

```
detach virtual vdev
```

where:

**virtual**

indicates a virtual device is to be detached.

*vdev*

is a virtual device number, a list of virtual device numbers, or a range of virtual device numbers to be detached from the virtual machine.

7. Control of the tape drive returns to you with the tape unloaded and rewound.

### Removing a Tape Drive from a VM/ESA User

Usually VM/ESA users remove tape drives from their virtual machines by entering the DETACH VIRTUAL command. However, if you need to remove a tape drive from a VM/ESA user, enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the user.

**Note:** If the 3480 or follow on drive was varied online with the ASSIGN option, CP will not unassign the drive during the detach process.

If a 3480 or follow on tape drive was attached with the NOASSIGN option, CP does not rewind and unload the tape; it leaves the tape positioned on the tape drive. All other tape drives rewind and unload the tape.

If you want to be sure the tape remains positioned on the tape drive, enter:

```
detach rdev userid leave
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the user.

If you want to be sure the tape rewinds and unloads from the tape drive, enter:

## Controlling Local Devices

```
detach rdev userid unload
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the user.

Now you may remove the tape drive from the system or dedicate it to another virtual machine.

### Removing a Tape Drive from the Production System

Removing a tape drive from the production system is the opposite of dedicating it:

1. At the production system's system console, enter any commands that the production operating system requires in order to release the device from use.

2. Enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the production system.

**Note:** If the 3480 or follow on drive was varied online with the ASSIGN option, CP will not unassign the drive during the detach process.

If a 3480 or follow on tape drive was attached with the NOASSIGN option, CP does not rewind and unload the tape; it leaves the tape positioned on the tape drive. All other tape drives rewind and unload the tape.

If you want to be sure the tape remains positioned on the tape drive, enter:

```
detach rdev userid leave
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the production system.

If you want to be sure the tape rewinds and unloads from the tape drive, enter:

```
detach rdev userid unload
```

where:

*rdev*

is the real device number of the tape drive.

*userid*

is the logon ID of the production system.

Now you may remove the tape drive from the system or dedicate it to another virtual machine.

### Removing a Tape Drive from the System

Removing a tape drive from the system is the opposite of making it available. To remove it from the system:

1. Make sure the tape drive is not in use. Enter a QUERY command for the device to find out if it is.

If it is in use, take appropriate steps to remove it from the virtual machine. The status should say FREE before you go to the next step.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the tape drive.

The tape drive is now unavailable to VM/ESA.

**Note:** As part of vary offline processing, CP will ensure that the drive is unassigned at command completion.

### Mounting a Tape

If you need to mount a tape for a VM/ESA user, a production system user, or a job, do the following:

1. Locate the tape.
2. Make sure the user or job is authorized to access data on the tape. Follow your installation's normal procedures.
3. Follow the procedures in "Finding Out a Tape Drive's Status" on page 128 and "Dedicating a Tape Drive to a VM/ESA User" on page 129 or "Dedicating a Tape Drive to the Production System" on page 130 to check the status of the tape drive and dedicate it to the user or production system.
4. Mount the tape (enabled for writing, or not, as requested).

The tape is now available to the user.

5. At the production system's system console, enter any commands that the production operating system requires in order to use the device.

The tape drive is now available to the production system user or job.

### Defining a Tape Drive as a Dump Device

In order to prepare the system for a possible failure, you may need to define a tape drive as a dump device. To find out how to do this, see "Preparing the System for a Possible Failure" on page 40.

### Dumping Data on DASD to Tape

If you need to dump all or part of the data on DASD to a tape, use the DASD Dump Restore program that IBM provides with VM/ESA. For more information, see "Running the DASD Dump Restore (DDR) Utility" on page 307.

If you want to dump one or more CMS files to tape, use the CMS TAPE DUMP command.

## Controlling Local Devices

For example, if you want to dump to tape all of the files on your A disk with a file type of ACCOUNT and the tape drive that is dedicated to your virtual machine is assigned virtual device number 184, enter:

```
tape dump * account a (tap4
```

The asterisk indicates that you want to dump all of the files with the specified file type. If you want to dump only a specific file, specify the file's name instead of the asterisk.

**Note:** The records in these CMS files can be either fixed or of variable length. However, none of the files can be larger than one tape volume.

If you want to dump a file that contains a loadable (through IPL) version of a program to tape, use the CMS FILEDEF and MOVEFILE commands.

**Example—Dumping Data on DASD to Tape:** Suppose you want to dump to tape an IPLable version of the DDR program. The program resides on the K disk with a file name and file type of IPL DDR. To put this file on tape, do the following:

1. Ask the operator to:
  - Mount on a tape drive a scratch tape enabled for writing
  - Attach the tape drive to your virtual machine as virtual device number 181.
2. Define for the MOVEFILE command the file you want to move to tape. Enter:

```
filedef in disk ipl ddr k
```
3. Define for the MOVEFILE command the tape drive to which you want to move the file. Enter:

```
filedef out tap1 (recfm f lrecl 80 block 80
```
4. Wait for CP to send you a message that the tape drive has been attached.
5. Move the DDR file from disk to tape. Enter:

```
movefile in out
```

### Restoring Data to DASD from Tape

If you need to restore data to DASD from a tape, and you used the DASD dump restore utility to create the tape, use the same program to restore it. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

If you want to load one or more CMS files from a tape onto a CMS minidisk, and you use the CMS TAPE DUMP command to dump them, use the CMS TAPE LOAD command to load them.

For example, if you want to load onto your K disk some CMS files that were previously dumped to tape, and the tape drive on which the tape is mounted is assigned the virtual device number 183, enter:

```
tape load * * k (tap3
```

The asterisks indicate that you want CMS to load all the files. If you want CMS to load only a specific file, specify the file's name and type instead of the asterisks.

**Copying One Tape to Another**

If you need to copy data from one tape to another, use the DASD dump restore utility that IBM provides with VM/ESA. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

**Dumping Spool Files or System Data Files to Tape**

If you need to dump spool files or system data files to tape, use the SPXTAPE command. For more information, see “Backing Up Standard Spool Files and System Data Files” on page 273.

**Loading Spool Files or System Data Files from Tape**

If you need to load spool files or system data files from tape back on to the system's spooling space, use the SPXTAPE command. For more information, see “Backing Up Standard Spool Files and System Data Files” on page 273.

---

## Channel-to-Channel Adapters (CTCAs)

To control channel-to-channel adapters (CTCAs), you need to be able to:

- Find out a CTCA's status
- Make a CTCA available to the system
- Dedicate a CTCA to a VM/ESA user or to the production system
- Remove a CTCA from a VM/ESA user or from the production system
- Make a CTCA unavailable to the system.

But before you start, you should know how your installation uses CTCAs to transmit data from one system to another.

**When You Share Data with Another System through CTCAs**

Many installations run more than one system on more than one processor complex. In these installations, the systems can be loosely coupled through channel-to-channel adapters (CTCAs). If this is true at your installation, you should make sure you know how to shut down data transmission safely before you remove CTCAs from VM/ESA.

If your installation uses CTCAs to connect VM/ESA or the production system to a network, you must be careful when you switch a CTCA from one virtual machine to another. You must also be careful when you remove the CTCA from VM/ESA's control (when you vary it offline) or when you shut down the system.

Normally, being careful means you must make sure that other systems have stopped sending data over the CTCA. Before you detach a CTCA or vary it offline, or enter the SHUTDOWN command, contact the operators of the other systems and follow your installation's normal procedures.

**Finding Out a CTCA's Status**

To find out the status of a specific CTCA, enter:

```
query rdev
```

where *rdev* is the real device number of the CTCA.

To find out the status of all the CTCAs in your VM/ESA system, enter:

```
query ctca all
```

## Controlling Local Devices

Table 9 on page 138 lists the keywords that appear in responses to QUERY commands for CTCAs. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active, free, or offline CTCA
- Whether the keyword indicates a dedicated CTCA or a CTCA in use by CP.

Table 9. CTCA Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ATTACHED TO</b>	The CTCA is dedicated to the indicated virtual machine.	Active (dedicated)
<b>FREE</b>	The CTCA is available but is not in use.	Free
<b>INT REQUIRED</b>	The CTCA requires operator intervention.	Active (CP or dedicated)
<b>OFFLINE</b>	The CTCA is unavailable to CP.	Offline
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled

### Making a CTCA Available to the System

If the status of a CTCA is offline, you must make it available to the system in order to use it. To make it available to the system, enter:

```
vary online rdev
```

where *rdev* is the real device number of the CTCA.

Now you may dedicate it to a VM/ESA user or to the production system.

### Dedicating a CTCA to a VM/ESA User

If a CTCA is offline and you need to dedicate it to a VM/ESA user, enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*  
is the real device number of the CTCA.

*userid*  
is the user's logon ID.

*vdev*  
is the virtual device number that the user asked you to assign to the CTCA.

### Dedicating a CTCA to the Production System

If a CTCA is offline and you want to dedicate it to the production system for its exclusive use, do the following:

1. Enter:  

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the CTCA.

*userid*

is the logon ID of the production system.

*vdev*

is the virtual device number that you want to assign to the CTCA.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

2. At the production system's system console, enter any commands that the production operating system requires to use the device.

**Example—Dedicating a CTCA to the Production System:** CTCA 620 should be dedicated to the production system, MVSESA, as virtual device 620. When you enter:

```
query 620
```

CP tells you that CTCA 620 is offline. To dedicate it to the production system, enter:

```
vary online 620
attach 620 mvsesa
```

At the MVSESA system's system console, enter appropriate MVS/SP commands to make sure the CTCA is usable.

## Removing a CTCA from a VM/ESA User

A VM/ESA user usually removes a dedicated CTCA from his virtual machine by entering a DETACH VIRTUAL command. However, if you need to remove a CTCA from a VM/ESA user, enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the CTCA.

*userid*

is the user's logon ID.

Now you may make the CTCA unavailable to the system or dedicate it to another virtual machine.

## Removing a CTCA from the Production System

Removing a CTCA from the production system is the opposite of dedicating it:

1. Make sure that any systems that are connected through the CTCA have stopped sending data. Follow your installation's normal procedures.
2. At the production system's system console, enter any commands that the production operating system requires to release the device from use.
3. Enter:

```
detach rdev userid
```

where:

## Controlling Local Devices

*rdev*

is the real device number of the CTCA.

*userid*

is the logon ID of the production system.

Now you may make the CTCA unavailable to the system or dedicate it to another virtual machine.

## Removing a CTCA from the System

Making the CTCA unavailable to the system is the opposite of making it available. To make the CTCA unavailable to the system:

1. Make sure the CTCA is not in use. Enter a QUERY command for the device to find out if it is.

If it is in use, take appropriate steps to remove it from the virtual machine. The status should say SYSTEM before you go to the next step.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the CTCA.

The CTCA is now unavailable to VM/ESA.

---

## Open Systems Adapters (OSAs)

To control open systems adapters (OSAs), you need to be able to:

- Find out an OSA's status
- Make an OSA available to the system
- Dedicate an OSA to a VM/ESA user or to the production system
- Remove an OSA from a VM/ESA user or from the production system
- Make an OSA unavailable to the system.

## Finding Out an OSA's Status

To find out the status of a specific OSA, enter:

```
query rdev
```

where *rdev* is the real device number of the OSA.

To find out the status of all the OSAs in your VM/ESA system, enter:

```
query osa all
```

Table 10 on page 141 lists the keywords that appear in responses to QUERY commands for OSAs. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active (dedicated), free, or offline OSA.

Table 10. OSA Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ATTACHED TO</b>	The OSA is dedicated to the indicated virtual machine.	Active (dedicated)
<b>FREE</b>	The OSA is available but is not in use.	Free
<b>OFFLINE</b>	The OSA is unavailable to CP.	Offline
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled

## Making an OSA Available to the System

If the status of an OSA is offline, you must make it available to the system in order to use it. To make it available to the system, enter:

```
vary online rdev
```

where *rdev* is the real device number of the OSA.

Now you may dedicate it to a VM/ESA user or to the production system.

## Dedicating an OSA to a VM/ESA User

If an OSA is offline and you need to dedicate it to a VM/ESA user, enter:

```
vary online rdev
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the OSA.

*userid*

is the user's logon ID.

*vdev*

is the virtual device number that the user asked you to assign to the OSA.

## Dedicating an OSA to the Production System

If an OSA is offline and you want to dedicate it to the production system for its exclusive use, do the following:

1. Enter:

```
vary online rdev
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the OSA.

*userid*

is the logon ID of the production system.

## Controlling Local Devices

*vdev*

is the virtual device number that you want to assign to the OSA.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

2. At the production system's system console, enter any commands that the production operating system requires to use the device.

**Example—Dedicating an OSA to the Production System:** OSA 620 should be dedicated to the production system, MVSESA, as virtual device 620. When you enter:

```
query 620
```

CP tells you that OSA 620 is offline. To dedicate it to the production system, enter:

```
vary online 620  
attach 620 mvsesa
```

At the MVSESA system's system console, enter appropriate MVS/SP commands to make sure the OSA is usable.

## Removing an OSA from a VM/ESA User

A VM/ESA user usually removes a dedicated OSA from his virtual machine by entering a DETACH VIRTUAL command. However, if you need to remove an OSA from a VM/ESA user, enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the OSA.

*userid*

is the user's logon ID.

Now you may remove the OSA from the system or dedicate it to another virtual machine.

## Removing an OSA from the Production System

Removing an OSA from the production system is the opposite of dedicating it:

1. At the production system's system console, enter any commands that the production operating system requires to release the device from use.
2. Enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the OSA.

*userid*

is the logon ID of the production system.

Now you may remove the OSA from the system or dedicate it to another virtual machine.

## Removing an OSA from the System

Removing an OSA from the system is the opposite of making it available. To remove it from the system:

1. Make sure the OSA is not in use. Enter a QUERY command for the device to find out if it is.

If it is in use, take appropriate steps to remove it from the virtual machine. The status should say FREE before you go to the next step.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the OSA.

The OSA is now unavailable to VM/ESA.

---

## Printers

A great deal of the work users do results in printed output. Accordingly, you need to spend a lot of your time controlling printers.

To control a printer, you must be able to:

- Find out a printer's status
- Set the security label for a printer
- Dedicate a printer to a VM/ESA user or to the production system
- Remove a printer from a VM/ESA user or from the production system
- Print files submitted by VM/ESA users on 3800, impact, and advanced function printers
- Stop a printer and remove it from the system
- Control the print spool files in the print spool file queue
- Control the active file on a printer.

**Note:** If you run CMS in your operator's virtual machine and you enter the START command without abbreviating it, CMS assumes you mean the CMS START command, not the CP START command. If you want to use the CP START command under CMS to start a printer, abbreviate the command to STA or enter CP START.

If an external security manager (ESM) is installed and security label checking is enabled, creation of printed output may be restricted to only authorized users. For additional information, contact your security administrator.

## Finding Out a Printer's Status

To find out the status of a specific printer, enter:

```
query rdev
```

where *rdev* is the real device number of the printer.

To find out the status of a specific print server virtual machine, enter:

```
query prtld
```

## Controlling Local Devices

where *prtid* is the identification of the advanced function printer (AFP\*) controlled by the print server virtual machine.

To find out the status of all the printers (and other unit record devices) in your VM/ESA system, enter:

```
query ur all
```

Table 11 lists the keywords that appear in responses to QUERY commands for printers. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active, free, or offline printer
- Whether the keyword indicates a dedicated printer or a printer in use by CP.

Table 11. Printer Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ATTACHED TO</b>	The printer is dedicated to the indicated virtual machine.	Active (dedicated)
<b>DRAINED</b>	The printer is unavailable for processing spool files.	Free
<b>DRAINING</b>	The printer will become unavailable for processing spool files after finishing the current file.	Active (CP)
<b>INT REQ</b>	The printer requires operator intervention.	Active (CP)
<b>INT REQUIRED</b>	The printer requires operator intervention.	Active (CP or dedicated)
<b>MOUNT REQ</b>	The printer is waiting for you to change the paper (mount a new form).	Active (CP)
<b>OFFLINE</b>	The printer is unavailable to CP.	Offline
<b>PRINTING</b>	The printer is printing a spool file.	Active (CP)
<b>SEC</b>	Specifies the security label of files that can be printed on the printer. This is used only when an ESM is installed and security label checking is enabled. If a security label is not assigned to the printer, the SEC field is followed by the word NONE. No files can be printed until the printer is STARTed with a valid security label.	Active (CP)
<b>SETUP REQ</b>	The impact printer is waiting for you to check the alignment of the paper on the printer.	Active (CP)
<b>STARTED</b>	The printer is available for processing spool files.	Active (CP)
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled

## Dedicating a Printer to a VM/ESA User

If a printer is offline and you need to dedicate it to a VM/ESA user, enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the printer.

*userid*

is the user's logon ID.

*vdev*

is the virtual device number that the user asked you to assign to the printer.

Note that you can use the method outlined above to dedicate an AFP to a print server virtual machine and then enter:

start *prt*id

where *prt*id is the identification of the AFP controlled by the print server virtual machine.

**Note:** The *prt*id option is *not* valid for the VARY command. Therefore, this command is meaningless for advanced function printers and their servers.

## Dedicating a Printer to the Production System

If a printer is offline, and you want to dedicate it to the production system for its exclusive use, do the following:

1. Enter:

```
vary online rdev
attach rdev userid vdev
```

where:

*rdev*

is the real device number of the printer.

*userid*

is the logon ID of the production system.

*vdev*

is the virtual device number that you want to assign to the printer.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

2. At the production system's system console, enter any commands that the production operating system requires to use the device.

**Example—Dedicating a Printer to the Production System:** Printer 00E should be dedicated to the production system, VMSPHPO, as virtual device 00E. When you enter:

```
query 00e
```

## Controlling Local Devices

CP tells you that printer 00E is offline. To dedicate it to the production system, enter:

```
vary online 00e  
attach 00e vmsphpo
```

At the VMSPHPO system's system console, enter appropriate VM/SP HPO commands to make sure the printer is usable.

## Removing a Printer from a VM/ESA User

A VM/ESA user usually removes a printer from his virtual machine by using a DETACH VIRTUAL command. If you need to remove a printer from a VM/ESA user, however, enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the printer.

*userid*

is the user's logon ID.

Now you may remove the printer from the system, use it to print files submitted by VM/ESA users, or dedicate it to another virtual machine.

To remove a printer from the system, enter:

```
vary offline rdev
```

where *rdev* is the real device number of the printer.

The printer is now unavailable to VM/ESA.

## Removing a Printer from the Production System

Removing a printer from the production system is the opposite of dedicating it:

1. At the production system's system console, enter any commands that the production operating system requires to release the device from use.
2. Enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the printer.

*userid*

is the logon ID of the production system.

Now you may remove the printer from the system, use it to print files submitted by VM/ESA users, or dedicate it to another virtual machine.

To remove the printer from the system, enter:

```
vary offline rdev
```

where *rdev* is the real device number of the printer.

The printer is now unavailable to VM/ESA.

## Printing Spool Files on a 3800

This section describes how to print files on an IBM 3800 Printing Subsystem Model 1 (referred to in this section as simply “3800”). If you want to find out how to print files on a 1403, 3203, 3262, 4245, or 4248 impact printer, see “Printing Spool Files on an Impact Printer” on page 158.

For convenience, this section refers only to 3800 Model 1 printers. You may also print files on a 3800 Model 3 printer in Model 1 compatibility mode. The procedure is the same for both models, with the following exceptions:

- You may use an FCB of 10 lines per inch for the 3800-3 or 3800-6, but not for the 3800-1.
- You must use a different image library for a 3800-3 or 3800-6 than for a 3800-1.
- Files created on a virtual 3800-3 may not print exactly as intended on a real 3800-1 printer. Therefore, IBM recommends that your installation set up different print file classes for the two kinds of files. Then you can use the appropriate real printer for each kind of file.

**Note:** The 3800-6 printer is supported but can only be run as a 3800 Model 3.

### Overview of Printing Spool Files on 3800s

To print spool files, whether you are using a 3800 or impact printers, you must have:

- A printer that is set up to print a certain group of files
- A group of files in the print queue whose characteristics match the printer's setup.

Spool files come into the print queue as users create them. As the files arrive, a printer prints any files that match its setup. Files that do not match remain in the print queue. To print these nonmatching files, you change the printer's setup.

If you have more than one printer, and each is set up to print a different group of spool files, you can print more than one group at a time. Alternatively, if you want to print one particular group of files as quickly as possible, you can set up all your printers to print the same group.

Thus, printing spool files is a matter of responding to the changing print queue. Files come into the print queue and either match a printer's setup (get printed) or do not match (wait). When too many files are waiting, you change the setup on one or more printers to match the characteristics of the waiting files.

That said, the main difference between printing on a 3800, as opposed to an impact printer, is in how you set up the printer. Because a 3800 has more features, it requires more settings, and this in turn may require more options on the START command. But your installation can make 3800 operation simpler by:

- Specifying default values for many of the 3800 settings.

During system generation, your installation can set up default 3800 settings to reflect your normal print operation. Doing so reduces the number of options that you need to enter on the START command.

## Controlling Local Devices

- Setting up PF keys for commands you use most often in 3800 operation.

During system operation, you can set up PF keys to enter the commands you use to operate a 3800. This reduces the amount of typing you need to do to enter, for example, a START command with many options. If your installation sets up your virtual machine to run CMS, you can further simplify 3800 operation by creating a PROFILE EXEC to set up the PF keys.

Though your installation may use a combination of these methods to make your job easier, the procedure that follows does not assume this has been done.

The procedure that follows shows you how to start with a 3800 printer in any state and print a sample group of files. The procedure assumes that some settings are normal for 3800 operation. For example, it assumes that most files you print do not need a forms overlay and that you want to print files without regard to their 3800 load CCW content. “Using Other START Command Options for 3800 Printers” on page 152 describes other 3800 settings you can specify. If necessary, substitute these other settings as appropriate.

The procedure that follows also assumes you are familiar with the way VM/ESA presents both printer and spool file status. If you are not, see Appendix B, “Printer and Print File Status” on page 331. The appendix also describes ways your installation is likely to group spool files.

To print a new group of spool files on the 3800, perform the following steps:

1. If necessary, make the 3800 available to the system.
2. Drain the 3800.
3. Find out the status of the 3800.
4. Find out what files are waiting to be printed.
5. Choose a new group of files to print.
6. Choose the correct START command options for the new group of files.
7. Choose START command options to correctly control the 3800.
8. Enter the START command with all the correct options.
9. If necessary, change the paper on the 3800.
10. Start the 3800.

The next sections explain these steps in detail, using settings assumed to reflect typical 3800 printer operation. “Using Other START Command Options for 3800 Printers” on page 152 explains alternate settings you may specify.

### **Making the 3800 Printer Available to the System**

Before you can use a 3800 to print files, it must be available to the system. To find out if it is available to the system, enter:

```
query rdev
```

where *rdev* is the real device number of the 3800.

If the response does not indicate that the device is offline or attached to a virtual machine, then it is already available to the system. Go to the next step.

If the status says the 3800 is offline, enter:

```
vary online rdev
```

where *rdev* is the real device number of the 3800. Go to the next step.

If the 3800 is dedicated to a virtual machine, remove it from the virtual machine, and go to the next step. See “Removing a Printer from a VM/ESA User” on page 146 or “Removing a Printer from the Production System” on page 146, as appropriate.

### Draining the 3800 Printer

The next thing to do when you are getting ready to print a group of files is to make sure the 3800 does not print them before you are ready. An easy way to do this is to enter the DRAIN command. In VM/ESA, this is called draining a printer.

The DRAIN command does two things: it tells the 3800 to finish any file it is now printing, and it puts the 3800 in a state that prevents it from printing any other file, that is, the drained state.

Normally, a 3800 that has already been set up to print is in the started state. In this state, the 3800 may print a file before you are ready. Whether it does depends on how the 3800 is set up and what characteristics the files in the print queue have. If there are no files in queue with characteristics that match the setup of the 3800, no files print. In this case, it is not necessary to drain the 3800. But by draining the 3800 anyway, you can make sure no new files print.

To drain the 3800 printer, enter:

```
drain rdev
```

where *rdev* is the real device number of the 3800.

If the 3800 is active, CP sends you two messages, one when the 3800 starts draining and another when it is drained. Otherwise, CP sends you just the drained message. When CP tells you the 3800 is drained, continue with the next step.

### Finding Out the Status of a 3800 Printer

Printing takes place only when the characteristics of a file in the print queue match the way a printer is set up. You change the way a 3800 printer is set up through options on the START command, which you enter in a later step. To find out what options you need to specify on the START command, you must find out the status of the 3800. To do this, enter:

```
query rdev
```

where *rdev* is the real device number of the 3800.

In response, CP displays the status of the 3800. If you are not familiar with the status of 3800 printers, see the detailed explanation in “Understanding Printer Status” on page 331.

### Finding Out What Files Are Waiting to Be Printed

After you know how the 3800 is set up, you need to find out what files are waiting to be printed. To do this, enter:

```
query printer
query printer exp
```

In response, CP displays information about all the files that are waiting to be printed. If you are not familiar with the status of files in the print queue, see the detailed explanation in “Understanding Print File Status” on page 337.

### Choosing a New Group of Files to Print on the 3800

From the files that are waiting, choose a group of files to print.

Each installation classifies its printed output differently, but it is common to use a combination of print class, form, and destination to group output. If your installation has a lot of different output groups, you probably have a table that tells you, for each kind of print file, what options to use on the START command. For 3800 printers, the START command options most likely to vary by group are:

- **CLASS** for the print class (A through Z or 0 through 9)
- **FORM** for the type of paper to use (a name your installation uses by convention)
- **DEST** for the destination value of a particular printer or group of printers.

Finally, you may need to select files that require a forms overlay. "Printing Files with a Forms Overlay on a 3800" on page 155 shows you how to do this. For now, choose files that do not require a forms overlay.

### Choosing the START Command Options for the New Files (3800 Printers)

At this point, you have decided which files to print on the 3800. Now you need to choose the correct options to specify with the START command for those files.

The options are:

- **USER** *userid*|SYSTEM  
where *userid* is the user ID whose files will print. SYSTEM specifies any users files will print.
- **CLASS** *abcdefgh*  
where *abcdefgh* is a string of one to eight classes. If you specify CLASS \*, any class file will print.
- **FORM** *operform*  
where *operform* is the name of the type of paper the output requires.
- **DEST** *dest*  
where *dest* is a 1- to 8-character value assigned to the printer. Up to four destination values may be specified. Specify a DEST of \* to indicate that files are to be selected for processing regardless of the file's DEST setting.
- **CHARS** *cccc*  
where *cccc* is the name of the character set the 3800 should use to print the separator pages. The 3800 also uses this character set to print a file if the file has no other character set associated with it.
- **FCB** *ffff*  
where *ffff* is the default spacing. You may specify the spacing as either a number (6, 8, 10, or 12), indicating lines per inch, or as a name. If you specify a name, the 3800 uses the FCB defined with that name in the image library it is using. You may specify an FCB of 10 lines per inch only for a 3800 Model 3 or 3800 Model 6 printer.

- **SECLABEL** *ssssssss*

where *ssssssss* is a 1- to 8-character alphanumeric value that identifies the security label of files to be printed on the printer. The SECLABEL option is valid only if an ESM is installed and security label checking is enabled.

### Choosing the START Command Options for 3800 Printer Control

In addition to the settings that relate to specific kinds of files, you must also decide how you want to operate the 3800 printer. “Understanding Printer Status” on page 331 describes the various settings in detail. For now, look at the printer status you got when you entered the QUERY command for the device. It should say:

- On the second line, MANUAL, SEP, LIMIT, and ANY3800
- On the third line, FLASH *name*, IMAGE *imagelib*, CHARS *name*, FCB *name*, and HOLD
- On the fourth line, DEST *dest*
- On the fifth line, NOAFP.

If necessary, select the following START command 3800 printer control options:

- MANUAL, if the status says AUTO
- SEP, if the status says NOSEP
- LIMIT for the number of records of a file to be printed
- ANY3800, if the status says NO3800 or BEG3800
- FLASH OFF, if the status displays a name after FLASH
- IMAGE *imagelib*, if the status displays after IMAGE an image library name your installation does not normally use
- CHARS for the default character set to use (a name your installation defines as a member of a 3800 image library)
- FCB for the default spacing to use (6, 8, 10, or 12 lines per inch, or a name your installation defines as a member of a 3800 image library)
- HOLD, if the status says PURGE
- NOAFP, to prevent the printer from choosing files meant for advanced function printers
- SECLABEL, to specify the security label of files to print on the printer.
- MARK/NOMARK, to indicate whether 3800 separator trailer pages are being marked with separator bars.

### Entering the START Command for the 3800

Based on the options you chose in the previous steps, you can now enter the START command, as follows:

```
start rdev user system file-options printer-options
```

where:

*rdev*

is the real device number of the 3800.

## Controlling Local Devices

### *file-options*

are the options that relate to the files you have chosen to print (CLASS, FORM, and DEST).

### *printer-options*

are any required options that relate to the control of the 3800 printer (MANUAL, SEP, ANY3800, FLASH OFF, IMAGE, CHARS, FCB, HOLD, NOAFP, and SECLABEL, MARK or NOMARK).

You may enter the options in any order.

**Example—Starting a 3800 Printer:** If you want to start the third floor 3800 printer to select classified listing files for printing, enter:

```
start rdev class c form listing dest floor3
```

where *rdev* is the real device number of the 3800.

In response to the START command, CP sends you several lines indicating that the 3800 has started. Then CP displays a message that asks you to mount the new form.

**Note:** If you run CMS in your operator's virtual machine and you enter the START command without abbreviating it, CMS assumes you mean the CMS START command, not the CP START command. If you want to enter the CP START command under CMS to start a printer, abbreviate the command to STA or enter CP START.

## Changing the Paper and Starting the 3800 Printer

When you receive CP's prompt to mount the new form, go to the 3800 and change the paper, if necessary. (If your installation defines more than one operator form name for the same kind of paper, you may not have to change the actual paper on the printer.) Then, tell CP that you have finished mounting the paper by doing either of the following, whichever is more convenient:

- If you are near the 3800, push the STOP and START buttons on the 3800.
- If you are near your console, enter:

```
start rdev
```

where *rdev* is the real device number of the 3800.

Either of these actions causes CP to recognize that the 3800 is ready to print. After the 3800 warms up, it starts printing the first file in the print queue that matches the characteristics you just finished setting up for the printer. As the first file starts to print, you get a message that tells you that the file is printing.

As each matching file starts to print, you get a similar message. When all the matching files are printed, you can repeat this procedure and print another group of files.

## Using Other START Command Options for 3800 Printers

"Printing Spool Files on a 3800" on page 147 describes a procedure for printing a typical group of spool files on a 3800 printer. But you can control your printing operation more flexibly by changing the options on the START command. The following sections describe how to do this in more detail.

### Assuring That Files with AFP Characteristics Do Not Print on 3800 Printers

A CP printer can select spool files having AFP characteristics, but because these attributes have no meaning for a CP printer, they may cause erroneous output. To avoid this, enter the START command with the NOAFP option. Even if the CLASS, FORM, and DEST options match, you should still use the NOAFP option to make sure the CP printer does not print AFP-characteristic files. AFPs are controlled by a print server rather than CP.

### Assigning a 3800 Printer to a User (Printing Only One User's Files)

Ordinarily, you print output by class and form, without regard to file owner. You accomplish this by specifying the keywords USER SYSTEM on the START command. But sometimes you may need to print the output of a high-priority user. This is called *assigning* the printer to a user. The user may or may not be the production system.

To assign a 3800 to a user, follow the normal procedure for printing files until you are about to enter the START command. Then, enter:

```
start rdev user userid other-options
```

where:

*rdev*

is the real device number of the 3800.

*userid*

is the logon ID of the user to whom you want to assign the 3800.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

When you are ready to print all system files again, follow the normal procedure for printing files until you are about to enter the START command. Then, enter:

```
start rdev user system other-options
```

After you finish the rest of the procedure, the 3800 again starts printing available files without regard to their owners.

**Example—Assigning a 3800 Printer to a User:** Suppose you are printing files and user VIP asks you to print all his files now. The printer you are using is a 3800 printer that has real device number B32. User VIP's files are all of class V and form STANDARD. The character set associated with this group of files has the name GF10, and the files should be printed at 8 lines per inch. You must change the paper for the new form. The status of the 3800 indicates that the form mode is MANUAL, the separator page mode is SEP, and the other settings are correct. To assign 3800 printer B32 to user VIP:

1. Enter:

```
start b32 user vip class v form standard chars gf10 fcb 8
```

2. When CP prompts you, change the paper on the 3800 for the operator form, STANDARD.

3. Enter:

```
start b32
```

The 3800 then starts to print user VIP's spool files.

### **Allowing CP to Choose the Next Form Automatically (3800 Printers)**

On a 3800, you may choose between two *form mode* settings, MANUAL or AUTO. The form mode setting governs how the printer acts when no more files of the current form are left to print.

Normally, you set up a 3800 printer to run with the form mode set to MANUAL. This setting allows you to choose the next form to mount. The 3800 idles until another file of the current form joins the queue, or until you start the printer with a new form.

If you prefer, you can allow CP to choose the next form automatically. When the form mode is set to AUTO and there are no more files of the current form, CP chooses a new form. The new form is a form associated with one of the files waiting to be printed, and if possible, a form that is not on another printer. CP then starts the printer and prompts you to mount the new form.

To set up the 3800 so that CP automatically chooses the next form, follow the normal procedure for printing files until you are about to enter the START command. Then, enter:

```
start rdev auto other-options
```

where:

```
rdev
```

is the real device number of the 3800.

```
other-options
```

are the other options you chose for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

### **Printing without Separator Pages on a 3800**

Most of the time you will want separator pages between the files that you print. These header and trailer pages help you separate the output, which would otherwise run together. But if you are printing on a special form (checks, for example), you may want to print files without separator pages.

To print without separator pages, follow the normal procedure for printing files on a 3800 until you are about to enter the START command. Then, enter:

```
start rdev nosepe other-options
```

where:

```
rdev
```

is the real device number of the 3800.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

**Note:** If an ESM is installed and security label checking is enabled, the NOSEP option is not valid.

### Controlling the 3800 Printer's 3800 Load CCW Mode

A printer's *3800 load CCW mode* determines whether the printer prints files with 3800 load CCWs.

A *3800 load CCW* is a special instruction imbedded in a spool file. It tells a 3800 to load data that defines the spacing, characters, or copy modification data that the printer is to use to print the file. CP keeps track of whether a spool file has any 3800 load CCWs, and if so, whether they appear only at the beginning or throughout the file. Files that do not have 3800 load CCWs are NO3800 files. BEG3800 files refer to files that have 3800 load CCWs only at the beginning of the file. ANY3800 files refer to files that have 3800 load CCWs throughout the file.

ANY3800 is the normal setting for a 3800. This setting allows a 3800 to print a print file without regard to its 3800 load CCW content. But because it takes longer to print files with 3800 load CCWs, you may want to print such files only at nonpeak times. Depending on the nature of your printing workload, you may want to change the 3800 load CCW setting on the 3800.

To change the 3800 printer to print only NO3800 files, follow the normal procedure for printing files until you are about to enter the START command. Then, enter:

```
start rdev no3800 other-options
```

where:

*rdev*

is the real device number of the 3800.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

To change the 3800 to print NO3800 and BEG3800 files, enter:

```
start rdev beg3800 other-options
```

To change the 3800 to print NO3800, BEG3800, and ANY3800 files, enter:

```
start rdev any3800 other-options
```

### Printing Files with a Forms Overlay on a 3800

Some of the files you print may require a forms overlay. This feature, when active, causes the 3800 to flash an image onto selected pages of a print file through a film negative mounted in a frame. To print files with a forms overlay on a 3800:

1. Choose a group of files that need a forms overlay.

## Controlling Local Devices

To do this, enter:

```
query printer  
query printer exp
```

Under the FLASH heading, find a group of one or more files that have a forms overlay name. For that group of files, also note the CLASS, FORM, DEST, CHARS, and FCB settings you need to enter with the START command.

2. Drain the 3800 by entering:

```
drain rdev
```

where *rdev* is the real device number of the printer.

3. Locate the correct film negative and mount it in the frame in the 3800 printer.

For each forms overlay name, your installation should have a corresponding film negative. If you do not have a film negative for a particular forms overlay name, contact the person at your installation who makes the negatives available for use.

4. Start the 3800 with the correct forms overlay name by entering:

```
start rdev flash name other-options
```

where:

*rdev*

is the real device number of the 3800.

*name*

is the forms overlay name you want to start.

*other-options*

are the other options you have chosen for the START command.

5. When you receive CP's request to mount the new form, change the paper, if necessary.

6. Enter:

```
start rdev
```

where *rdev* is the real device number of the 3800.

The 3800 then starts printing both files that require the specified forms overlay and files that do not require any overlay. The 3800 flashes an image onto print files that require the overlay. Files that do not require an overlay are printed without it. When printing ends, you may repeat the procedure for a new forms overlay name.

When you wish to print only files that do not require a forms overlay, follow the normal procedure for printing files until you are about to enter the START command. Then, enter:

```
start rdev flash off other-options
```

and continue as usual.

**Example—Printing Files with a Forms Overlay on a 3800:** Suppose you are in the process of printing files that do not require a forms overlay, and a user needs to have some billing output right away. The output requires a forms overlay, but because it is a high-priority request, you decide to print it. To print the file on 3800 printer B32:

1. Enter:

```
query printer
query printer exp
```

In response, CP displays the status of all of the files in the print queue. Only the status of the file of interest is shown here.

```
OWNERID  FILE CLASS RECORDS  CPY HOLD USERFORM OPERFORM DEST  KEEP MSG
FINANCE1 1612 S PRT 00004833 001 NONE BILLING1 BILLFORM BLDG1  ON  OFF

OWNERID  FILE CLASS RECORDS  FLASH FCB  MDFY  FLSHC LOAD CHARS  SIZE
FINANCE1 1612 S PRT 00004833 BILL  BFCB BMOD 1 001  ANY  BT10 BT10 BB10 BB10 004
```

From this display, you note the forms overlay name (BILL), the class (S), the form (BILLFORM), and the dest (BLDG1). A table your installation provides also shows that the character set for the separator pages should be GF10, while the FCB should be 8 lines to the inch. (The file specifies its own character sets and FCB, which the 3800 uses to print the file itself.)

2. Enter:

```
drain b32
```

3. Locate the film negative labeled BILL and mount it in the frame in the 3800.

4. Enter:

```
start b32 flash bill class s form billform dest bldg1 chars gf10 fcb 8
```

5. When CP requests you to mount the new form, load the BILLFORM paper in the 3800.

6. Enter:

```
start b32
```

The 3800 then prints file 1612 with the appropriate billing forms overlay.

### Changing a 3800 Printer's Image Library

To operate, a 3800 must have access to an image library. An *image library* is a set of modules that define the spacing, characters, and copy modification data the printer may select to print a spool file. An installation typically stores all of these modules in one image library and specifies that image library's name as the one the 3800 uses by default. So you usually do not have to change the image library of a 3800.

But sometimes you may have to set up a 3800 to use a new image library. For example, the person who maintains the image libraries at your installation may want to test a new one. Or your installation may use different image libraries for different kinds of output. In either case, you must change the 3800 printer's image library.

To find out what image libraries are available, enter:

```
query img
```

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CP responds with the status of all of the image libraries in queue. Available image libraries are marked with an A under the CL heading on the response. The name of each image library appears under the FILENAME heading.

To change an image library, follow the normal procedure for printing files until you are about to enter the START command. Then enter:

```
start rdev image name other-options
```

where:

*rdev*

is the real device number of the 3800.

*name*

is the new image library's name.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

### Changing a 3800 Printer's Load Check Action

The load-check action setting controls what a 3800 printer does when it encounters a load-check error while printing a file. A load-check error indicates a problem with a spool file's 3800 load CCW. It usually results from an error in the way the user created the file.

HOLD is the normal load-check action setting; it causes CP to put the file in system hold. If there are an excessive number of files with these problems, though, you may wish to have CP delete them instead (the PURGE setting). To change the load check action to PURGE, enter:

```
start rdev purge
```

where *rdev* is the real device number of the 3800.

After the active file has finished printing, the PURGE setting takes effect. CP then deletes any files with load-check errors.

## Printing Spool Files on an Impact Printer

This section describes how to print files on a 1403, 3203, 3262, 4245, or 4248 impact printer. If you want to find out how to print files on a 3800, see "Printing Spool Files on a 3800" on page 147.

### Overview of Printing Spool Files on Impact Printers

Whether you are using impact printers or 3800 printers, you must have the following to print spool files:

- A printer that is set up to print a certain group of files
- A group of files in the print queue whose characteristics match the printer's setup.

Spool files come into the print queue as users create them. As the files arrive, a printer prints any files that match its setup. Files that do not match remain in the print queue. To print these nonmatching files, you change the printer's setup.

If you have more than one printer, and each is set up to print a different group of spool files, you can print more than one group at a time. Alternatively, if you want to print one particular group of files as quickly as possible, you can set up all your printers to print the same group.

Printing spool files is, therefore, a matter of responding to the changing print queue. Files come into the print queue and either match a printer's setup (get printed) or do not match (wait). When too many files are waiting, you change the setup on one or more printers to match the characteristics of the waiting files.

That said, the main difference between printing on an impact printer and printing on a 3800 is in the way you set up the printer. An impact printer requires different settings, and this in turn requires different options on the START command. Your installation can also make operation of the impact printer simpler by:

- Specifying default values for many of the impact printer settings. During system generation, your installation can set up default impact printer settings to reflect your normal print operation. Doing so reduces the number of options you need to enter on the START command.
- Setting up PF keys for commands you use most often in impact printer operation. During system operation, you can set up PF keys to enter the commands you use to operate an impact printer. This reduces the amount of typing you need to do to enter, for example, a START command with many options. If your installation sets up your virtual machine to run CMS, you can further simplify impact printer operation by creating a PROFILE EXEC to set up the PF keys.

Though your installation may use a combination of these methods to make your job easier, *the procedure that follows does not assume this has been done.*

The procedure that follows shows you how to start with an impact printer in any state and print a sample group of files. The procedure assumes that some settings are normal for impact printer operation. For example, it assumes that you want to print only those files that do not have 3800 load CCWs. "Using Other START Command Options for Impact Printers" on page 164 describes other impact printer settings you can specify. If necessary, substitute these other settings as appropriate.

The procedure that follows also assumes you are familiar with the way VM/ESA presents both printer and spool file status. If you are not, see Appendix B, "Printer and Print File Status" on page 331. The appendix also describes ways with which your installation is likely to group spool files.

To print a new group of spool files on the impact printer, perform the following steps:

1. If necessary, make the impact printer available to the system.
2. Drain the impact printer.
3. Find out the impact printer's status.
4. Find out what files are waiting to be printed.
5. Choose a new group of files to print.
6. Choose the correct START command options for the new group of files.
7. Set up the correct character set for the new group of files.
8. Set up the correct spacing for the new group of files.
9. Choose START command options to correctly control the impact printer.

10. Enter the START command with all the correct options.
11. Change and align the paper on the impact printer.
12. Start the impact printer.

The next sections explain these steps in detail, using settings assumed to reflect typical impact printer operation. “Using Other START Command Options for Impact Printers” on page 164 explains alternate settings you may specify.

### **Making the Impact Printer Available to the System**

Before you can use an impact printer to print files, it must be available to the system. To find out if it is available to the system, enter:

```
query rdev
```

where *rdev* is the impact printer's real device number.

If the status does not say OFFLINE or ATTACHED to a virtual machine, it is already available to the system. Go to the next step.

If the status says the impact printer is offline, enter:

```
vary online rdev
```

where *rdev* is the impact printer's real device number, and go to the next step.

If the impact printer is dedicated to a virtual machine, remove it from the virtual machine.

Go to the next step. See “Removing a Printer from a VM/ESA User” on page 146 or “Removing a Printer from the Production System” on page 146, as appropriate.

### **Draining the Impact Printer**

The next thing to do when you are getting ready to print a group of files is to make sure the impact printer does not print them before you are ready. An easy way to do this is to use the DRAIN command. In VM/ESA, this is called draining a printer.

The DRAIN command does two things: it tells the impact printer to finish any file it is now printing, and it puts the impact printer in a state that prevents it from printing any other file, that is, the drained state.

Normally, an impact printer that has already been set up to print is in the started state. In this state, the impact printer may print a file before you are ready. Whether it does or not depends on how the printer is set up and what characteristics the files in the print queue have. If there are no files in queue with characteristics that match the impact printer's setup, no files print. In this case, it is not necessary to drain the printer. But by draining the impact printer anyway, you can make sure no new files print.

To drain the impact printer, enter:

```
drain rdev
```

where *rdev* is the real device number of the impact printer.

If the impact printer is active, CP sends you two messages, one when the impact printer starts draining and another when it is drained. Otherwise, CP sends you just the drained message. When CP tells you the impact printer is drained, continue with the next step.

### Finding Out an Impact Printer's Status

Printing takes place only when the characteristics of a file in the print queue match the way a printer is set up. You change the way an impact printer is set up through options on the START command, which you will enter in a later step. To find out what options you need to specify with the START command, you must find out the impact printer's status. To do this, enter:

```
query rdev
```

where *rdev* is the real device number of the impact printer.

In response, CP displays the status of the impact printer. If you are not familiar with the status of impact printers, see the detailed explanation in “Understanding Printer Status” on page 331.

### Finding Out What Files Are Waiting to Be Printed

After you know how the impact printer is set up, you need to find out what files are waiting to be printed. To do this, enter:

```
query printer
query printer exp
```

In response, CP displays information about all the files waiting to be printed. If you are not familiar with the status of files in the print queue, see the detailed explanation in “Understanding Print File Status” on page 337.

### Choosing a New Group of Files to Print on the Impact Printer

From the files waiting to be printed, choose a group of files to print.

Each installation classifies its printed output differently, but it is common to use a combination of print CLASS, FORM, and DEST to group output. If your installation has a lot of different output groups, you probably have a table that tells you, for each kind of print file, what options to use on the START command. For impact printers, the START command options most likely to vary by group are:

- CLASS for the print class (A through Z or 0 through 9)
- FORM for the type of paper to use (a name your installation uses by convention)
- DEST for the destination value of a particular printer or group of printers.

### Choosing the START Command Options for the New Files (Impact Printers)

At this point, you have decided which files to print on the impact printer. Now you need to choose the correct options specify with the START command for those files. The options are:

- **CLASS** *abcdefgh*

where *abcdefgh* is a string of one to eight classes. If you specify *class \**, any class file will print.

- **FORM** *operform*

where *operform* is the name of the type of paper the output requires.

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- **DEST** *dest*

where *dest* is a 1- to 8-character value assigned to the printer. Up to four destination values may be specified. Specify a DEST of \* to indicate that files are to be selected for processing regardless of the file's DEST setting.

- **CHARS** *cccc*

where *cccc* is the name of the character set the impact printer should use to print the separator pages. The printer uses this character set to print a file if the file has no other character set associated with it.

**Note:** This option is incorrect for 1403 impact printers unless it has the universal character set (UCS) feature. The option is also incorrect for 4245 and 4248 impact printers.

- **FCB** *ffff*

where *ffff* is the default spacing. You have to specify an FCB name. The printer uses the FCB defined with that name in the image library it is using.

- **SECLABEL** *ssssssss*

where *ssssssss* is a 1- to 8-character alphanumeric value that identifies the security label of files to be printed on the printer. The SECLABEL option is valid only if an ESM is installed and security label checking is enabled.

### Choosing the START Command Options for Impact Printer Control

In addition to the settings that relate to specific kinds of files, you must also decide how you want to operate the impact printer. "Understanding Printer Status" on page 331 describes the various settings in detail. For now, look at the printer status you got when you entered the QUERY command for the device. It should say:

- On the second line, MANUAL, SEP, LIMIT, DEFFCB, and ANY3800
- On the third line, NOFOLD, IMAGE *imagelib*, CHARS *name*, and FCB *name*
- On the fourth line, DEST *dest*
- On the fifth line, AFP or NOAFP.

If necessary, select the following options for impact printer control with the START command:

- SEP, if the status says NOSEP
- N03800, if the status says BEG3800 or ANY3800
- LIMIT, to specify the maximum number of records of a file to be printed
- DEFFCB uses the default FCB that was loaded in the printer
- IMAGE *newname*, if the status displays after IMAGE
- CHARS for the default character set to use (a name your installation defines as a member of a 3800 image library)
- FCB for the default spacing to use (6, 8, 10, or 12 lines per inch, or a name your installation defines as a member of a 3800 image library)
- DEST \*, to choose files without regard to destination
- NOAFP, to prevent the printer from choosing files meant for advanced function printers.

- SECLABEL, to specify the security label of files to print on the printer.

In addition, select:

- SETUP, whether the status says MANUAL, AUTO, or SETUP.

### Entering the START Command for the Impact Printer

Based on the options you have chosen in the previous steps, you can now enter the START command, as follows:

```
start rdev user system file-options setup printer-options
```

where:

*rdev*

is the real device number of the impact printer.

*file-options*

are the options that relate to the files you have chosen to print (CLASS, FORM, and DEST).

*printer-options*

are any required options that relate to the control of the impact printer (SEP, NO3800, NOFOLD, IMAGE, CHARS, FCB, INDEX, NOAFP, LIMIT, DEFFCB and SECLABEL).

Always enter the SETUP printer option. This option puts the impact printer in SETUP mode, which allows you to make sure the paper is aligned properly.

You may enter the options in any order.

**Example—Starting an Impact Printer:** If you want to start the third-floor impact printer to select classified listing files for printing, enter:

```
start rdev class c form listing dest floor3 setup
```

where *rdev* is the real device number of the impact printer.

In response to the START command, CP sends you a couple of lines that indicate that the impact printer has started. Then CP displays a message that asks you to set up the new form for a forms alignment check.

**Note:** If you run CMS in your operator's virtual machine and you enter the START command without abbreviating it, CMS assumes you mean the CMS START command, not the CP START command. If you want to use the CP START command under CMS to start a printer, abbreviate the command to STA or enter CP START.

### Changing the Paper and Starting the Impact Printer

When you receive CP's prompt to set up the new form, go to the impact printer and change the paper, if necessary. (If your installation defines more than one operator form name for the same kind of paper, you may not have to change the actual paper on the printer.) At this point, the impact printer is in SETUP mode, which allows you to make sure the paper is aligned properly.

To check the forms alignment:

1. Push the STOP and START buttons on the printer.

Doing this causes the impact printer to print an *alignment page*. An alignment page is the first non-blank page of the first file that prints, except that the letters

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on the page appear as Xs and the numbers appear as 9s. By looking at the alignment page, you can tell whether the file will print properly.

2. Look at the alignment page, and if necessary, adjust the paper on the printer.

If the paper is not lined up correctly, adjust its alignment on the printer. Then push the STOP and START buttons on the printer again to print out another alignment page. Continue this procedure until the paper is lined up correctly.

When you are satisfied with the alignment of the paper, go back to the console and enter:

```
start rdev manual
```

where *rdev* is the real device number of the impact printer.

This command causes CP to recognize that the printer is ready to print. The impact printer starts printing the first file that matches the characteristics you just finished setting up for the printer. As the first file starts to print, you get a message telling you that the file is printing.

As each matching file starts to print, you get a similar message. When all the matching files have printed, you can repeat this procedure and print another group of files.

## Using Other START Command Options for Impact Printers

“Printing Spool Files on an Impact Printer” on page 158 describes a procedure for printing a typical group of spool files on an impact printer. But you can control your printing operation more flexibly by changing the options specified with the START command. The following sections explain in more detail how to do this.

### Assuring that Files with AFP Characteristics Do Not Print on Impact Printers

A CP printer can select spool files having AFP characteristics, but since these attributes have no meaning for a CP printer, they may cause erroneous output. To avoid this, enter the START command with the NOAFP option. Even if the CLASS, FORM, and DEST options match, you should still use the NOAFP option to make sure the CP printer does not print AFP-characteristic files.

**Note:** AFPs are controlled by a print server rather than CP.

Ordinarily, you print output by class and form, without regard to file owner. You accomplish this by specifying the keywords USER SYSTEM on the START command. But sometimes you may need to print the output of a high-priority user. This is called *assigning* the printer to a user. The user may or may not be the production system.

To assign an impact printer to a user, follow the normal procedure for printing files until you are about to enter the START command. Then, enter:

```
start rdev user userid other-options
```

where:

```
rdev
```

is the real device number of the impact printer

*userid*

is the logon ID of the user to whom you want to assign the impact printer

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

When you are ready to print all system files again, follow the normal procedure for printing files until you are about to enter the START command. Then enter:

```
start rdev user system other-options
```

After you finish the rest of the procedure, the impact printer again starts printing available files without regard to their owners.

**Example—Assigning an Impact Printer to a User:** Suppose you are printing files and user VIP asks you to print all of his files now. The printer you are using is a 3262 printer that has real device number 003. User VIP's files are all of class V and form STANDARD. The print train image associated with class V has the name T11 and the forms control buffer has the name FCB8. You must change the print train cartridge and the paper for the new output. To assign impact printer 003 to user VIP:

1. Enter:

```
drain 003
```

2. Mount the print train cartridge for class V.

3. Enter:

```
loadbuf 003 ucs t11 ver
```

4. Look at the print train image that printed out when you entered the LOADBUF command to make sure it is the right one.

5. Enter:

```
loadbuf 003 fcb fcb8
```

6. Enter:

```
start 003 user vip class v form standard setup
```

7. When CP prompts you, change and align the paper on the impact printer for the operator form, STANDARD.

To print out an alignment page, press the STOP and START buttons on the printer. If necessary, adjust the alignment.

8. Enter:

```
start 003 manual
```

The impact printer then starts to print user VIP's spool files.

### Allowing CP to Choose the Next Form Automatically (Impact Printers)

On an impact printer, you may choose between three *form mode* settings: SETUP, MANUAL, and AUTO.

SETUP mode allows you to align the paper on an impact printer before you start printing files. When you want the impact printer to leave SETUP mode, you may

start the printer with the MANUAL setting, the AUTO setting, or with neither setting. If you specify neither MANUAL nor AUTO, the printer reverts to the form mode it had before you put it in SETUP mode. The MANUAL and AUTO form mode settings govern how the impact printer acts when no more files of the current form are left to print.

Normally, you use SETUP mode to start an impact printer with a new form, and then you put the printer into MANUAL mode when you start printing files. The MANUAL setting allows you to choose the next form to mount. The impact printer idles until another file of the current form joins the queue or until you start the printer with a new form.

If you prefer, you can allow CP to choose the next form automatically. When the form mode is set to AUTO and there are no more files of the current form, CP chooses a new form. The new form is a form associated with one of the files waiting to be printed, and if possible, a form that is not on another printer. CP then starts the printer and prompts you to mount the new form.

To set up the impact printer so that CP automatically chooses the next form, follow the normal procedure for printing files until you are about to enter the START command that causes the printer to leave SETUP mode. Then enter:

```
start rdev auto
```

where *rdev* is the real device number of the impact printer.

The impact printer starts printing files. When there are no more files of the current form, CP chooses a new form and waits for you to mount the new form.

If you prefer, when you want the impact printer to leave SETUP mode, you may start the printer without specifying either the MANUAL or AUTO setting. In this case, the printer reverts to the form mode setting that was in effect before you put the printer in SETUP mode.

### Printing without Separator Pages on an Impact Printer

Most of the time you want separator pages between the files that you print. These header and trailer pages help you to separate the output, which would otherwise run together. But if you are printing on a special form (checks or labels, for example), you may want to print files without separator pages.

To print without separator pages, follow the normal procedure for printing files on an impact printer until you are about to enter the START command. Then, enter:

```
start rdev nosep other-options
```

where:

*rdev*

is the real device number of the impact printer.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

**Note:** If an ESM is installed and security label checking is enabled, the NOSEP option is not valid.

### Controlling the Impact Printer's 3800 Load CCW Mode

A printer's *3800 load CCW mode* determines whether the printer prints files with 3800 load CCWs. Usually, you print files that contain 3800 load CCWs on a 3800 printer, whereas the only kind of files you print on an impact printer are NO3800 files. The normal setting for an impact printer, therefore, is NO3800.

You may print BEG3800 and ANY3800 files on an impact printer, but doing so does not make use of any required 3800 features. An impact printer ignores 3800 load CCWs.

If you need to change an impact printer to print BEG3800 and NO3800 files, follow the normal procedure for printing files until you are about to enter the START command. Then enter:

```
start rdev beg3800 other-options
```

where:

*rdev*

is the real device number of the impact printer.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

If you need to change an impact printer to print NO3800, BEG3800, and ANY3800 files, enter:

```
start rdev any3800 other-options
```

### Changing an Impact Printer's Image Library

To operate, printers need access to an image library. An *image library* is a set of modules that define the spacing, characters, and copy modification data the printer may select to print a spool file. An installation typically stores all these modules in one image library, and specifies that image library's name as the one the printer uses by default. You usually do not have to change a printer's image library.

But sometimes you may have to set up a printer to use a new image library. For example, the person who maintains the image libraries at your installation may want to test a new one. Or your installation may use different image libraries for different kinds of output. In either case, you must change the printer's image library.

To find out what image libraries are available, enter:

```
query img
```

CP responds with the status of all of the image libraries in queue. Available image libraries are marked with an A under the CL heading in the response. The name of each image library appears under the FILENAME heading.

To change an image library, follow the normal procedure for printing files until you are about to enter the START command. Then enter:

```
start rdev image name other-options
```

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where:

*rdev*

is the real device number of the impact printer.

*name*

is the new image library's name.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

## Overview of Printing Spool Files on Advanced Function Printers (AFPs)

AFPs are controlled through print servers, such as the IBM Print Services Facility\* (PSF\*) licensed program. You can control an AFP by specifying the *prtId* (identification of the AFP that is controlled by a print server virtual machine) instead of the real device number. The *prtId* operand is valid for the START, DRAIN, FLUSH, QUERY (real device), and SEND commands. For further information on this operand, refer to the specific command as described in the *VM/ESA: CP Command and Utility Reference* book.

**Note:** AFPs are controlled by a print server machine rather than CP. Therefore, it is necessary that you have some print server program product to support AFPs and AFP characteristic type files. For more information about IBM's advanced function printing licensed programs and program offerings, see the *Advanced Function Printing\* Software: General Information* book.

The following list outlines the steps that are necessary to print a new group of spool files on an AFP:

1. If necessary, make the AFP available to the system.
2. Dedicate an AFP to a print server virtual machine using the CP ATTACH command.
3. Find out what files are waiting to be printed.
4. Choose a new group of files to print.
5. Choose the correct START command options for the new group of files.
6. Enter the START command with all the correct options, specifying the appropriate *prtId*.

For a more detailed explanation of the steps outlined above, see "Overview of Printing Spool Files on 3800s" on page 147 or "Overview of Printing Spool Files on Impact Printers" on page 158.

**Example—Starting an AFP:** If you want to start the AFP on the first floor to select unclassified memo files for printing, enter:

```
start prtId class u form memo dest floor1
```

where *prtId* is the identification of the AFP that is controlled by the print server virtual machine that issues the START command to the AFP.

## Stopping a Printer

To stop a printer after it finishes printing the current file, enter:

```
drain rdev
```

where *rdev* is the real device number of the printer. You may now set up to print a new group of files or remove the printer from the system.

Sometimes you may need to stop the printer without waiting for the current file to finish printing. For example, the printer may have the wrong print train cartridge for the file, or the file may take too long to print during first shift. If you want to stop a printer immediately and save the file that is interrupted, enter:

```
drain rdev  
flush rdev hold
```

where *rdev* is the device number of the printer you want to stop. In response to this command, CP stops printing the active file and puts it back in the print queue in system hold. To print the interrupted file later, release it from system hold. See “Releasing Files in the Print Queue from System Hold” on page 173.

If you want to stop a printer immediately and delete the file that is interrupted, enter:

```
drain rdev  
flush rdev all
```

where *rdev* is the device number of the printer you want to stop. In response to this command, CP stops printing the file and deletes it.

## Removing a Printer from the System

To remove a printer from the system, do the following:

1. Make sure the printer's status is drained. Enter:

```
query rdev
```

where *rdev* is the real device number of the printer. If CP's response does not indicate that the printer is drained, enter:

```
drain rdev
```

where *rdev* is the real device number of the printer.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the printer. The printer is now unavailable to VM/ESA.

## Controlling Spool Files in the Print Queue

VM/ESA gives you options on the commands you use to manipulate spool files in the print queue. Spool files are collections of data to be processed. Spool files in the print queue are files waiting to be printed.

To control files in the print queue, you need to be able to:

- Find out what files are waiting to be printed
- Put one or more files at the top of the print queue
- Change one or more attributes associated with a file in the print queue

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- Transfer files from the print queue
- Purge one or more files from the print queue.

### Finding Out What Files Are Waiting to Be Printed

To find out how many files are waiting to be printed, enter:

```
query files system
```

CP's response to this command indicates how many spool files are in the reader, printer, and punch spool file queues.

Note that in a cross systems extension (CSE) complex, you must specify the AVAIL operand in order to display information about all systems in the complex.

Information that is locked by another system will *not* be displayed. If you do not specify the AVAIL operand, you will only obtain information about the files on the system from which the command was entered.

To display information about all of the spool files that are waiting to be printed, enter:

```
query printer
query printer all
query printer exp
query printer psf
```

In response, CP displays the information. In a CSE complex, the QUERY PRINTER ALL command has a response that differs from that in a non-CSE complex. An example of this response can be found on page 185. If you are not familiar with the status of files in the print queue, see "Understanding Print File Status" on page 337.

For information about other options you can specify on the QUERY PRINTER command, see the QUERY READER|PRINTER|PUNCH command in the *VM/ESA: CP Command and Utility Reference* book.

### Putting Files at the Top of the Print Queue

If you want to print a particular file before any others and the file matches the setup of the printer, you can put that file at the top of the print queue. To do this, enter:

```
order userid printer nnn
```

where:

*userid*

is the ID of the user who owns the spool file.

*nnn*

is the spool file identification number of the file you want to print next.

To put several files at the top of the print queue, enter:

```
order userid printer nnn1 nnn2 nnn3 ....
```

where:

*userid*

is the ID of the user who owns the spool files.

*nnn1 nnn2 nnn3*

are spool file identification numbers of the files you want to print next.

You may enter as many spool file identification numbers for one user ID as fit on the input line.

To put a whole class of files at the top of the print queue, enter:

```
order userid printer class c
```

where:

*userid*

is the ID of the user who owns the spool files.

*c* is the class of files you want to print next.

To put all of the files of a given operator form at the top of the print queue, enter:

```
order userid printer form operform
```

where:

*userid*

is the ID of the user who owns the spool files.

*operform*

is the operator form associated with the files you want to print next.

To put all of the files having a particular destination at the top of the print queue, enter:

```
order userid printer dest dest
```

where:

*userid*

is the ID of the user who owns the spool files.

*dest*

is the destination value of the files that you want to print next.

For information about other options you can specify with the ORDER command, see the *VM/ESA: CP Command and Utility Reference* book.

### Changing the Attributes of Files in the Print Queue

The responses to the QUERY PRINTER, QUERY PRINTER EXP, QUERY PRINTER ALL, and QUERY PRINTER PSF commands show all the attributes a file in the print queue can have. See Appendix B, "Printer and Print File Status" on page 331. Sometimes you need to change some of these attributes. The attributes you usually change are a file's class, form, or destination, and its system hold status. You may also need to change the number of copies or the security label associated with files in the print queue.

The sections that follow tell you how to use the CHANGE command to:

- Change the class, form, or destination of a file in the print queue
- Put files in the print queue in system hold
- Release files in the print queue out of system hold
- Change the conversion status of a file in the print queue
- Change the number of copies of a file in the print queue

## Controlling Local Devices

- Change the security label value associated with files in the print queue.

**Note:** If an ESM is installed you may not be authorized to change attributes of files in the print queue. For additional information, contact your security administrator.

For information about other options you can specify with the CHANGE command, see the *VM/ESA: CP Command and Utility Reference* book.

**Changing the Class, Form, or Destination of a File in the Print Queue:** To change the class of a file in the print queue, enter:

```
change userid printer nnnn class c
```

where:

*userid*

is the ID of the user who owns the spool file you want to change.

*nnnn*

is the spool file identification number of the file.

*c* is the new class.

To change the form of a file in the print queue, enter:

```
change userid printer nnnn form operform
```

where:

*userid*

is the ID of the user who owns the spool file you want to change.

*nnnn*

is the spool file identification number of the file.

*operform*

is the new operator form.

To change the destination of a file in the print queue, enter:

```
change userid printer nnnn dest dest
```

where:

*userid*

is the ID of the user who owns the spool file you want to change.

*nnnn*

is the spool file identification number of the file.

*dest*

is the new destination value.

**Putting Files in the Print Queue in System Hold:** To prevent a file from being printed, you may put it in system hold. To do this, enter:

```
change userid printer nnnn sys
```

where:

*userid*

is the ID of the user who owns the spool file you want to put in system hold.

*nnnn*

is the spool file identification number of the file.

You cannot print the file until you take it out of system hold.

To prevent a class of files from being printed, put them in system hold by entering:

```
change userid printer class c sys
```

where:

*userid*

is the ID of the user who owns the spool files.

*c* is the class of files you want to hold.

You cannot print these files until you take them out of system hold.

To put all of the files in the print queue in system hold, enter:

```
change userid printer all sys
```

**Releasing Files in the Print Queue from System Hold:** A file in the print queue in system hold cannot be printed. To take a file in the print queue out of system hold, enter:

```
change userid printer nnnn nosys
```

where:

*userid*

is the ID of the user who owns the spool file you want to release from system hold.

*nnnn*

is the spool file identification number of the file.

To take a class of files in the print queue out of system hold, enter:

```
change userid printer class c nosys
```

where:

*userid*

is the ID of the user who owns the spool files you want to release from system hold.

*c* is the class of files.

To take all of the files in the print queue out of system hold, enter:

```
change userid printer all nosys
```

**Changing the Conversion Status of a File in the Print Queue:** Even though a file has been converted, it can still be changed and printed with different options. To cancel any preprocessing that the print server may have done to a file, enter:

```
change userid printer nnnn unconv
```

where:

*userid*

is the ID of the user who owns the spool file that you want to print.

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*nnnn*

is the spool file identification number of the file that you want to change to an unconverted status.

**Changing the Number of Copies of a File in the Print Queue:** At a user's request, you may change the number of copies of a file in the print queue. To do this, enter:

```
change userid printer nnnn copy cpy
```

where:

*userid*

is the ID of the user who owns the spool file you want to print.

*nnnn*

is the spool file identification number of the file.

*cpy*

is the total number of copies you want to print.

**Changing the Security Label of a File in the Print Queue:** Class D users can change the value of the security label associated with any file in the print queue if the following conditions are met:

- An external security manager (ESM) is installed
- Security label checking is enabled, and:
  - The user is exempt from ESM authorization checking, or
  - The system has been placed in a tranquil state by the security administrator.

For additional information, contact your security administrator.

To change the security label of a file in the printer queue, enter:

```
change userid printer nnnn seclabel ssssssss
```

where:

*userid*

is the ID of the owner of the spool file.

*nnnn*

is the spool file identification number of the file you want to change the security label value of.

*ssssssss*

is a 1- to 8-character alphanumeric value to be assigned to the file for the security label.

### Transferring Files from the Print Queue

To transfer spool files from a printer, enter:

```
transfer prt class c|userid1|all to|from all|*|userid2 rdr|prt|pun
```

where:

**CLASS** *c*

is the class of the spool files you want to transfer.

*userid1*

is the user whose files are to be transferred or reclaimed.

**ALL**

specifies the transfer of all files in the queue.

**TO|FROM \***

indicates to or from your own user ID.

*userid2*

identifies the user to whom the files are transferred.

**Example 1—Transferring a Spool File from the Printer to a User:** A spool file with spoolid 9234 needs to be transferred from the print queue to the reader queue of USERB. To transfer the spool file, enter:

```
transfer prt 9234 to userb
```

**Example 2—Transferring Spool Files from the Printer to Your Punch:** Spool files on your printer queue need to be transferred to your punch queue. To transfer the spool files, enter:

```
transfer prt all to * pun
```

**Example 3—Reclaiming Spool Files Sent to Other Printer Queues:** You need to reclaim spool files sent to the printer queues of other users and place them on your printer queue. To do this, enter:

```
transfer prt all from all prt
```

**Note:** If an ESM is installed, you may not be authorized to use the TRANSFER command. For additional information, contact your security administrator.

## Purging Files from the Print Queue

At a user's request, you may remove one or more files from the print queue. To purge particular files, enter:

```
purge userid printer nnn1 nnn2 ...
```

where:

*userid*

is the identification of the user whose files are to be purged.

*nnn1, nnn2*

are spool file identification numbers of the files you want to purge from the print queue.

CP then erases the files.

To purge a class of files in the print queue (for example, a group of files with a class not defined by your installation), enter:

```
purge system printer class c
```

where *c* is the class of files you want to purge from the print queue.

To purge all files in the print queue that have a particular operator form (for example, a group of files with a form not defined by your installation), enter:

```
purge userid printer form operform
```

## Controlling Local Devices

where:

*userid*

is the ID of the user who owns the spool files.

*operform*

is the name of the operator form you want to purge.

To purge all files in the print queue that have a particular destination value, enter:

```
purge userid printer dest dest
```

where:

*userid*

is the ID of the user who owns the spool files.

*dest*

is the destination value of the files that you want to purge.

### Dumping Files in the Print Queue to Tape

If you need to dump files in the print queue to tape, use the SPTAPE DUMP command. For more information, see “Restoring Standard Spool Files from Tape” on page 277.

### Loading Files in the Print Queue from Tape

If you need to load files from tape back onto the system's print queue, use the SPTAPE LOAD command. For more information, see “Restoring Standard Spool Files from Tape” on page 277.

## Controlling the Active File on a Printer

In addition to managing the queue of spool files waiting to be printed, you must be able to control the active file on a printer. The active file is the file that a printer is now printing.

To control the active file on a printer, you need to be able to:

- Backspace or forward space the file
- Cause the file to print single-spaced
- Print another copy of the file
- Stop the file from printing.

### Backspacing and Forward Spacing the Active File on a Printer

If a printer starts producing unreadable output, you need to reprint part of the file it is printing. To cause the printer to go back a number of pages, enter:

```
backspace rdev nnn
```

where:

*rdev*

is the real device number of the printer.

*nnn*

is the number of pages you want the printer to go back.

If you want to reprint the entire file, you can cause the printer to start over at the beginning of the file. To do this, enter:

```
backspace rdev file
```

If you want to reprint from the end of the file, enter:

```
backspace rdev nnn eof
```

where:

*rdev*

is the real device number of the printer.

*nnn*

is the number of pages from the end of the file where you want the printer to begin.

For example, if you want to reprint the last 50 pages of the file on printer 621, enter:

```
backspace 621 50 eof
```

If you want to reprint most of the file, you can cause the printer to go back to the beginning of the file and space forward a number of pages. To do this, enter:

```
backspace rdev file
forward rdev nnn
```

where:

*rdev*

is the real device number of the printer.

*nnn*

is the number of pages you want the printer to go forward from the beginning.

**Example—Backspacing the Active File on a Printer:** A problem on printer 003 caused the print to run together starting on page 30 of the output. The printer is now at page 40 and stopped. After fixing the problem, enter:

```
backspace 003 file
forward 003 29
```

These commands cause the printer to start printing again at page 29 of the file. You can later discard the unwanted output.

**Note:** The *ptid* option is *not* valid for the BACKSPACE command. Therefore, this command is meaningless for advanced function printers and their servers.

### Causing the Active File to Print Single-Spaced

If a printer starts printing one line per page, a user has probably specified that the file contains carriage control characters when in fact it does not. To force the output to be single-spaced (and more readable), enter:

```
space rdev
```

where *rdev* is the real device number of the printer. The printer now starts to single-space the output of this file.

**Note:** The *ptid* option is *not* valid for the SPACE command, so this command is meaningless for advanced function printers and their servers.

### Printing Another Copy of the Active File

If a file is waiting to be printed, you can use the CHANGE command to create more than one copy. See “Changing the Number of Copies of a File in the Print Queue” on page 174.

If the file is now on the printer and the user needs more copies, enter:

```
repeat rdev nnn
```

where:

*rdev*

is the real device number of the printer.

*nnn*

is the number of *additional* copies you need.

**Example—Printing Another Copy of the Active File:** A user originally requested two copies of a file that is now on printer 003. He calls you and says he needs four copies. To get the additional copies, enter:

```
repeat 003 2
```

**Note:** The *prtid* option is *not* valid for the REPEAT command, so this command is meaningless for advanced function printers and their servers.

### Stopping the Active File from Printing

If you want to stop the file that is on a printer from printing, enter:

```
flush rdev hold
```

where *rdev* is the real device number of the printer. In response, CP stops printing the file, puts it back in the print queue in system hold, and starts printing the next available file. To print the interrupted file later, or on another printer, you must take it out of system hold by entering:

```
change userid printer nnnn nosys
```

where:

*userid*

is the user identification of the user.

*nnnn*

is the file's spool file identification number.

## Card Punch Devices

Some of the work users do involves punched cards. Accordingly, you must be able to control real card readers and card punches. For example, to control a card punch device as a dedicated device, you must be able to:

- Find out a card punch device's status
- Dedicate a card punch device to a VM/ESA user or to the production system
- Remove a card punch device from a VM/ESA user or from the production system.

Also, you may need to control a card reader as a spooling device. To do this, you must be able to:

- Read in a card deck for a VM/ESA user
- Stop a card reader and remove it from the system
- Control the spool files in the reader queue
- Control the active file on a card reader.

Finally, you may need to control a card punch as a spooling device. To do this, you must be able to:

- Punch files submitted by VM/ESA users
- Stop a card punch and remove it from the system
- Control the spool files in the punch queue
- Control the active file on a card punch.

### Notes:

1. If you run CMS in your operator's virtual machine and you enter the START command without abbreviating it, CMS assumes you mean the CMS START command, not the CP START command. If you want to use the CP START command under CMS to start a card punch or card reader, abbreviate the command to STA or enter CP START.
2. You may operate the 3890 Document Processor as a dedicated card reader.

## Finding Out a Card Punch Device's Status

To find out the status of a specific card reader or card punch, enter:

```
query rdev
```

where *rdev* is the real device number of the card reader or punch.

To find out the status of all the card readers and card punches (as well as the printers) in your VM/ESA system, enter:

```
query ur all
```

Table 12 on page 180 lists the keywords that appear in responses to QUERY commands for card readers and card punches. It also shows:

- The meaning of each keyword
- Whether the keyword indicates an active, free, or offline device
- Whether the keyword indicates a dedicated device or a device in use by CP.

## Controlling Local Devices

Table 12. Card Punch Device Status

Device Status Keyword	Keyword Meaning	Type of Status
<b>ATTACHED TO</b>	The device is dedicated to the indicated virtual machine.	Active (dedicated)
<b>DRAINED</b>	The device is unavailable for processing spool files.	Free
<b>DRAINING</b>	The device will become unavailable for processing spool files after finishing the current file.	Active (CP)
<b>INT REQ</b>	The device requires operator intervention.	Active (CP)
<b>INT REQUIRED</b>	The device requires operator intervention.	Active (CP or dedicated)
<b>MOUNT REQ</b>	The card punch is waiting for you to change the cards (mount a new form).	Active (CP)
<b>OFFLINE</b>	The device is unavailable to CP.	Offline
<b>PUNCHING</b>	The card punch is punching a spool file.	Active (CP)
<b>READING</b>	The card reader is reading a card deck.	Active (CP)
<b>STARTED</b>	The device is available for processing spool files.	Active (CP)
<b>SUBCHOFF</b>	The subchannel for this device is disabled.	Offline Disabled

### Dedicating a Card Punch Device to a VM/ESA User

If a card reader or card punch is offline and you need to dedicate it to a VM/ESA user, enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*  
is the real device number of the device.

*userid*  
is the user's logon ID.

*vdev*  
is the virtual device number that the user asked you to assign to the device.

### Dedicating a Card Punch Device to the Production System

If a card punch device is offline, and you want to dedicate it to the production system for its exclusive use, do the following:

1. Enter:

```
vary online rdev  
attach rdev userid vdev
```

where:

*rdev*  
is the real device number of the device.

*userid*

is the logon ID of the production system.

*vdev*

is the virtual device number that you want to assign to the device.

**Note:** If *rdev* and *vdev* are the same, you may enter:

```
attach rdev userid
```

2. At the production system's system console, enter any commands that the production operating system requires to use the device.

**Example—Dedicating a Card Reader to the Production System:** Reader 00C should be dedicated to the production system, VMSPHPO, as virtual device 00C. When you enter:

```
query 00c
```

CP tells you that reader 00C is offline. To dedicate it to the production system, enter:

```
vary online 00c
attach 00c vmsphpo
```

At the VMSPHPO system's system console, enter appropriate VM/SP HPO commands to make sure the card reader is usable.

## Removing a Card Punch Device from a VM/ESA User

A VM/ESA user usually removes a card punch device from his virtual machine by entering a DETACH VIRTUAL command. However, if you need to remove it, enter:

```
detach rdev userid
```

where:

*rdev*

is the real device number of the device.

*userid*

is the user's logon ID.

Now you may remove the card punch device from the system, use it to read or punch cards for VM/ESA users, or dedicate it to another virtual machine.

To remove the card punch device from the system, enter:

```
vary offline rdev
```

where *rdev* is the real device number of the device. The card reader or card punch is now unavailable to VM/ESA.

## Removing a Card Punch Device from the Production System

Removing a card reader or card punch from the production system is the opposite of dedicating it:

1. At the production system's system console, enter any commands that the production operating system requires to release the device from use.
2. Enter:

```
detach rdev userid
```

## Controlling Local Devices

where:

*rdev*

is the real device number of the device.

*userid*

is the logon ID of the production system.

Now you may remove the device from the system, use it to read or punch cards for VM/ESA users, or dedicate it to another virtual machine.

To remove the card reader or card punch from the system, enter:

```
vary offline rdev
```

where *rdev* is the real device number of the device. The device is now unavailable to VM/ESA.

## Reading in a Card Deck for a VM/ESA User

To read in a card deck for a VM/ESA user, you must:

1. Find out the card reader's status
2. Make the card reader available to the system
3. Check the card deck for proper format
4. Read the cards into the card reader.
5. Determine whether there is a security label for the card reader's spool files.  
For an explanation of the SECLABEL option see "Finding Out What Files Are in the Reader Queue" on page 184.

You will also need to be able to:

- Stop the card reader
- Remove the card reader from the system.

### Finding Out a Card Reader's Status

To find out the status of a specific card reader, enter:

```
query rdev
```

where *rdev* is the real device number of the card reader.

To find out the status of all the card readers (and other unit record devices) in your VM/ESA system, enter:

```
query ur all
```

### Making a Card Reader Available to the System

If the card reader is offline, you must make it available to the system in order to use it. To make it available to the system, enter:

```
vary online rdev
```

where *rdev* is the real device number of the card reader. It is now available for use by VM/ESA for spooling (reading in cards to create reader spool files).

## Checking the Card Deck for Proper Format

When you read in a deck of cards for a VM/ESA user, CP puts the data in a reader spool file and sends it to the user's virtual reader.

VM/ESA requires that the first card of an input card deck have a certain format. The format follows:

1. The first card must be a CP identification (CP ID) card. The format of this card is either:

```
USERID userid CLASS n NAME name TAG tagtext
```

or

```
ID userid CLASS n NAME name TAG tagtext
```

where:

*userid*

is the logon ID of the user for whom you are reading this card deck.

*n* is an optional class.

*name*

is an optional name that CP assigns to the spool file that it will create.

*tagtext*

is optional data that will be associated with the spool file.

2. The USERID or ID keyword must begin in column 1.
3. All the keywords and operands must be separated by one or more blanks.
4. If the TAG operand is included, it must be the last operand on the card.

Make sure the input deck starts with the CP ID card and follows these rules. If it does not, return it to the user for correction.

## Starting a Card Reader

The next step is to start the card reader. To do this, enter:

```
start rdev
```

where *rdev* is the real device number of the card reader. Now you are ready to read the cards into the reader.

## Reading Cards into a Card Reader

Put the cards into the card reader.

CP then reads in the cards, creates a reader spool file, and sends the spool file to the user's virtual reader.

**Note:** You can load only one input deck into the reader at a time. If you try to load more than one input deck, CP ignores the CP ID cards that start the other decks. CP reads in all the cards as if they were part of one deck.

If there is an error in the CP ID card, or if an error occurs while reading in the deck, CP purges the reader spool file. After the error is corrected, you must read in the card deck again.

### Stopping a Card Reader

To stop a card reader after it finishes reading the current deck, enter:

```
drain rdev
```

where *rdev* is the real device number of the card reader. You may now remove the reader from the system.

### Removing a Card Reader from the System

To remove a card reader from the system, do the following:

1. Make sure the card reader's status says drained. Enter:

```
query rdev
```

where *rdev* is the real device number of the card reader.

If CP's response does not indicate that the card reader is DRAINED, enter:

```
drain rdev
```

where *rdev* is the real device number of the card reader.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the card reader. The card reader is now unavailable to VM/ESA.

### Controlling Spool Files in the Reader Queue

VM/ESA gives you options with the commands you use to manipulate spool files in the reader queue. Spool files are collections of data to be processed. Spool files in the reader queue are files that have been read in from a card reader or that were created by a virtual unit record device.

Spool files in the reader queue are destined for user virtual readers; they are primarily the responsibility of those users. As a system operator, you may perform some of the following functions for files destined for service virtual machines. But, in general, you do not need to manipulate spool files in the reader queue.

To control files in the reader queue, you need to be able to:

- Find out what files are in the reader queue
- Put one or more files at the top of the reader queue
- Change one or more attributes associated with a file in the reader queue
- Put one or more files in the reader queue in system hold
- Purge one or more files from the reader queue
- Transfer one or more files from the reader queue.

### Finding Out What Files Are in the Reader Queue

To find out how many files are in the reader queue, enter:

```
query files system
```

CP's response to this command indicates how many spool files are in the reader, printer, and punch spool file queues.

When cross system spooling is active, if you specify the AVAIL operand, this command does not display information about files that are locked by another

system. If you do *not* specify the AVAIL operand, this command displays information about all files on the system from which the command was processed.

To list the files in the reader queue, enter:

```
query reader all
```

CP's response to this command lists, in the order of processing, all the spool files in the reader queue. The response looks similar to this:

OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	DATE	TIME	NAME	TYPE	DIST
MAINT	1598	A	PUN	00000173	001	NONE	09/18 11:37:32	TESTPUN1	CARDS	1:16-3
MAINT	1603	A	RDR	00000084	001	NONE	09/18 11:38:57	TESTRDR1	CARDS	1:16-3
MAINT	1632	A	PUN	00000032	001	NONE	09/18 11:39:02	TESTPUN2	CARDS	1:16-3
MAINT	1645	A	PUN	00000576	001	NONE	09/18 12:42:83	TESTPUN3	CARDS	1:16-3
MAINT	1668	A	PUN	00000893	001	NONE	09/18 12:46:43	TESTPUN4	CARDS	1:16-3
MAINT	1672	T	RDR	00000344	001	NONE	OPEN- 000C	TESTSYS	CARDS	1:16-3
MAINT	1688	D	RDR	00049655	001	NONE	OPEN- SYS	TESTRDR6	CARDS	1:16-3
MAINT	1689	A	RDR	00000040	001	NONE	OPEN- 0012	TREALRDR	CARDS	1:16-3

In a CSE complex, one response to the QUERY READER/PRINT/PUNCH ALL command can differ from the response in a non-CSE complex. The response looks similar to the following:

ORIGINID	FILE	CLASS	RECORDS	CPY	HOLD	DATE	TIME	NAME	TYPE	DIST	
<i>userid</i>	<i>spid</i>	<i>c</i>	<i>typ</i>	<i>nnnnnnnn</i>	<i>nnn</i>	NONE	LOCK	<i>sysname</i>	<i>filename</i>	<i>filetype</i>	<i>distcode</i>

or

ORIGINID	FILE	CLASS	RECORDS	CPY	HOLD	DATE	TIME	NAME	TYPE	DIST	
<i>userid</i>	<i>spid</i>	<i>c</i>	<i>typ</i>	<i>nnnnnnnn</i>	<i>nnn</i>	NONE	COPY	<i>sysname</i>	<i>filename</i>	<i>filetype</i>	<i>distcode</i>

To list the files in the reader queue, along with each file's security label, enter:

```
query reader seclabel
```

CP's response to this command lists, in the order of processing, all the spool files in the reader queue, along with each file's security label. For a class D user, the response looks like this:

OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	USERFORM	OPERFORM	DEST	SECLABEL
MAINT	1593	A	RDR	00000173	001	NONE	PLAIN	PLAIN	BLDG2 009BDF
MAINT	1603	A	RDR	00000084	001	NONE	PLAIN	PLAIN	BLDG1 12345678
MAINT	1632	A	RDR	00000032	001	USER	PLAIN	PLAIN	BLDG2 543219E
MAINT	1645	A	RDR	00000576	001	SYS	PLAIN	PLAIN	BLDG1 89FED7
MAINT	1668	A	RDR	00000893	001	USYS	PLAIN	PLAIN	BLDG3 7EF9C1

For a class G user, the response looks like this:

ORIGINID	FILE	CLASS	RECORDS	CPY	HOLD	FORM	DEST	KEEP	MSG	SECLABEL	
MAINT	1593	A	RDR	00000273	001	NONE	PLAIN	BLDG3	ON	ON	019BCF
MAINT	1603	A	RDR	00000096	001	NONE	PLAIN	BLDG2	OFF	OFF	87654321
MAINT	1632	A	RDR	00000032	001	USER	PLAIN	BLDG1	ON	OFF	54319E
MAINT	1645	A	RDR	00000276	001	SYS	PLAIN	BLDG1	ON	ON	82FED9

## Controlling Local Devices

For a class D user, the response looks like this if an external security manager (ESM) denies access to the information for certain spool files:

OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	USERFORM	OPERFORM	DEST	SECLABEL
MAINT	1593	A	RDR	00000173	001	NONE	PLAIN	PLAIN	BLDG2 009BDF
MAINT	1603	A	RDR	*****	***	NONE	*****	*****	*****
MAINT	1632	A	RDR	00000032	001	USER	PLAIN	PLAIN	BLDG2 543219E
MAINT	1645	A	RDR	*****	***	SYS	*****	*****	*****
MAINT	1668	A	RDR	00000893	001	USYS	PLAIN	PLAIN	BLDG3 7EF9C1

For a class G user, the response looks like this if an ESM denies access to the information for certain spool files:

ORIGINID	FILE	CLASS	RECORDS	CPY	HOLD	FORM	DEST	KEEP	MSG	SECLABEL	
MAINT	1593	A	RDR	*****	***	NONE	*****	*****	***	***	*****
MAINT	1603	A	RDR	00000867	001	USER	PLAIN	BLDG2	OFF	OFF	1673238L
MAINT	1632	A	RDR	00009643	001	SYS	PLAIN	BLDG2	ON	OFF	PROJARO
MAINT	1645	A	RDR	*****	***	USYS	*****	*****	***	***	*****

**Note:** When an external security manager (ESM) is installed and security label checking is enabled, the ESM is called to verify the user's access to each file. If the user is denied access to a specific file, some of the information about that file is hidden from the user. The only fields of the response that contain information are ORIGINID, FILE, CLASS, HOLD, DATE, and TIME. All other fields contain asterisks. If a security label is not assigned to the file, the SECLABEL field contains the word NONE.

In the response to the QUERY READER *SECLABEL* command, the information is as follows:

- **ORIGINID|OWNERID** is the logon ID of the file owner. The file owner is the user who either created the file or put it in the reader queue.
- **FILE** is the spool file identification number, a number CP assigned to the file when it was created.
- **CLASS** tells you the class of the spool file and how the spool file was created. The class can be a letter (A through Z) or a number (0 through 9). The origin may be one of the following:
  - **PRT** (virtual printer)
  - **RDR** (real reader)
  - **PUN** (virtual punch)
  - **CON** (virtual console)
  - **SYS** (CP—for example, an abend dump file).
- **RECORDS** is the number of logical records in the file.
- **CPY** is the number of copies of the file.
- **HOLD** is the status of the file, where:
  - **USER** means the file is in user hold.
  - **SYS** means the file is in system hold.
  - **USYS** means the file is in both user and system hold.
  - **NONE** means the file is not in hold status.
- **DATE** and **TIME** are one of the following:
  - The date and time the file was created.

- **OPEN- vdev** if a file is still open, where *vdev* is the virtual device number of the virtual device at which the file is queued.
  - **OPEN- SYS** if a file is open but not associated with a virtual device (for example, if the file is being processed by the SPTAPE command).
  - **OPEN- rdev** if a file is still being read on a real card reader, where *rdev* is the card reader's real device number.
  - **LOCK- sysname** if a file is unavailable for processing in a CSE complex, where *sysname* is the identification of the system that is using the file. The *sysname* variable appears under TIME.
  - **COPY- sysname** if a file in a cross system spooling complex is unavailable for processing because communications with the system that owns the file cannot be made. The *sysname* variable is the identification of the system that has a copy of the file and appears under TIME.
- **FORM** is the name of the paper type understood by the user.
  - **USERFORM** is the name of the form associated with the file as understood by the user.
  - **OPERFORM** is the name of the form associated with the file as understood by the operator. The form names under **OPERFORM** are the ones you use when you enter a START command for a card punch.
  - **DEST** is the destination value of the file, where:
    - *ddddddd* means that the file will be punched by a specific reader or group of readers indicated by the 1- to 8-character destination value.
    - **OFF** means that the file will only be processed by a reader that is specifically started or defaulted to OFF.
    - **ANY** means that the file can be selected on any CP-owned reader, regardless of the reader's DEST setting, as long as the other selection criteria match.
  - **NAME** is the file name of the file, if any.
  - **TYPE** is the file type of the file, if any.
  - **DIST** is a code your installation may use to distribute output.
  - **KEEP** is the keep status of the file, where:
    - **ON** means the file is in keep status.
    - **OFF** means the file is not in keep status.
  - **MSG** is the message status of the file, where:
    - **ON** means the file is in message status.
    - **OFF** means the file is not in message status.
- If the file is in message status, CP sends a message to the file's owner when you punch the file.
- **SECLABEL** is the security label associated with each file. It is a 1- to 8-character alphanumeric value. The SECLABEL information is displayed only if an ESM is installed, security label checking is enabled, and the SECLABEL option is specified on the QUERY READER command.

For information about other options you can specify with the QUERY READER command, see the QUERY READER/PRINTER/PUNCH command in the *VM/ESA: CP Command and Utility Reference* book.

### Putting Files at the Top of the Reader Queue

If you want to put a particular file at the top of the reader queue, enter:

```
order userid reader nnn
```

where:

*userid*

is the ID of the owner of the spool file.

*nnn*

is the spool file identification number of the file.

To put several files at the top of the reader queue, enter:

```
order userid reader nnn1 nnn2 nnn3 ....
```

where:

*userid*

is the owner of the spool files.

*nnn1 nnn2 nnn3*

are spool file identification numbers of the files.

For information about other options you can specify with the ORDER command, see the *VM/ESA: CP Command and Utility Reference* book.

### Changing the Attributes of Files in the Reader Queue

The responses to the QUERY READER ALL, QUERY READER, and QUERY READER EXP commands show all of the attributes a file in the reader queue can have.

To change the attributes of reader files, you use options with the CHANGE command. For more information about the CHANGE command, see the *VM/ESA: CP Command and Utility Reference* book.

**Note:** If an external security manager (ESM) is installed, you may not be authorized to use the CHANGE command. For additional information, contact your security administrator.

### Purging Files from the Reader Queue

At a user's request, you may remove one or more files from the reader queue. To purge particular files, enter:

```
purge userid reader nnn1 nnn2 ...
```

where:

*userid*

is the owner of the reader files.

*nnn1 nnn2*

are spool file identification numbers of the files you want to purge from the reader queue.

CP then erases the files.

## Transferring Files from the Reader Queue

The TRANSFER command transfers files from the reader queue of another user. The operator (as a privilege class D user) can transfer any spool files in the system, regardless of ownership or origin.

**Note:** If an ESM is installed, you may not be authorized to use the TRANSFER command. For additional information, contact your security administrator.

To transfer spool files from a reader, enter:

```
transfer rdr class c|userid1|all to|from all|*|userid2 rdr|prt|pun
```

where:

### **CLASS** *c*

is the class of the spool files you want to transfer.

### *userid1*

is the user whose files are to be transferred or reclaimed.

### **ALL**

specifies the transfer of all files in the queue.

### **TO|FROM** \*

indicates to or from your own user ID.

### *userid2*

identifies the user to whom the files are transferred.

**Example 1—Transferring Files from the Reader to the Punch:** All the class B files on your reader queue need to be transferred to your punch queue. To transfer the class B files, enter:

```
transfer rdr class b to * pch
```

**Example 2—Transferring a Spool File from Your Reader Queue to the Reader Queue of a User:** Spool file with spool ID 1673 needs to be transferred from your reader queue to the reader queue of USERA. Note that the file is in the reader queue, which is the default. To transfer the spool files, enter:

```
transfer 1673 to usera
```

## Dumping Files in the Reader Queue to Tape

If you need to dump files in the reader queue to tape, use the SPTAPE DUMP command. For more information, see “Restoring Standard Spool Files from Tape” on page 277.

## Loading Files in the Reader Queue from Tape

If you need to load files from tape back on to the system's reader queue, use the SPTAPE LOAD command. For more information, see “Restoring Standard Spool Files from Tape” on page 277.

### Controlling the Active File on a Card Reader

You cannot use CP commands to control the active reader spool file (that is, the card deck a card reader is now reading). All the CP commands that control active spool files apply to output spool files. The BACKSPACE, FORWARD, SPACE, REPEAT, and FLUSH commands apply only to printers and card punches.

### Punching a Card Deck for a VM/ESA User

To punch a card deck for a VM/ESA user, you must:

1. Make the card punch available to the system, if necessary
2. Drain the card punch
3. Find out the status of the card punch
4. Find out what files are waiting to be punched
5. Choose a new group of files to punch
6. Choose the correct START command options for the new group of files
7. Choose START command options to control the card punch correctly
8. Enter the START command with all the correct options
9. Change the cards in the card punch
10. Start the card punch.

The next sections explain these steps in detail. Figure 4 on page 195 shows an example of the dialog that might occur between you and CP as you follow this procedure.

If you rarely punch cards at your installation, you may first wish to verify that the user really wants to punch a card deck.

#### Making the Card Punch Available to the System

Before you can use a card punch to punch files, it must be available to the system. To find out whether it is available to the system, enter:

```
query rdev
```

If the status does not say OFFLINE or ATTACHED to a virtual machine, it is already available to the system. Go to the next step.

If the card punch is offline, enter:

```
vary online rdev
```

where *rdev* is the card punch's real device number.

If the card punch is dedicated to a virtual machine, remove it from the virtual machine. Go to the next step. See “Removing a Card Punch Device from a VM/ESA User” on page 181 or “Removing a Card Punch Device from the Production System” on page 181, as appropriate.

#### Draining the Card Punch

The next thing to do when you are getting ready to punch a group of files is to make sure the card punch does not punch them before you are ready. An easy way to do this is to enter the DRAIN command. In VM/ESA, this is called *draining* a card punch.

The DRAIN command does two things: it tells the card punch to finish any file it is now punching, and it puts the card punch in a state that prevents it from punching any other file—the drained state.

Normally, a card punch that has already been set up to punch is in the started state. In this state, the card punch might punch a file before you are ready. Whether it does depends on how the card punch is set up and what characteristics the files in the punch queue have. If there are no files in queue with characteristics that match the card punch setup, no files punch. In this case, it is not necessary to drain the card punch. But by draining the card punch anyway, you can make sure no new files punch.

To drain the card punch, enter:

```
drain rdev
```

where *rdev* is the card punch's real device number.

If the card punch is active, CP sends you two messages, one when the card punch starts draining and another when it is drained. Otherwise, CP sends you just the drained message. When CP tells you the card punch is drained, continue with the next step.

### Finding Out the Status of a Card Punch

Punching takes place only when the characteristics of a file in the punch queue match the way a card punch is set up. You change the way a card punch is set up through options on the START command, which you will enter in a later step. To find out what options you need to specify on the START command, you must find out the card punch's status. To do this, enter:

```
query rdev
```

where *rdev* is the real device number of the card punch. In response, CP displays the status of the card punch, which looks something like this:

```
PUN  000D DRAINED   SYSTEM  CLASS AB
PUN  000D FORM STANDARD MANUAL SEP LIMIT
PUN  000D DEST OFF   DEST - NONE - DEST - NONE - DEST - NONE -
```

Card punch status is like printer status (explained in detail in “Understanding Printer Status” on page 331). This sample shows the status of a card punch with real device 00D in the drained state (DRAINED). The card punch is set up to punch spool files that belong to any user (SYSTEM) that have punch class A or B (CLASS AB) and have form STANDARD (FORM STANDARD). When there are no more files of the current form, CP does not prompt you for a new form (MANUAL). The card punch produces separator cards between files (SEP). Up to four destination values can be serviced by this machine. The DEST value for the first device is OFF (DEST OFF), and the remaining values are null (DEST - NONE -). The LIMIT option specifies the maximum number of records of a file to be punched.

### Finding Out What Files Are Waiting to Be Punched

After you know how the card punch is set up, you need to find out what files are waiting to be punched. To do this, enter:

```
query punch
```

## Controlling Local Devices

In response, CP displays information about all the files that are waiting to be punched. The responses look like this:

```
User:      query punch
System:    OWNERID FILE CLASS RECORDS  CPY HOLD USERFORM OPERFORM DEST  KEEP MSG
          MAINT   1598 A PUN 00000173 001 NONE PLAIN   PLAIN  BLDG1 OFF  OFF
          MAINT   1603 A PUN 00000008 001 NONE PLAIN   PLAIN  BLDG1 OFF  OFF
          MAINT   1612 A PUN 00000220 001 NONE PLAIN   PLAIN  BLDG1 OFF  OFF
          MAINT   1613 A PUN 00000564 001 NONE PLAIN   PLAIN  BLDG1 OFF  OFF
          MAINT   1618 A PUN 00000173 001 NONE PLAIN   PLAIN  BLDG1 OFF  OFF
```

If you are not familiar with the status of files in the punch queue, you can find a detailed explanation in “Finding Out What Files Are Waiting to Be Punched” on page 199. Right now, you need to be concerned with the information listed under:

- The C in CLASS, the punch spool file class
- OPERFORM, the punch spool file form
- DEST, the punch spool file destination.

### Choosing a New Group of Files to Punch

From the files that are waiting, choose a group of files to punch.

Each installation classifies its punched output differently, but it is common to use a combination of punch class, form, and destination to group output. If you punch only a few cards at your installation, you may have only one punch job class, one punch form, and one punch destination. Otherwise, you may have several classes, forms, and destinations. Different punch classes may vary by the size of the output deck. The punch form may indicate the kind of card you are to use, and the punch destination indicates the destination values of the files to be selected. For example, a card punch used as an employee time card may contain printed information that is different from that on a card punch to be used to register for a seminar. The punch spool files that represent these two different kinds of output therefore call for different punch forms.

If your installation has many output groups, you probably have a table that tells you, for each kind of punch file, what options to use with the START command. The START command options most likely to vary by group are:

- CLASS for the punch class (A through Z or 0 through 9)
- FORM for the type of cards to use (a name your installation uses by convention)
- DEST for the destination of a particular punch machine.

### Choosing the START Command Options for the New Files

At this point, you have decided which files to punch. Now you need to choose the correct options with the START command for those files. The options are:

- **CLASS** *abcdefgh*

where *abcdefgh* is a string of one to eight classes. If you specify *class* \*, any class file will punch.

- **FORM** *operform*

where *operform* is the name of the type of cards the output requires.

- **DEST** *dest*

where *dest* is a 1- to 8-character value assigned to the punch machine. Up to four destination values may be specified. Specify a DEST of \* to indicate that files are to be selected for processing regardless of the file's DEST setting.

### Choosing the START Command Options for Card Punch Control

In addition to the settings that relate to specific kinds of files, you must also decide how you want to operate the card punch. You must choose settings for the following modes:

- **Form mode** — MANUAL or AUTO

The form mode governs how the card punch acts when no more files of the current form are left to punch.

The MANUAL setting allows you to choose the next form you want to load on the card punch. The card punch idles until another file of the current form joins the punch queue, or until you start the card punch with a new form.

When AUTO is set, CP automatically chooses the next form for you. When there are no more files in queue for the current form, CP starts the card punch with the form of the next available file. CP then prompts you to mount the new form.

- **Separator mode** — SEP or NOSEP

The separator mode controls whether the card punch produces separator cards between files. The SEP setting causes the card punch to produce separator cards, so that you may separate the card decks more easily. When NOSEP is set, instead of producing separator cards, the card punch stops between each file. After you remove each card deck, you must press the START button on the card punch to punch the next file.

Normally, you use the MANUAL and SEP settings. So if you look at the card punch status, it should say MANUAL and SEP on the second line.

If necessary, select the following card punch control options for the START command:

- **MANUAL**, if the status says AUTO
- **SEP**, if the status says NOSEP.

### Entering the START Command

Based on the options you have chosen in the previous steps, you can now enter the START command, as follows:

```
start rdev user system file-options punch-options
```

where:

*rdev*

is the real device number of the card punch.

*file-options*

are the options that relate to the files you have chosen to punch (CLASS, FORM, and DEST).

### *punch-options*

are any required options that relate to the control of the card punch (MANUAL, SEP, LIMIT). You may enter the options in any order.

In response to the START command, CP sends you several lines that indicate that the card punch has started. Then, CP displays a message that asks you to mount the new form.

### **Changing the Cards and Starting the Card Punch**

When you receive CP's prompt to mount the new form, go to the card punch and load new cards, if necessary. Then, tell CP that you have finished loading the new cards by doing either of the following, whichever is more convenient:

- If you are near the card punch, push the STOP and START buttons on the card punch.
- If you are near your console, enter:

```
start rdev
```

where *rdev* is the real device number of the card punch.

Either of these actions causes CP to recognize that the card punch is ready to punch. The card punch starts punching the first file that matches the characteristics you just finished setting up for the card punch. As the first file starts to punch, you get a message that tells you that the file is punching.

As each matching file starts to punch, you get a similar message. When all the matching files have finished punching, you can repeat this procedure and punch another group of files.

### **Using the Card Punching Procedure**

Figure 4 on page 195 shows an example of using the whole procedure to punch cards on a card punch.

```

User: drain 00d
System: PUN 000D DRAINED      SYSTEM  CLASS AB
        PUN 000D FORM STANDARD MANUAL SEP LIMIT
        PUN 000D DEST OFF      DEST - NONE - DEST - NONE - DEST - NONE -
User: query 00d
System: PUN 000D DRAINED      SYSTEM  CLASS AB
        PUN 000D FORM STANDARD MANUAL SEP LIMIT
        PUN 000D DEST OFF      DEST - NONE - DEST - NONE - DEST - NONE -
User: query punch
System: OWNERID FILE CLASS RECORDS CPY HOLD USERFORM OPERFORM DEST KEEP MSG
        MAINT 1598 A PUN 00000173 001 NONE PLAIN PLAIN BLDG1 OFF OFF
        MAINT 1603 A PUN 00000008 001 NONE PLAIN PLAIN BLDG1 OFF OFF
        MAINT 1612 A PUN 00000220 001 NONE PLAIN PLAIN BLDG1 OFF OFF
        MAINT 1613 A PUN 00000564 001 NONE PLAIN PLAIN BLDG1 OFF OFF
        MAINT 1618 A PUN 00000173 001 NONE PLAIN PLAIN BLDG1 OFF OFF
User: start 00d user system class a form plain dest bldg1
System: PUN 000D STARTED      SYSTEM  CLASS A
        PUN 000D FORM PLAIN    MANUAL SEP LIMIT
        PUN 000D DEST BLDG1    DEST - NONE - DEST - NONE - DEST - NONE -
        H CPRSP405A MOUNT FORM PLAIN ON PUN 000D

[Operator loads cards for PLAIN form]

User: start 00d
System: PUN 000D STARTED      SYSTEM  CLASS A
        PUN 000D FORM PLAIN    MANUAL SEP
        PUN 000D DEST BLDG1    DEST - NONE - DEST - NONE - DEST - NONE -
        PUN 000D PUNCHING MAINT FILE 1598 RECS 0173 COPY 001 SEQ 001 CL A PUN
        PUN 000D PUNCHING MAINT FILE 1603 RECS 0008 COPY 001 SEQ 002 CL A PUN
        PUN 000D PUNCHING MAINT FILE 1612 RECS 0220 COPY 001 SEQ 003 CL A PUN
        PUN 000D PUNCHING MAINT FILE 1613 RECS 0564 COPY 001 SEQ 004 CL A PUN
        PUN 000D PUNCHING MAINT FILE 1618 RECS 0173 COPY 001 SEQ 005 CL A PUN

```

Figure 4. Example of Punching Spool Files

### Example of Punching Spool Files

Figure 4 shows an example of the dialog that might occur between you and CP. Your input is shown in lowercase boldface letters. CP's response is in uppercase.

In this example, your card punch has a real device number of 00D. After draining the card punch, finding out its status, and finding out what files are waiting to be punched, you decide to punch all of the files. They are all class A files that need plain cards and have a destination value of BLDG1 for the device, so you need the CLASS A, FORM PLAIN, and DEST BLDG1 options on the START command.

Next, you look at the card punch control options. Card punch 00D's status shows that it already has the MANUAL form mode and the SEP separator mode. Therefore, you do not have to specify any card punch control options with the START command.

## Controlling Local Devices

After entering the START command with the options for the new group of files, you load the cards for the PLAIN form. You use another START command to tell CP that the card punch is ready.

As CP punches each file, it sends you a message. Because none of the files are in system or user hold and they all match the card punch setup, they all punch.

## Using Other START Command Options for Card Punches

“Punching a Card Deck for a VM/ESA User” on page 190 described a procedure for punching a typical group of spool files. But you can control your punching operation more flexibly by changing the options on the START command. The following sections describe how to do this in more detail.

### Assigning a Card Punch to a User (Punching Only One User's Files)

Ordinarily, you punch output by class, form, and destination without regard to file owner. You accomplish this by specifying the keywords USER SYSTEM on the START command. But sometimes you may need to punch the output of a high-priority user. This is called *assigning* the card punch to a user. The user may or may not be the production system.

To assign a card punch to a user, follow the normal procedure for punching files until you are about to enter the START command. Then, enter:

```
start rdev user userid other-options
```

where:

*rdev*

is the real device number of the card punch.

*userid*

is the logon ID of the user to whom you want to assign the card punch.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

When you are ready to punch all system files again, follow the normal procedure for punching files until you are about to enter the START command. Then, enter:

```
start rdev user system other-options
```

After you finish the rest of the procedure, the card punch again starts punching available files without regard to their owners.

**Example—Assigning a Card Punch to a User:** Suppose you are punching files and user PCHVIP asks you to punch all of his files now. You are using a card punch that has real device number 00D. User PCHVIP's files are all of class V, form SPECIAL, and destination BLDG1. You must change the cards for the new form. The card punch's status indicates that the form mode is MANUAL and the separator mode is SEP. To assign card punch 00D to user PCHVIP:

1. Enter:

```
drain 00d
```

2. Enter:

```
start 00d user pchvip class v form special dest bldg1
```

3. When CP prompts you, load the new cards in the card punch for the operator form SPECIAL.

4. Enter:

```
start 00d
```

The card punch then starts to punch user PCHVIP's spool files.

### Allowing CP to Choose the Next Form Automatically

On a card punch, you may choose between two *form mode* settings, MANUAL or AUTO. The form mode setting governs how the card punch acts when no more files of the current form are left to punch.

Normally, you set up a card punch to run with the form mode set to MANUAL. This setting allows you to choose the next form to mount. The card punch idles until another file of the current form joins the queue, or until you start the card punch with a new form.

If you prefer, you can allow CP to choose the next form automatically. When the form mode is set to AUTO and there are no more files of the current form, CP starts the card punch with the form of the next available file. CP then prompts you to mount the new form.

To set up the card punch so that CP automatically chooses the next form, follow the normal procedure for punching files until you are about to enter the START command. Then, enter:

```
start rdev auto other-options
```

where:

*rdev*

is the real device number of the card punch.

*other-options*

are the other options you have chosen for the START command.

When CP responds to the START command, continue with the rest of the procedure as usual.

### Punching without Separator Cards

Most of the time you want separator cards between the files that you punch. These header cards help you to separate the output decks, which otherwise run together. But if you want the card punch to stop after each file, you may want to punch files without separator cards.

To punch without separator cards, follow the normal procedure for punching files until you are about to enter the START command. Then, enter:

```
start rdev nosep other-options
```

where:

*rdev*

is the real device number of the card punch.

## Controlling Local Devices

### *other-options*

are the other options you have chosen for the START command.

If CP prompts you to mount a new form, load new cards and press the STOP and START buttons, as usual. CP then prompts you to start the card punch by displaying something similar to this:

```
PUN 0013 START FOR OUTPUT
```

When you receive the START prompt, go to the card punch and press the STOP and START buttons on the card punch. The card punch starts punching the first file that matches the characteristics you set up for the card punch.

The NOSEP option causes the card punch to stop after each file. After you remove each card deck, press the STOP and START buttons on the card punch to punch the next file.

## Stopping a Card Punch

To stop a card punch after it finishes punching the current deck, enter:

```
drain rdev
```

where *rdev* is the real device number of the card punch. You may now remove the card punch from the system.

Sometimes you may need to stop a card punch immediately without waiting for the current file to finish punching. For example, the file may take too long to punch during first shift. If you want to stop a card punch immediately and save the file that is interrupted, enter:

```
flush rdev hold
```

where *rdev* is the device number of the card punch you want to stop. In response to this command, CP stops punching the active file, puts it back in the punch queue in system hold, and starts punching the next available file. To punch the interrupted file later, release it from system hold. See "Releasing Files in the Punch Queue from System Hold" on page 204.

If you want to stop a card punch immediately and delete all copies of the file that is interrupted, enter:

```
flush rdev all
```

where *rdev* is the device number of the card punch you want to stop. In response to this command, CP stops punching the file and deletes it. CP then continues punching the next available file.

## Removing a Card Punch from the System

To remove a card punch from the system, do the following:

1. Make sure the card punch's status says DRAINED. Enter:

```
query rdev
```

where *rdev* is the real device number of the card punch.

If CP's response does not indicate that the card punch is drained, enter:

```
drain rdev
```

where *rdev* is the real device number of the card punch.

2. Enter:

```
vary offline rdev
```

where *rdev* is the real device number of the card punch.

The card punch is now unavailable to VM/ESA.

## Controlling Spool Files in the Punch Queue

VM/ESA gives you options on the commands you use to manipulate spool files in the punch queue. Spool files are collections of data to be processed. Spool files in the punch queue are files that are waiting to be punched.

To control files in the punch queue, you need to be able to:

- Find out what files are waiting to be punched
- Put one or more files at the top of the punch queue
- Change one or more attributes associated with a file in the punch queue
- Transfer one or more files from the punch queue
- Purge one or more files from the punch queue.

### Finding Out What Files Are Waiting to Be Punched

To find out how many files are waiting to be punched, enter:

```
query files system
```

CP's response to this command indicates how many spool files are in the reader, printer, and punch spool file queues.

To list the files that are waiting to be punched, enter:

```
query punch
```

CP's response to this command lists, in the order of processing, all the spool files in the punch queue. The response looks similar to this:

OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	USERFORM	OPERFORM	DEST	KEEP	MSG
MAINT	1598	A	PUN	00000173	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1603	A	PUN	00000008	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1612	A	PUN	00000220	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1613	A	PUN	00000564	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1618	A	PUN	00000173	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1627	A	PUN	00012058	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1628	A	PUN	00001524	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF
MAINT	1632	A	PUN	00032075	001	NONE	PLAIN	PLAIN	BLDG1	OFF OFF

In a CSE complex, the QUERY PUNCH ALL command has a response that differs from a non-CSE complex. An example of this response can be found on page 185.

To list the files in the queue that are waiting to be punched, along with each file's security label, enter:

```
query punch seclabel
```

## Controlling Local Devices

CP's response to this command lists, in the order of processing, all the spool files in the punch queue, along with each file's security label. For the class D user, the response looks similar to this:

OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	USERFORM	OPERFORM	DEST	SECLABEL	
MAINT	1598	A	PUN	00000173	001	NONE	PLAIN	PLAIN	BLDG1	13579EF
MAINT	1603	A	PUN	00000008	001	NONE	PLAIN	PLAIN	BLDG1	9EFD450
MAINT	1612	A	PUN	00000220	001	NONE	PLAIN	PLAIN	BLDG1	DFC3450
MAINT	1613	A	PUN	00000564	001	NONE	PLAIN	PLAIN	BLDG1	12678EF

For a class G user, the response looks similar to this:

ORIGINID	FILE	CLASS	RECORDS	CPY	HOLD	FORM	DEST	KEEP	MSG	SECLABEL	
MAINT	1593	A	PUN	00000273	001	NONE	PLAIN	BLDG3	ON	ON	019BCF
MAINT	1603	A	PUN	00000096	001	NONE	PLAIN	BLDG2	OFF	OFF	87654321
MAINT	1632	A	PUN	00000032	001	USER	PLAIN	BLDG1	ON	OFF	54319E
MAINT	1645	A	PUN	00000276	001	SYS	PLAIN	BLDG1	ON	ON	82FED9

**Note:** When an external security manager (ESM) is installed and security label checking is enabled, the ESM is called to verify the user's access to each file. If the user is denied access to a specific file, some of the information about that file is hidden from the user. The only fields of the response that will contain information are ORIGINID, FILE, CLASS, HOLD, DATE and TIME. All other fields contain asterisks. If a security label is not assigned to the file, the SECLABEL field contains the word NONE. For examples of responses when an ESM denies access to files, see page 186.

In the response to the QUERY PUNCH command, the information is as follows:

- **ORIGINID|OWNERID** is the logon ID of the file owner. The file owner is the user who either created the file or put it in the punch queue.
- **FILE** is the spool file identification number, a number CP assigned to the file when it was created.
- **CLASS** tells you the class of the spool file and how the spool file was created. The class can be a letter (A through Z) or a number (0 through 9). The origin may be one of the following:
  - **PRT** (virtual printer)
  - **RDR** (real reader)
  - **PUN** (virtual punch)
  - **CON** (virtual console).
- **RECORDS** is the number of logical records in the file.
- **CPY** is the number of copies of the file.
- **HOLD** is the hold status of the file, where:
  - **USER** means the file is in user hold.
  - **SYS** means the file is in system hold.
  - **USYS** means the file is in both user and system hold.
  - **NONE** means the file is not in hold status.

If the file is in system hold or user hold status, you cannot punch it.

- **FORM** is the name of the paper type understood by the user.

- **USERFORM** is the name of the form associated with the file as understood by the user.
- **OPERFORM** is the name of the form associated with the file as understood by the operator. The form names under **OPERFORM** are the ones you use when you enter a START command for a card punch.
- **DEST** is the destination value of the file, where:
  - *ddddddd* means that the file will be punched by a specific punch or group of punches indicated by the 1- to 8-character destination value.
  - **OFF** means that the file will only be processed by a punch that is specifically started or defaulted to OFF.
  - **ANY** means that the file can be selected on any CP-owned punch, regardless of the punch's DEST setting, as long as the other selection criteria match.
- **KEEP** is the keep status of the file, where:
  - **ON** means the file is in keep status.
  - **OFF** means the file is not in keep status.

If the file is in keep status, you may punch the file, but the system also keeps a copy in user hold.

- **MSG** is the message status of the file, where:
  - **ON** means the file is in message status.
  - **OFF** means the file is not in message status.

If the file is in message status, CP sends a message to the file's owner when you punch the file.

- **SECLABEL** is the security label associated with each file. It is a 1- to 8-character alphanumeric value. The SECLABEL information is displayed only if an ESM is installed, security label checking is enabled, and the SECLABEL option is specified on the QUERY PUNCH command.

To list additional information about the files that are waiting to be punched, enter:

```
query punch all
```

CP's response to this command lists, in the order of processing, all the spool files in the punch queue. The response looks like this:

```
OWNERID FILE CLASS RECORDS CPY HOLD DATE TIME NAME TYPE DIST
MAINT 1598 A PUN 00000173 001 NONE 09/18 10:22:18 TESTPUN1 CARDS 1:16-3
MAINT 1603 A PUN 00000008 001 NONE 09/18 10:43:36 TESTPUN2 CARDS 1:16-3
MAINT 1612 A PUN 00000220 001 NONE 09/18 10:44:05 TESTPUN3 CARDS 1:16-3
MAINT 1613 A PUN 00000564 001 NONE 09/18 11:08:52 TESTPUN4 CARDS 1:16-3
MAINT 1618 A PUN 00000173 001 NONE 09/18 11:11:23 TESTPUN1 CARDS 1:16-3
MAINT 1627 A PUN 00012058 001 NONE OPEN- 000D TESTPUN7 CARDS 1:16-3
MAINT 1628 A PUN 00001524 001 NONE PUN- (1267) TESTPUN8 CARDS 1:16-3
MAINT 1632 A PUN 00032075 001 NONE OPEN- SYS TESTDUMP CARDS 1:16-3
```

In the response to the QUERY PUNCH ALL command, the information is as follows:

- **OWNERID** is the logon ID of the file owner.
- **FILE** is the spool file identification number.
- **CLASS** tells you the class of the spool file and how the spool file was created.

## Controlling Local Devices

- **RECORDS** is the number of logical records in the file.
- **CPY** is the number of copies of the file.
- **HOLD** is the hold status of the file.
- **DATE** and **TIME** is one of the following:
  - The date and time the file was created.
  - **PUN-** (*recs*) if a file is being punched, where *recs* indicates the number of logical records left to punch
  - **OPEN-** *vdev* if a file is still open, where *vdev* is the virtual device number of the virtual device at which the file is queued
  - **OPEN- SYS** if a file is open but not associated with a virtual device (for example, if the file is being processed by the SPTAPE command).
- **NAME** is the file name of the file, if any.
- **TYPE** is the file type of the file, if any.
- **DIST** is a code your installation may use to distribute output.

For information about other options you can specify on the QUERY PUNCH command, see the QUERY READER|PRINTER|PUNCH command in the *VM/ESA: CP Command and Utility Reference* book.

### Putting Files at the Top of the Punch Queue

If you want to punch a particular file before any others, and the file matches the setup of the card punch, you can put that file at the top of the punch queue. To do this, enter:

```
order userid punch nnn
```

where:

*userid*

is the ID of the owner of the spool file.

*nnn*

is the spool file identification number of the file you want to punch next.

To put several files at the top of the punch queue, enter:

```
order userid punch nnn1 nnn2 nnn3 ....
```

where:

*userid*

is the ID of the owner of the spool files.

*nnn1 nnn2 nnn3*

are spool file identification numbers of the files you want to punch next.

To put a whole class of files at the top of the punch queue, enter:

```
order userid punch class c
```

where:

*userid*

is the ID of the owner of the spool files.

*c* is the class of files you want to punch next.

To put all the files of a given operator form at the top of the punch queue, enter:

```
order userid punch form operform
```

where:

*userid*

is the ID of the owner of the spool files.

*operform*

is the operator form associated with the files you want to punch next.

To put all the files of a given destination value at the top of the punch queue, enter:

```
order userid punch dest dest
```

where:

*userid*

is the ID of the owner of the spool files.

*dest*

is the destination value of the files you want to punch next.

For information about other options you can specify with the ORDER command, see the *VM/ESA: CP Command and Utility Reference* book.

### Changing the Attributes of Files in the Punch Queue

The responses to the QUERY PUNCH, QUERY PUNCH ALL, QUERY PUNCH EXP, and QUERY PUNCH PSF commands show all the attributes a file in the punch queue can have. See “Finding Out What Files Are Waiting to Be Punched” on page 199. Sometimes you need to change some of these attributes. The attributes you usually change are a file's class and its system hold status. You may also need to change the number of copies or the security label of files in the punch queue.

The sections that follow tell you how to use the CHANGE command to:

- Change the class of a file in the punch queue
- Put files in the punch queue in system hold
- Release files in the punch queue from system hold
- Change the number of copies of a file in the punch queue
- Change the security label associated with files in the punch.

**Note:** If an external security manager is installed, you may not be authorized to use the CHANGE command. For additional information, contact your security administrator.

For information about other options you can specify with the CHANGE command, see the *VM/ESA: CP Command and Utility Reference* book.

### Changing the Class of a File in the Punch Queue

To change the class of a file in the punch queue, enter:

```
change userid punch nnn class c
```

## Controlling Local Devices

where:

*userid*

is the ID of the owner of the spool files.

*nnnn*

is the spool file identification number of the file you want to change.

*c* is the new class.

### Putting Files in the Punch Queue in System Hold

To prevent a file from being punched, you may put it in system hold. To do this, enter:

```
change userid punch nnnn sys
```

where:

*userid*

is the ID of the owner of the spool file.

*nnnn*

is the spool file identification number of the file you want to hold.

You may not punch the file until you take it out of system hold.

To prevent a class of files from being punched, put them in system hold by entering:

```
change userid punch class c sys
```

where:

*userid*

is the ID of the owner of the spool files.

*c* is the class of files you want to hold.

You may not punch these files until you take them out of system hold.

To put all of the files in the punch queue in system hold, enter:

```
change userid punch all sys
```

### Releasing Files in the Punch Queue from System Hold

A file in the punch queue in system hold cannot be punched. To take a file in the punch queue out of system hold, enter:

```
change userid punch nnnn nosys
```

where:

*userid*

is the ID of the owner of the spool file.

*nnnn*

is the spool file identification number of the file you want to release from system hold.

To take a class of files in the punch queue out of system hold, enter:

```
change userid punch class c nosys
```

where:

*userid*

is the ID of the owner of the spool files.

*c* is the class of files you want to release from system hold.

To take all the files in the punch queue out of system hold, enter:

change *userid* punch all nosys

### Changing the Number of Copies of a File in the Punch Queue

At a user's request, you may change the number of copies of a file in the punch queue. To do this, enter:

change *userid* punch *nnnn* copy *cpy*

where:

*userid*

is the ID of the owner of the spool file.

*nnnn*

is the spool file identification number of the file.

*cpy*

is the total number of copies you want to punch.

### Changing the Security Label of a File in the Punch Queue

Class D users can change the value of the security label associated with any file in the punch queue if the following conditions are met:

- An external security manager (ESM) is installed
- Security label checking is enabled, and:
  - The user is exempt from ESM authorization checking, or
  - The system has been placed in a tranquil state by the security administrator.

For additional information, contact your security administrator.

To change the security label of a punch file, enter:

change *userid* punch *nnnn* seclabel *sssssss*

where:

*userid*

is the ID of the owner of the spool file.

*nnnn*

is the spool file identification number of the file for which you want to change the security label value.

*sssssss*

is a 1- to 8-character alphanumeric value assigned to the file for the security label.

### Transferring Files from the Punch Queue

The TRANSFER command transfers files from the punch queue of another user. The operator (as a privilege class D user) can transfer any spool files in the system, regardless of ownership or origin.

**Note:** If an ESM is installed, you may not be authorized to use the TRANSFER command. For additional information, contact your security administrator.

To transfer spool files from a punch, enter:

```
transfer pun class c|userid1|all to|from all|*|userid2 rdr|prt|pun
```

where:

**CLASS *c***

is the class of the spool files you want to transfer.

*userid1*

is the user whose files are to be transferred or reclaimed.

**ALL**

specifies the transfer of all files in the queue.

**TO|FROM \***

indicates to or from your own user ID.

*userid2*

identifies the user to whom the files are transferred.

**Example 1—Transferring a Spool File from the Punch to a User:** You need to transfer a spool file with spool ID 2345 from the punch queue to the reader queue of USERY. To transfer the spool file, enter:

```
transfer pun 2345 to usery
```

**Example 2—Transferring Spool Files from the Punch to Your Reader:** You need to transfer spool files on your punch queue to your reader queue. To transfer the spool files, enter:

```
transfer pun all to * rdr
```

**Example 3—Reclaiming Spool Files Sent to Other Printer Queues:** You need to reclaim spool files sent to the printer queues of other users and place them on your punch queue.

To do this, enter:

```
transfer pun all from all prt
```

### Purging Files from the Punch Queue

At a user's request, you may remove one or more files from the punch queue. To purge particular files, enter:

```
purge userid punch nnn1 nnn2 ...
```

where:

*userid*

is the user identification of the files to be punched.

*nnn1 nnn2 ...*

are the spool file identification numbers of the files you want to purge from the punch queue.

CP then erases the files.

To purge a class of files in the punch queue, (for example, a group of files with an incorrect class), enter:

```
purge userid punch class c
```

where:

*userid*

is the user identification of the files.

*c* is the incorrect class of files you want to purge from the punch queue.

To purge all files in the punch queue that have a particular operator form (for example, a group of files with an incorrect form), enter:

```
purge userid punch form operform
```

where:

*userid*

is the user identification of the files.

*operform*

is the name of the incorrect operator form.

To purge all files in the punch queue that have a particular destination (for example, a group of files with an incorrect *dest*), enter:

```
purge userid punch dest dest
```

where:

*userid*

is the user identification of the files.

*dest*

is the name of the incorrect destination.

### Dumping Files in the Punch Queue to Tape

If you need to dump files in the punch queue to tape, use the SPXTAPE DUMP command. For more information, see “Restoring Standard Spool Files from Tape” on page 277.

### Loading Files in the Punch Queue from Tape

If you need to load files from tape back onto the system's punch queue, use the SPXTAPE LOAD command. For more information, see “Restoring Standard Spool Files from Tape” on page 277.

### Controlling the Active File on a Card Punch

In addition to managing the queue of spool files waiting to be punched, you need to be able to control the active file on a card punch. The active file is the file that a card punch is now punching.

To control the active file on a card punch, you need to be able to:

- Backspace and forward space the file
- Punch another copy of the file
- Stop the file from punching.

#### Backspacing and Forward Spacing the Active File on a Card Punch

If a card punch jams, you must repunch the active file. CP does not allow you to repunch part of a file.

To cause the card punch to start over at the beginning of the file, enter:

```
backspace rdev file
```

where *rdev* is the real device number of the card punch.

If there is more than one copy of the file, you can cause the card punch to stop punching the active copy and skip to the beginning of the next copy. To do this, enter:

```
forward rdev
```

where *rdev* is the real device number of the card punch.

**Example—Backspacing the Active File on a Card Punch:** A problem on card punch 00D caused the card deck to be unusable after the first 10 cards. After fixing the problem, enter:

```
backspace 00d file
```

This command causes the card punch to start punching again at the beginning of the file. You can later discard the unwanted output.

#### Punching Another Copy of the Active File

If a file is waiting to be punched, you can use the CHANGE command to create more than one copy. See “Changing the Number of Copies of a File in the Punch Queue” on page 205.

But if the file is now on the card punch and the user needs more copies, enter:

```
repeat rdev nnn
```

where:

*rdev*

is the real device number of the card punch.

*nnn*

is the number of *additional* copies you need.

**Example—Punching Another Copy of the Active File:** A user originally requested two copies of a file that is now on card punch 00D. The user calls you to say four more copies are needed. To get the additional copies, enter:

```
repeat 00d 2
```

### Stopping the Active File from Punching

If you want to stop the file that is on a card punch from punching, enter:

```
flush rdev hold
```

where *rdev* is the real device number of the card punch. In response, CP stops punching the file, puts it back on the punch queue in system hold, and starts punching the next available file. To punch the interrupted file later, you must take it out of system hold by entering:

```
change userid punch nnn nosys
```

where:

*userid*

is the ID of the owner of the spool file.

*nnn*

is the file's spool file identification number.

---

## Summary of Controlling Local Devices

See Appendix A, “Common Operator Commands for VM/ESA” on page 317 for a summary of commands you use to control devices that are local to your processor complex. Included are commands to control:

- Channel paths to local devices
- 3270 devices and communication lines
- SNA/CCS terminals
- Direct access storage devices (DASDs)
- Tape drives
- Channel-to-channel adapters (CTCAs)
- Printers and printer spool file queues
- Punched card devices (card readers and card punches) and reader and punch spool file queues.



---

## Chapter 6. Responding to Errors

This chapter tells you what to do when errors occur while you are operating VM/ESA. After reading this chapter, you will understand:

- What happens when VM/ESA terminates
  - What happens to the VM/ESA system, the operator's virtual machine, and other users' virtual machines
  - What happens to the V=R preferred machine
- How to recover the production system when possible.

If you need only a brief summary of the tasks in this chapter, see “Summary of Recovering the Preferred Virtual Machine” on page 222.

---

### Preferred Machine Recovery

V=R preferred machine recovery is a CP function that allows the V=R preferred machine, and in some cases the V=F machines, to resume operation after most abnormal CP terminations (abends).

If CP abends, it tries to save the environment of the V=R preferred machine. Then when CP comes back up, you may only have to reconnect the V=R preferred machine to start it running again. If the V=R preferred machine has a dedicated console, the V=R guest may continue running automatically once the system returns.

*You do not need to re-IPL the V=R preferred machine if CP successfully restores it.*

**Note:** If you want to use the V=R guest recovery feature on a CP bounce or re-IPL and you have ANY devices defined in HCPRIO ASSEMBLE, then you MUST define all devices that will be dedicated to the V=R guest in HCPRIO ASSEMBLE. In this case, all dynamically defined devices dedicated to the V=R guest will not be survived. However, if no devices are defined in HCPRIO ASSEMBLE, then the V=R recovery feature will preserve all the dynamically defined devices dedicated to the V=R guest over a CP bounce or re-IPL.

### Production System and the Preferred Virtual Machine

What are preferred virtual machines? And how do they relate to your production system?

A preferred virtual machine is a virtual machine that gets preferred treatment from CP. There are two types of preferred virtual machines, the V=R (virtual=real) machine and the V=F (virtual=fixed) machine.

All of a preferred virtual machine's storage resides in a special part of storage called the V=R (virtual=real) area. CP does no paging for these machines, so they are faster than V=V (virtual=virtual) machines, which are paged in and out of storage.

In addition to the virtual=real (V=R) machine, your installation can accommodate up to five virtual=fixed (V=F) machines, which operate under the same general considerations as the V=R machine.

## Responding to Errors

V=F machines perform much like the V=R machine. As with the V=R machine, V=F machines operate without paging.

When a virtual machine with the V=F option specified in the directory logs on, its virtual storage is dynamically allocated from the V=R area. This means that the storage for the V=F machine is real storage, even though it does not start at real page 0. Figure 5 shows the real storage layout with three V=F machines.

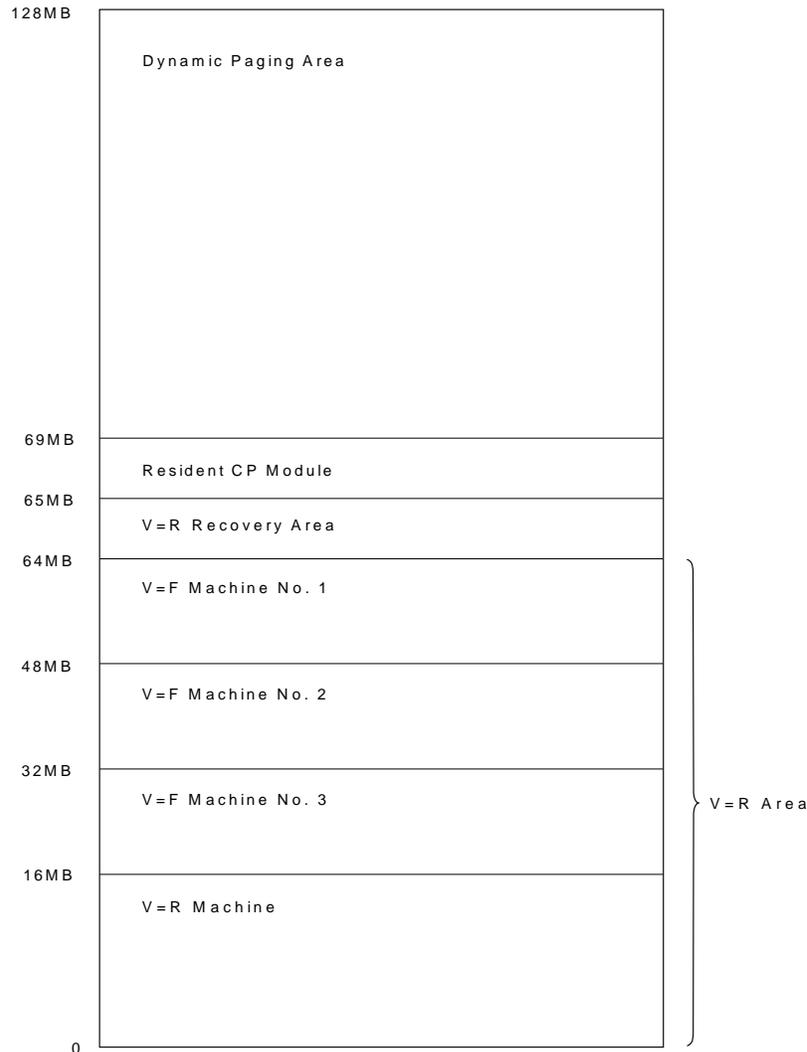


Figure 5. Layout of Real Storage with V=R and V=F Machines

Both V=R and V=F machines occupy contiguous areas of storage. The storage for V=R machines is allocated from the lowest storage address (real page 0) up. Storage for V=F machines is allocated from the highest available storage address in the V=R area down. In Figure 5, the first V=F machine starts at 64MB, the top of the installation-defined V=R area.

There are some differences between V=R and V=F virtual machines. There can be only one V=R machine, whereas there can be up to six V=F machines (five, if there is a V=R machine) at any given time. You can define many different guests as V=F machines. The first five or six (again, depending on whether there is a V=R

machine) guests defined as V=F that log on receive the V=F status. Any other guests designated as V=F in the directory receive standard V=V status.

Finally, and the most important to you, is that the recovery is different for the V=R and V=F machines. CP attempts to recover the V=R machine, but not the V=F machines. However, CP does try to save the storage for the V=F machine or machines.

By default, CP also provides the V=R preferred virtual machine with special processor support. In a multiprocessor system, CP dedicates one or more processors to the V=R preferred virtual machine. CP also arranges for the dedicated processors to handle the V=R preferred virtual machine's I/O interruptions. Without competition from the I/O operations of other virtual machines, V=R preferred virtual machine's I/O operations are completed more quickly.

**Note:** Your installation may choose to override the default by entering the UNDEDICATE command or directory statement, but doing so does not change the preferred virtual machine's preferred status.

Finally, if CP abends, it tries to save the operating environment of the V=R preferred machine. If you want to use the V=R guest recovery feature on a CP bounce or re-IPL and you have ANY devices defined in HCPRIO ASSEMBLE, then you MUST define all devices that will be dedicated to the V=R guest in HCPRIO ASSEMBLE. In this case, all dynamically defined devices dedicated to the V=R guest will not be survived. However, if no devices are defined in HCPRIO ASSEMBLE, then the V=R recovery feature will preserve all the dynamically defined devices dedicated to the V=R guest over a CP bounce or re-IPL. THIS IS TRUE ONLY FOR THE V=R PREFERRED MACHINE. CP DOES NOT SAVE V=F MACHINES.

Because preferred virtual machines get this special treatment, your installation may choose to run the production systems in one of the preferred virtual machines. *To recover the production system correctly, you must know if your production system is running in a V=R preferred machine, V=F machine, or V=V machine.*

To find out which machine your production system is running in, enter:

indicate user *userid*

where *userid* is the logon ID of the production system's virtual machine.

If the response contains **VIRT=R**, your production system is running in the V=R preferred machine. If the response contains **VIRT=F**, your production system is running in a V=F virtual machine. If the response contains **VIRT=V**, your production system is running in a V=V machine.

To recover the V=R preferred machine, you must know which virtual devices belong to its normal running configuration.

CP restores only some of the V=R preferred machine's devices:

- Its dedicated devices
- The full-pack minidisks to which it is linked at the time of the abend, except for those that reside on CP-owned volumes.

## Responding to Errors

To recover correctly, you must redefine or relink to any devices that CP does not restore. This includes redefining the V=R preferred machine's console if it is not a dedicated device. Therefore, you need a list of the virtual devices that CP does not restore, along with any minidisk information, such as link passwords, that may be required.

This list may include any of the following:

- Storage
- Expanded Storage
- Processors
- Vector Facilities
- Consoles
- Readers
- Punches
- Printers
- DASDs
- Tapes
- Displays
- Lines
- CTCAs
- CTLR
- Dynamic switching devices.

To get this list, you can display the virtual device configuration by entering at the console where you log the V=R preferred machine on:

```
query virtual all
```

A convenient time to enter this command is after you set up the V=R preferred machine's running environment and before you load the production system into storage with the IPL command. You may also wish to consult the person who is responsible for setting up the V=R preferred machine's configuration to obtain any minidisk information that may be required.

## What CP Tries to Do During Error Recovery

The processor and VM/ESA try to correct most errors without your help. These include intermittent and permanent machine errors and system I/O errors.

However, when an error occurs, CP records it and sends a message to your VM/ESA primary system console. The message notifies you of the error and tells you whether:

- System operation can continue
- System operation can continue, but with fewer resources
- System restart and recovery is beginning.

If CP can isolate the error condition to a single virtual machine, and system integrity is not in danger, a soft abend occurs. During a soft abend, CP takes a soft abend dump and operation continues.

If the error is more severe, CP terminates with a hard abend. A number of errors can cause a hard abend, and some are severe enough to prevent CP from restarting. But in most instances, CP:

- Tries to save the operating environment of the preferred V=R virtual machine
- Tries to save the storage for all V=F virtual machines

- Tries to save the VM/ESA spool file and system data file queues
- Takes a hard abend dump
- Restarts itself
- Restarts your operator's virtual machine
- Notifies you whether preferred V=R virtual machine recovery succeeded or not.

During a hard abend, CP does not try to save the operating environments of virtual machines that belong to V=F or V=V (virtual=virtual) VM/ESA users. Users of V=V machines have to log on again and reload the operating systems that were running in their virtual machines.

If CP needs your help to restart itself, it issues a message telling you what you must do to recover the error.

During a software re-IPL, whether it was caused by a system incident or you entered the SHUTDOWN REIPL command, CP attempts to determine whether the operator is logged on the primary system console. If the operator's user ID is disconnected or logged on another terminal, CP leaves it disconnected or disconnects the operator when the system reinitializes.

**Note:** If V=R preferred machine recovery fails, CP does not preserve the V=R preferred virtual machine's operating environment. However, the storage assigned to all preferred virtual machines (V=R or V=F) remains intact. This allows a recovery program, such as the IMS/VS log tape terminator utility, to recover any information that was in real storage when the system terminated.

When CP cannot restart the system, you must bring up the system again from the processor complex's system console. Chapter 3, "Bringing Up the System" on page 15 describes this procedure.

### Hard and Soft Abend Dumps

When you perform a system restart from the system console, or when CP encounters a software error, CP takes an abnormal termination (abend) dump. The format of the dump depends on which abend CP takes: hard or soft.

A hard abend occurs when CP detects an error condition that it cannot isolate to a single virtual machine. A hard abend also occurs when CP suspects damage to system integrity.

A soft abend occurs when CP can isolate the error condition to a single virtual machine, and system integrity is not in danger.

An abend dump contains (in order):

1. The system abend code.
2. The following information about the processor on which the error occurred:
  - Processor address
  - General-purpose registers
  - Control registers
  - Floating-point registers
  - Time-of-day clock, clock comparator, and CPU timer
  - Prefix register.

## Responding to Errors

A soft abend dump contains this information only for the processor on which the error occurred. A hard abend dump repeats this information for any other processors in the configuration.

3. The prefix page of the failing processor.
4. The rest of storage as determined by the type of abend dump (soft or hard) and the dump options in effect at the time of the abend.
  - For a hard abend, this is all of CP-owned storage, unless you used the SET DUMP command to change the dump environment.

## Recovering the V=R Preferred Virtual Machine

If your production system is running in the preferred virtual machine, and CP terminates, CP tries to save its operating environment.

If CP is successful, the preferred virtual machine runs disconnected. CP also sends you (as the VM/ESA primary system operator) a message that preferred virtual machine recovery succeeded. Even if you do not get a message, you should try to recover the preferred virtual machine, as follows:

1. When CP restarts your operator's virtual machine, enter:

```
query userid
```

where *userid* is the logon ID of the production system in the preferred virtual machine.

If you get the response that the production system's virtual machine is disconnected (DSC), there is a good chance you can recover the production system's virtual machine.

2. Make sure CP is correctly using each real processor in your configuration. To find out the current use of each processor, enter:

```
query processors
```

CP may or may not preserve the dedication of a real processor to a particular virtual processor in the preferred virtual machine's virtual configuration. If you need to dedicate or remove a real processor from the preferred virtual machine, enter the appropriate DEDICATE or UNDEDICATE command.

3. Make sure the console you use to log on the production system's virtual machine is enabled.

To find out the console's status, enter:

```
query rdev
```

where *rdev* is the real device number of the display you are using as the console for the production system's virtual machine.

If the status indicates that the display is enabled, go to step 4 on page 217.

If the status indicates that the display is disabled, enter:

```
enable rdev
```

If the status indicates that the display is offline, enter:

```
vary on rdev  
enable rdev
```

4. Go to the console that you use to log on the production system's virtual machine. If the device is enabled, you see the VM/ESA logo. If you do not see the logo, go back to step 3.
5. On the VM/ESA logo, enter the logon ID of the production system's virtual machine. The cursor will be positioned at the correct place for you to enter the logon ID.
6. When CP prompts you, enter the logon password.

CP responds with the system log message and a message that the production system has been reconnected.

7. Redefine the production system's virtual machine console by entering:

```
define console as vdev devtype
```

where:

*vdev*

is the virtual device number you want to assign to the virtual console.

*devtype*

is the device type you want to assign to the virtual console, for example 3215.

CP does not preserve the production system's virtual machine console. Therefore, you must redefine this virtual console.

8. If your installation has set up your production system's virtual machine configuration to include other virtual devices that CP does not preserve, redefine or relink to them now.

CP restores only some of the preferred virtual machine's devices:

- Its dedicated devices
- The full-pack minidisks to which it is linked at the time of the abend, except for those that reside on CP-owned volumes.

Therefore, you must redefine any other virtual devices. These devices may include displays (including dialed lines), minidisks that are not defined as full-pack minidisks, full-pack minidisks that reside on CP-owned volumes, temporary disks, spooled unit record devices, and virtual channel-to-channel adapters.

9. Enter:

```
#cp begin
```

This command should start up operations in your production system. You should see messages on the production system's system console.

If the production system does not come up when you enter the #CP BEGIN command, you may still be able to recover data left in real storage. Therefore, if your production system has a storage recovery program (such as the IMS/VS log tape terminator utility), run it in the production system's virtual machine. Then you can bring up the production system again as you normally do.

10. After the production system is running again, you may have another use for the console at which you reconnected the production system's virtual machine. If so, you may disconnect the production system's virtual machine by entering at that console:

## Responding to Errors

```
#cp set run on  
#cp disconnect
```

When the VM/ESA logo appears on the screen, you can use the display for other work. The production system continues to run normally.

If your production system is not running in the preferred virtual machine, you must log on the production system's virtual machine and start it as you normally do. Follow the normal procedure starting with "Logging on a Production System's Virtual Machine" on page 32.

## Recovering the V=F Preferred Virtual Machine

Because CP tries to save the V=R area if it terminates, it may be possible to recover the V=F machines.

To recover V=F machines, CP must successfully restore the V=R area. If CP does recover the V=R area, you can log on each of the V=F machines, in the same order and size as before the termination.

*Make sure you start with exactly the same V=R and V=F machines, and log them on in exactly the same order they were in before the termination.*

**Note:** Your installation may have a different configuration for startup from the one you were running before the termination. If you want to recover the V=F machines, make sure you start up with the same allocation that you had before the system terminated.

Because the V=F machines are allocated dynamically, any change in the order or size will change the storage given to each machine.

Once you have logged on the V=F machine or machines (and the V=R machine if it did not recover), use a stand-alone dump program, or a recovery program.

## Errors That Affect CP Termination and Recovery

Although the processor and VM/ESA try to correct most errors without your help, they cannot correct the following:

- Errors that cause CP to terminate
- Errors that prevent CP from restarting
- Circumstances that prevent CP from recovering the preferred virtual machine.

### Errors That Cause CP to Terminate

CP terminates if one of the following errors occurs:

- A second machine check occurs while the CP is handling the first.
- A channel path error occurs.
- Severe damage to the I/O subsystem occurs.
- Integrity damage occurs in CP-controlled storage.
- A hard abend occurs.
- A soft abend set to be handled like a hard abend occurs.

### Errors That Prevent CP from Restarting

CP cannot restart the system after a termination if any of the following are true:

- The error occurs in one of the hardware or software error recovery programs.
- The CP module or nucleus is damaged.
- A channel path error occurs on a channel path that has a device dedicated to the preferred virtual machine.
- Severe damage to the I/O subsystem occurs.
- When CP tried to halt a processor during termination, the processor did not respond.
- Since you last IPLed CP, your installation placed a new nucleus on the system residence volume.

### Circumstances That Prevent Preferred Virtual Machine Recovery

CP does not save the operating environment of the preferred virtual machine if any of the following are true:

- Operator intervention is required to bring VM/ESA back up after an abend.
- The V=R preferred virtual machine user is using the TRACE command.
- The V=R preferred virtual machine is enabled to use the virtual machine communication facility (VMCF).
- Device(s) were defined in HCPRIO ASSEMBLE but devices dedicated to the V=R machine were not.
- You are in the process of bringing up an operating system in the V=R preferred virtual machine.
- You are resetting the operating system running in the V=R preferred virtual machine.
- You are in the process of logging on or off the V=R preferred virtual machine.
- You are re-IPLing with another nucleus using the SHUTDOWN REIPL command.
- You are re-IPLing using the SHUTDOWN Re-IPL command and the V=R area size and/or the V=R Free area size was changed in the system configuration file. The size change takes effect but V=R recovery is suppressed. Note: If the system is re-ipling due to an ABEND, then any size changes to the V=R area or V=R FREE area made in the system configuration file are suppressed and V=R recovery is attempted.
- CP is in the process of forcing the V=R preferred virtual machine off the system.
- For processor complexes with no real Vector Facility installed, the V=R preferred virtual machine has more virtual processors in its real configuration than your processor complex has real processors in the real hardware configuration.

For example, if your processor complex has no Vector Facility installed, and the V=R preferred virtual machine has three or more virtual processors, CP cannot recover the V=R preferred virtual machine.

For processor complexes that do have at least one real Vector Facility installed, the V=R preferred virtual machine may have the same number of virtual

## Responding to Errors

processors as the real processor complex has real processors and may have the same number of virtual Vector Facilities as the real processor complex has real Vector Facilities without jeopardizing recovery of the V=R preferred virtual machine and without risking losing Vector Facility data.

Because space for the control blocks for virtual processors and virtual Vector Facilities is allocated from a common pool, more virtual CPUs can be defined if fewer virtual Vector Facilities are defined without jeopardizing recovery. However, if virtual Vector Facilities are added later and their control blocks have to be allocated outside the preferred virtual machine recovery area, Vector Facility data is lost (see the next item). If the VMDBK control blocks for virtual processors have to be allocated outside the area, CP cannot recover the V=R preferred virtual machine.

- CP has used up the preferred virtual machine recovery area.

CP uses the preferred virtual machine recovery area to save critical data relating to the V=R preferred virtual machine.

Allocating storage outside the recovery area for one or more of the preferred virtual machine's Vector Facility save areas does not prevent preferred virtual machine recovery. However, CP does not preserve the contents of any Vector Facility save areas outside the recovery area. Instead, CP reflects a machine check to notify the preferred virtual machine's operating system of the lost data.

- The time-of-day clock was damaged.
- CP is removing from the V=R preferred virtual machine the use of the start interpretive execution assist.
- A second abend occurs before the preferred virtual machine resumes its operation.
- A printer dedicated to the preferred virtual machine was reset during the recovery process.
- CP detected integrity losses in the preferred virtual machine recovery area.
- CP detected damage to storage that contains information that describes a virtual machine.
- CP detected that the preferred virtual machine had an active POSIX process which uses CP storage.

In case the V=R machine has used POSIX it will not recover from a DIAG 2A4. Also, as part of preferred virtual machine recovery, CP reflects machine checks to the V=R preferred virtual machine. If the operating system running in the V=R preferred virtual machine does not handle these machine checks, it cannot recover.

Finally, if a device dedicated to the V=R preferred virtual machine shares a physical control unit with a CP-controlled device, the devices contend for outstanding sense information, which could prevent system recovery.

For more information on preferred virtual machine recovery, see the *VM/ESA: CP Diagnosis Reference* book.

---

## Backing Off to Another Nucleus or Module

You may need to IPL an alternate nucleus if:

- The current system residence (SYSRES) volume experiences a hardware error
- The current nucleus or module is unreliable
- You need to test a new level of CP.

If you originally initialized the system from a CP module, you can back off to a different CP module by entering the following SHUTDOWN command:

```
SHUTDOWN REIPL MODULE modulename
```

where *modulename* is the name of the CP module you wish to load.

If the module which you wish to load resides on a minidisk other than the one that the current module was loaded from, you can enter the following SHUTDOWN command:

```
SHUTDOWN REIPL MDISK userid vdev MODULE modulename
```

where *userid* is the owner of the target minidisk, *vdev* is the address of the user's minidisk and *modulename* is as before.

If you originally initialized the system from a nucleus, you can automatically re-IPL your system with another nucleus by entering:

```
shutdown reipl rdev
```

where *rdev* is the address of the real device to be IPLed when the system restarts.

**Example—Backing off to an Alternate Nucleus:** You are running a test system that contains program updates. The new system is running very slowly and causing some small system errors. The old, stable, module is called CPLOAD MODULE and resides on the minidisk that the current module was loaded from. To shut the system down and re-IPL with the old module, enter:

```
SHUTDOWN REIPL MODULE CPLOAD
```

---

## CPU Sparing

CPU Sparing is a feature of IBM S/390 Parallel Enterprise Server, Generation 4. "Spare" processors are built in. If an active processor fails, a spare processor can be varied online to replace the failing processor.

The VM system can react in several different ways when a machine check occurs which check-stops the failing CPU.

1. Abend (usually MCH005) and go into disabled wait state
2. Abend and then restart automatically
3. Reflect the machine check to the guest and continue operating.

Which scenario occurs depends on what code was running at the time the machine check occurred and the nature of the hardware error as reported in the Machine Check Interrupt Code (MCIC).

### Guest Operating System

If a guest was running in SIE at the time of the machine check, VM will attempt to reflect the machine check to the guest and continue running. In this case, the Hardware Management Console (HMC) will indicate that a spare CPU has been made available and the VM operator can use the CP VARY command to bring the spare online.

### Control Program

If VM itself (CP code) was running, then an abend will occur. In this case, VM may or may not restart itself. If it does not restart, a disabled wait state will be entered and the operator can restart the system manually. The HMC will indicate that a spare CPU has been made available. Once VM is re-initialized, whether manually or automatically, the VM operator can use the CP VARY command to bring the spare processor online.

### Dedicated Guest Operating System

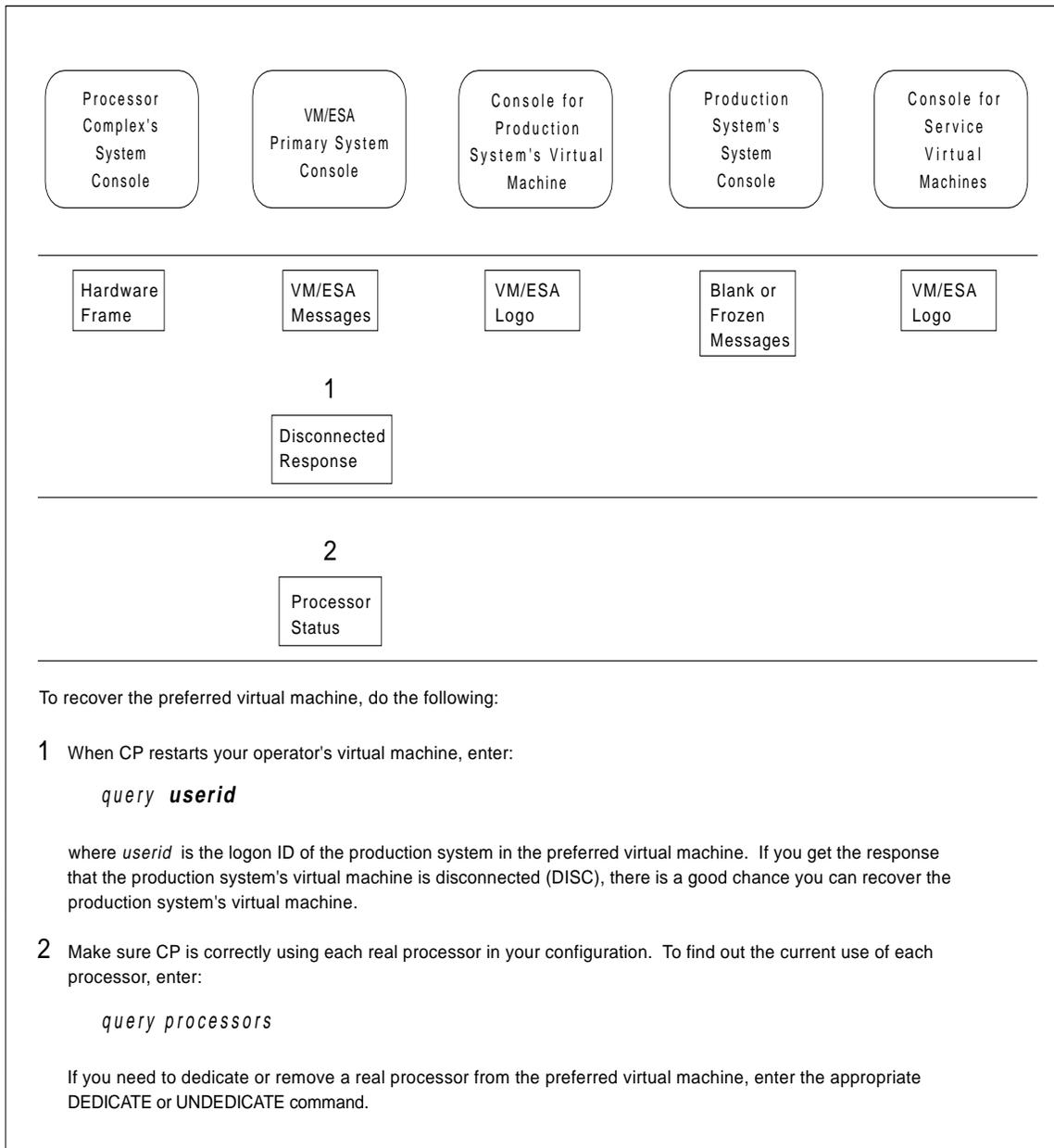
If a machine check occurs on a processor that is dedicated to a guest virtual machine VM will determine whether to abend or to reflect the machine check to the guest in the same manner as described in the above paragraphs. In addition the dedicated processor will be undedicated when it is varied offline by the machine check handler. The VM operator will therefore have to issue the CP DEDICATE command for the guest once the spare CPU is varied online in order to restore the system to its original state prior to the machine check.

In any of these cases, a hardware error occurred and this failure should be reported to the proper support personnel.

---

## Summary of Recovering the Preferred Virtual Machine

Figure 6 on page 223 summarizes the procedure for recovering the preferred virtual machine.



To recover the preferred virtual machine, do the following:

- 1 When CP restarts your operator's virtual machine, enter:

`query userid`

where *userid* is the logon ID of the production system in the preferred virtual machine. If you get the response that the production system's virtual machine is disconnected (DISC), there is a good chance you can recover the production system's virtual machine.

- 2 Make sure CP is correctly using each real processor in your configuration. To find out the current use of each processor, enter:

`query processors`

If you need to dedicate or remove a real processor from the preferred virtual machine, enter the appropriate DEDICATE or UNDEDICATE command.

Figure 6 (Part 1 of 3). Summary of Recovering the Preferred Virtual Machine

## Responding to Errors

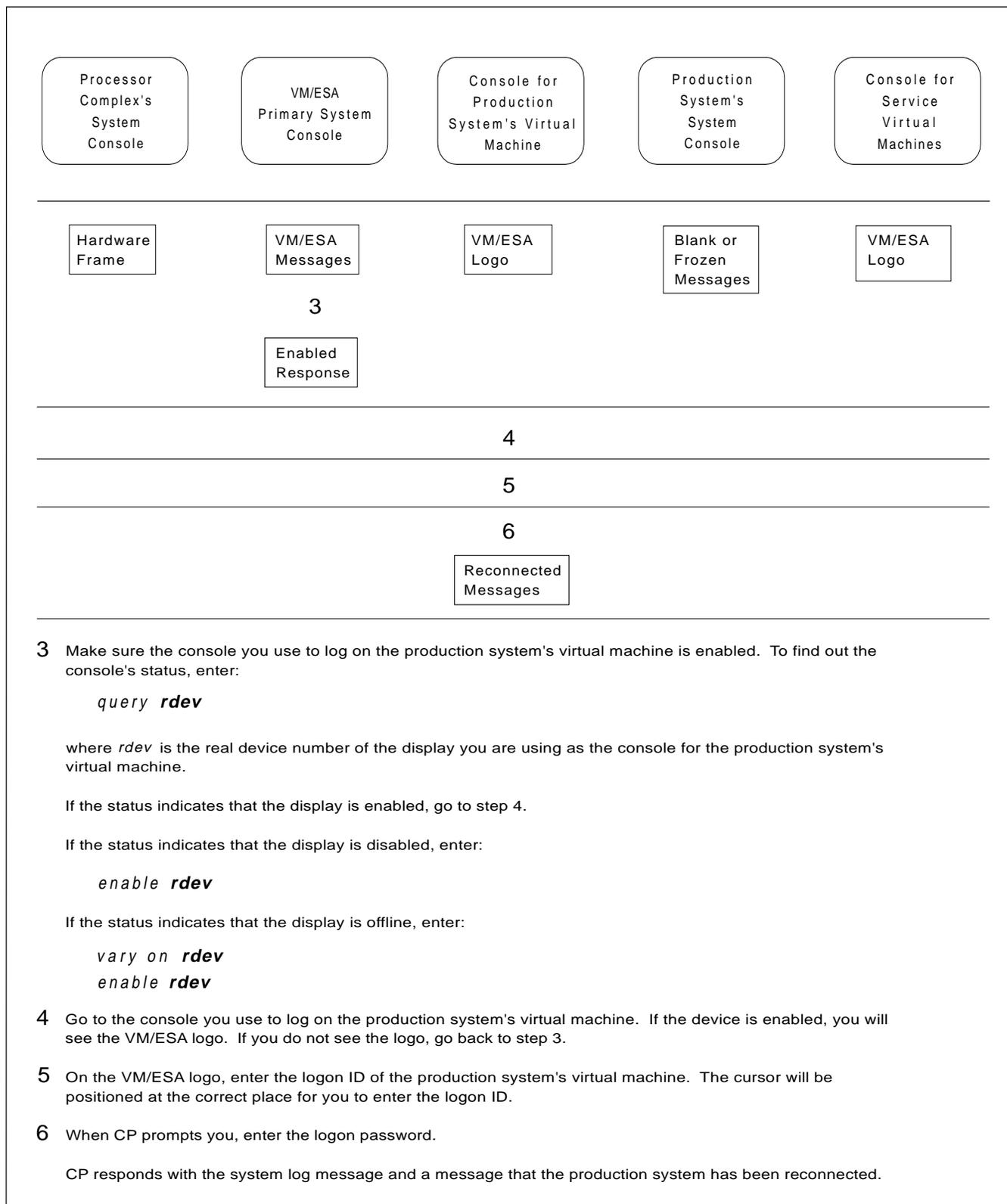


Figure 6 (Part 2 of 3). Summary of Recovering the Preferred Virtual Machine

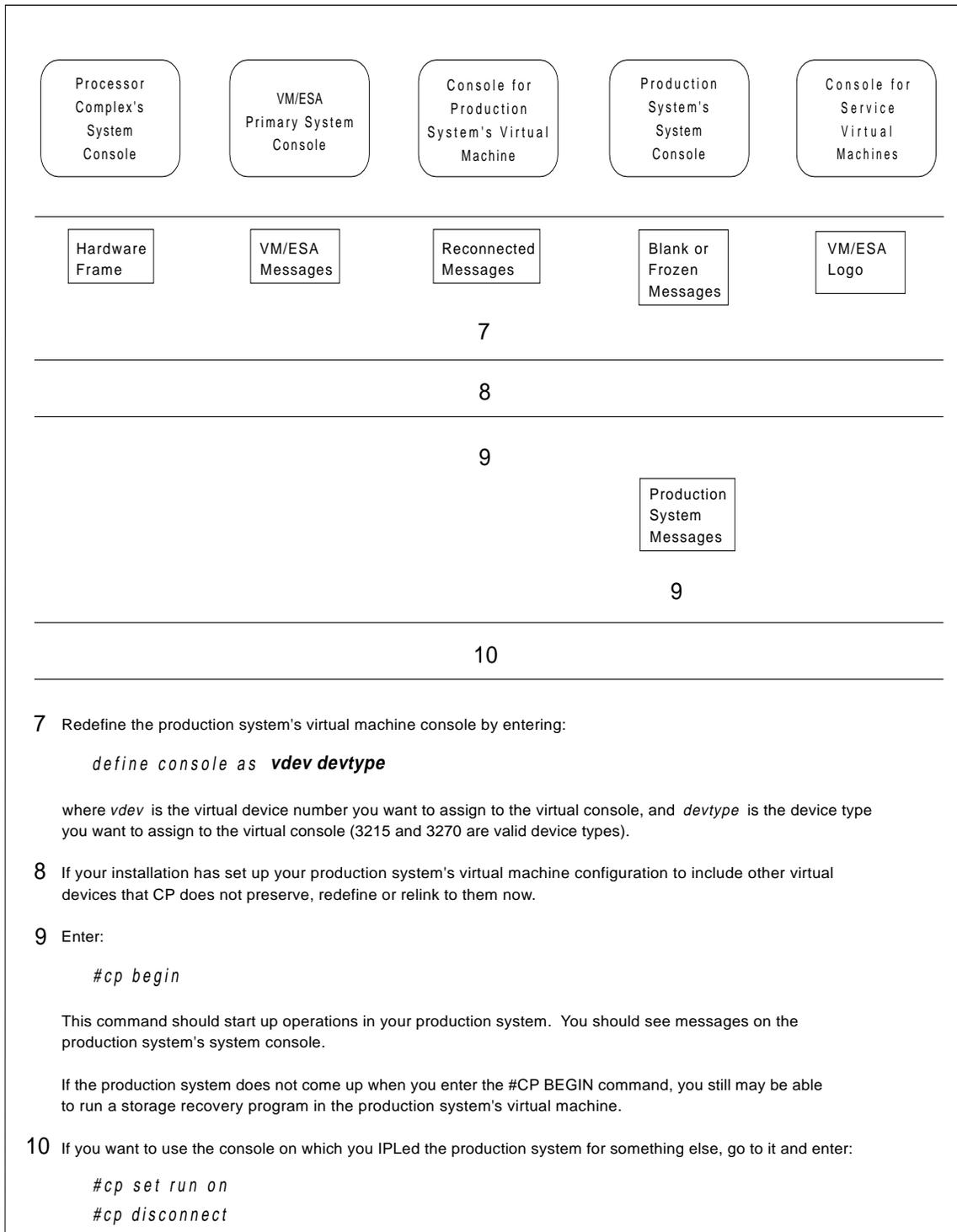


Figure 6 (Part 3 of 3). Summary of Recovering the Preferred Virtual Machine

## Responding to Errors

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## Chapter 7. Shutting Down the System

This chapter tells you how to shut down the VM/ESA system, the production system running in a virtual machine, and any service virtual machines you run. After reading this chapter, you will be able to:

- Inform users about a scheduled shutdown
- Shut down the production system
- Stop any VM/ESA service virtual machines
- If necessary, stop processing on real devices
- Enter the SHUTDOWN command.

If you need only a brief summary of the tasks in this chapter, see “Summary of Shutting Down the System” on page 230.

---

### Informing Users about a Scheduled Shutdown

Your installation may schedule a shutdown of the VM/ESA system. As soon as you know when the shutdown is to take place, update the system log message. For information on how to do this, see “Creating and Changing the System Log Message” on page 72.

You should also let your production system users know when the system is to be shut down. If your production system has a system log message, use production system commands to update it with the shutdown information.

---

### Reminding Users of an Impending Shutdown

About an hour before the planned shutdown, send a warning message to all VM/ESA users that you plan to shut down the system. This gives them time to reach a stopping point and log off.

To send a warning to all users, enter:

```
warning all *** system shutting down at 20:30 ***
```

Reenter this message at intervals to remind any users who are just logging on that you plan to shut down the system soon.

Just before you shut down the system, send a final warning message to all users:

```
warning all *** please log off. system shutting down now ***
```

You should also enter similar messages at the same intervals to your production system users.

#### Notes:

1. The WARNING command is limited by the length of the input area. If the entire text of a message does not fit in this area, enter another command with the remaining text.
2. If an ESM is installed, you may not be authorized to use the WARNING command. For additional information, contact your security administrator. For additional information, see the *VM/ESA: CP Command and Utility Reference* book.

## Shutting Down the System

3. If CP does not issue your message the way you entered it, it may be because you are including special line-editing symbols in the text of your message. For example, if logical line editing is in effect, the “#” symbol is your logical line-end symbol; if you include a “#” in your message text, CP cuts off your message.

To prevent CP from interpreting these symbols as logical line-editing functions, enter:

```
set linedit off
```

CP then issues your messages as you enter them.

---

## Shutting Down the Production System

Before you shut down the VM/ESA system itself, shut down the production system. To do this, enter appropriate production system commands at the production system's system console. Follow your installation's normal shutdown procedures for the production system.

You do not have to log off the production system's virtual machine.

---

## Stopping Service Virtual Machines

Before you shut down the VM/ESA system itself, shut down any service virtual machines that are running. These virtual machines provide system services and include:

- Accounting virtual machine
- Error recording (EREP) virtual machine
- Symptom record recording virtual machine
- Virtual machines required by supported licensed programs
- SFS file pool server and CRR recovery server virtual machines.

## Stopping the Accounting, EREP, and Symptom Virtual Machines

If accounting, error, or symptom record recording is active on your VM/ESA system, you may log on these virtual machines and then log them off. However, it is not necessary to do this. When you enter the SHUTDOWN command, CP saves any accounting or error recording records that these virtual machines have not yet retrieved. The records are again available at the time of the next warm start.

For information about how to log on the accounting, error, and symptom record recording virtual machines, see “Collecting Accounting Information” on page 239, “Collecting Hardware Error Information” on page 247, and “Collecting Symptom Record Information” on page 260.

## Stopping the Licensed Program Virtual Machines

If your installation has installed any of the following licensed programs, you may need to stop the service virtual machines they require:

- RSCS
- VM/Pass-Through
- VTAM Communications Network Applications (VCNA)
- VM/Virtual Telecommunications Access Method (VM/VTAM).

For information about when and how to stop these service virtual machines, see the appropriate publications listed here and in the bibliography:

- *RSCS General Information*
- *VM/Pass-Through Facility General Information*
- *VTAM Communication Network Application (VCNA) General Information.*

### Stopping the SFS and CRR Server Virtual Machines

If your installation has installed the SFS file pool server and/or CRR recovery server virtual machine, it is important that you notify the server operator of the pending system shut down. The server operator will want to issue the STOP command before system shutdown occurs. For more information about the STOP command, see the *VM/ESA: Planning and Administration* book.

---

### Stopping Processing on Real Devices

Before you enter the SHUTDOWN command, use the DRAIN UR command to stop processing on any unit record devices attached to VM/ESA. Also, if your production system shares any of its DASDs with another system, make sure that shutting down the VM/ESA system does not disrupt processing on the other system. Also ensure that all data in 3990 storage controls with cache and nonvolatile storage (NVS) be transferred to backing storage if any hardware service is planned after system shutdown.

### Draining Real Unit Record Devices

If your installation processes spool files on unit record devices attached to VM/ESA, stop processing on these devices before you shut down the system. To do this, enter:

```
drain ur all
```

In response to this command, CP stops assigning new spool files to the real unit record devices for processing. However, these devices finish processing any active spool files.

As each unit record device finishes processing its active spool file, CP informs you that the device is drained. To keep track of the draining of these devices, enter:

```
query ur active
```

CP's response tells you which devices are still active.

### When You Share DASDs with Another System

If your production system shares any of its DASDs with another system, make sure that the shutdown does not disrupt the other system's operation. Normally, this means you must make sure that the DASDs are unavailable for use by the other system. Contact the operator(s) of the other system(s) and follow your installation's normal procedures.

### Destaging Data in 3990 Storage Controls with Cache and NVS

Before performing any service to a 3990 storage control, please refer to “Transferring Data to Backing Storage” on page 111 for information on properly transferring data residing in cache or nonvolatile storage to subsystem backing storage. This action will ensure that no data loss occurs. This is an important consideration because cache data is lost immediately upon the storage control being powered off and NVS data is lost if the control is powered off for more than 48 hours (i.e. battery life).

---

### Entering the SHUTDOWN Command

After the unit record devices are drained and other systems have stopped using any DASDs your production system shares with them, enter:

```
shutdown
```

You can enter SHUTDOWN from any class A virtual machine.

In response to this command, CP stores:

- System status information
- The system log message (only if you did not specify FEATURES ENABLE LOGMSG\_FROM\_FILE in your system configuration file) file.
- The spool file and system data file queues
- The accounting, EREP, and symptom records in storage.

If you specify a warm start the next time you bring up the system, all of these are again available to the system.

### Performing an Unplanned Shutdown

An irrecoverable system error may require you to perform an unplanned shutdown. When this happens, send a warning message to all users of VM/ESA and the production system. Then, if time permits, drain the unit record devices, quiesce the use of shared DASDs by other systems, and enter the SHUTDOWN command.

If possible, enter the SHUTDOWN command. During a warm start, CP uses the checkpoint data (for example, the saved spool file queues) that SHUTDOWN creates.

### Accessing an Alternate Nucleus or Module

If you encounter a system error, you may need to re-IPL another nucleus or module immediately after shutting down the system. To do this, you need to use the REIPL option of the SHUTDOWN command. See “Backing Off to Another Nucleus or Module” on page 221.

---

### Summary of Shutting Down the System

Figure 7 on page 231 summarizes the procedure for shutting down a VM/ESA system.

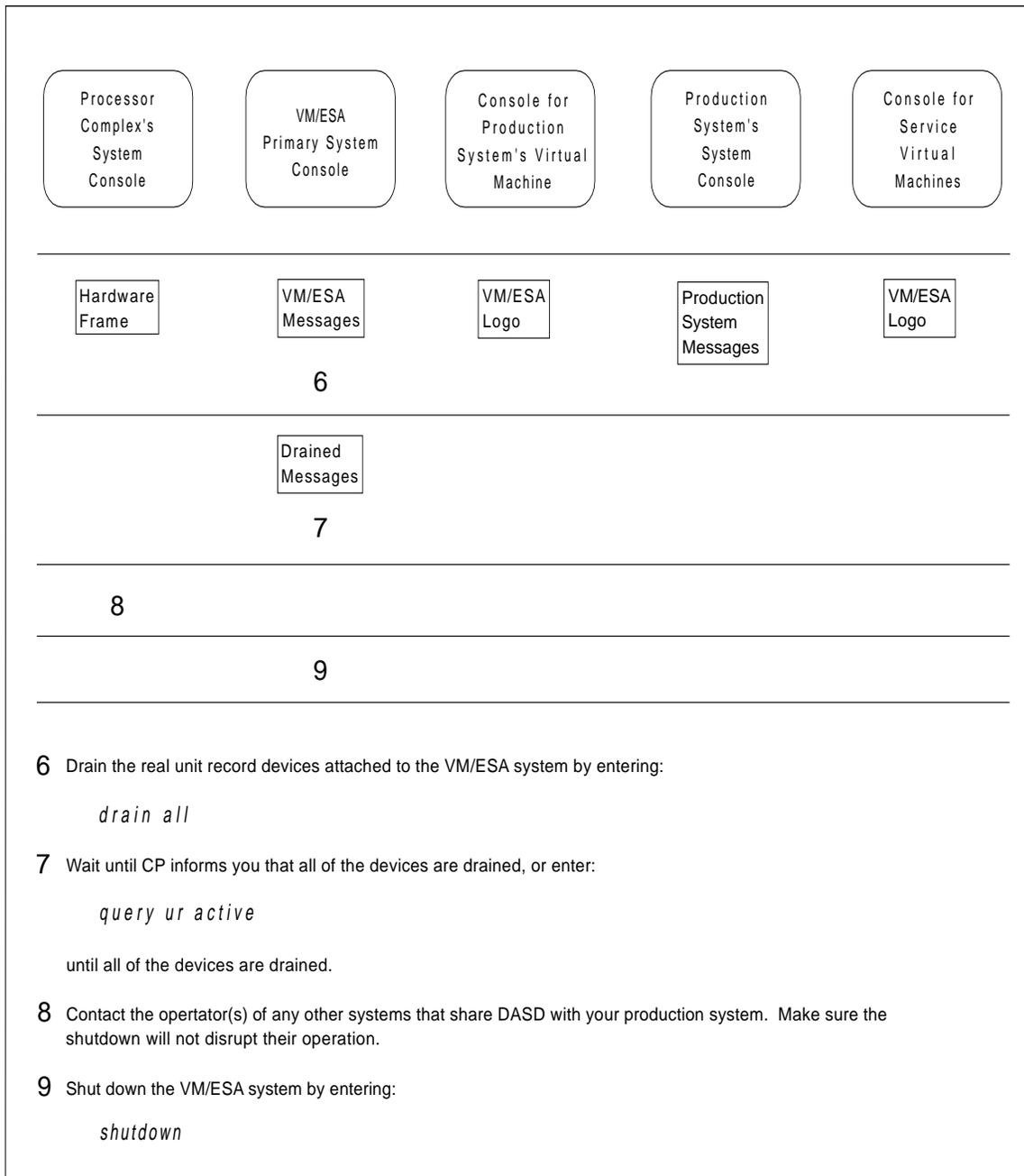


Figure 7 (Part 1 of 2). Summary of Shutting Down the System

## Shutting Down the System

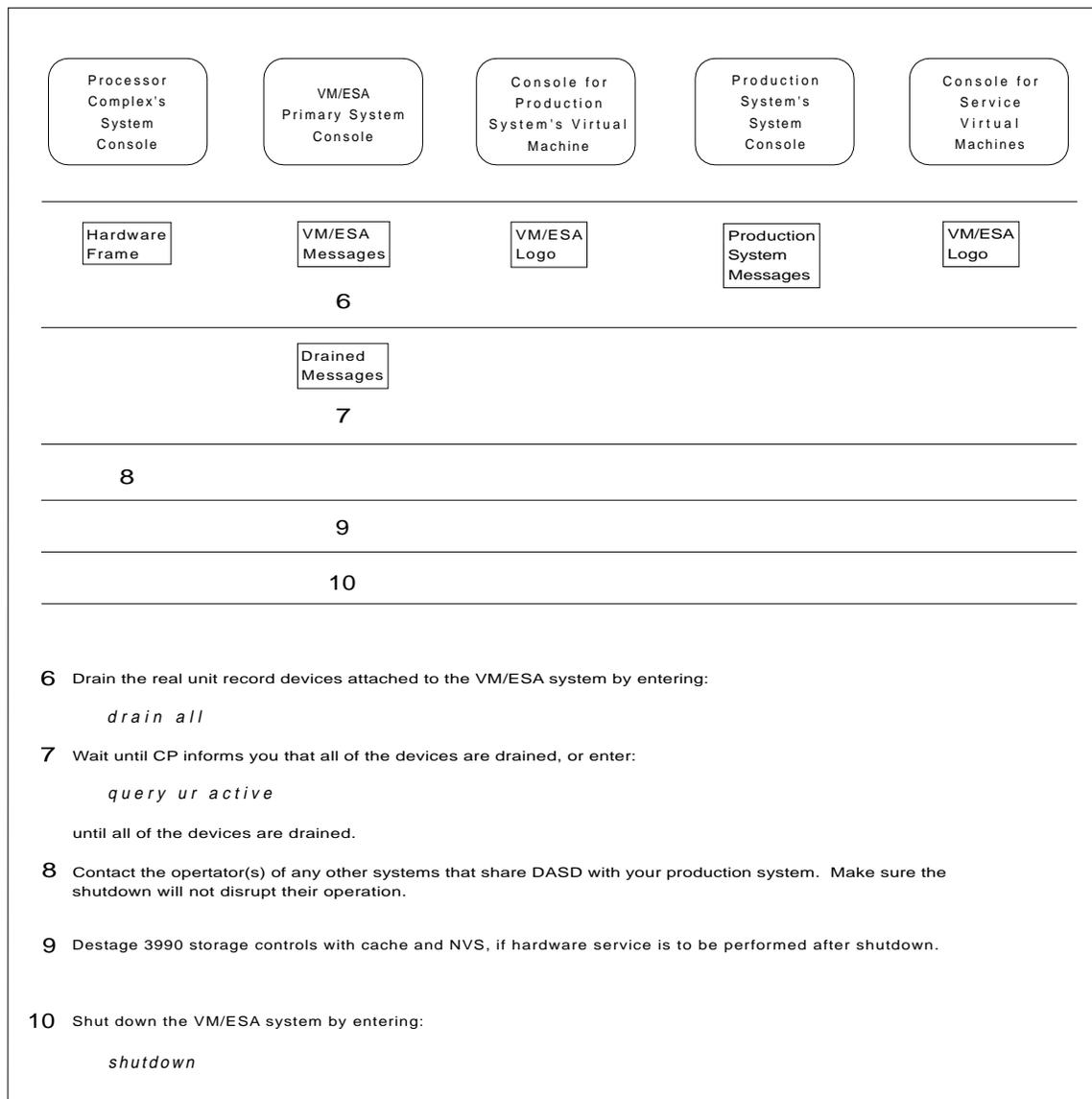


Figure 7 (Part 2 of 2). Summary of Shutting Down the System

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## Chapter 8. Collecting Information about System Operation

This chapter tells you how to collect and print information about system events, performance, accounting, and error recording. If you need only a brief summary of the tasks in this chapter, see “Summary of Collecting Information about System Operation” on page 267.

After reading this chapter, you will be able to:

- State three reasons why system operation includes collecting system data
- Start and print a VM/ESA console log
- Collect performance information on VM/ESA
- Collect accounting information on VM/ESA
- Collect error recording information on VM/ESA.

---

### Purpose of Collecting Information about System Operation

As the real system operator, your job is to make the real resources of your computer installation available to users so that they can get their work done. Part of your job includes collecting and providing reports of the following kinds of information:

- System events
- System performance
- Accounting
- Error recording.

You provide these reports so your installation can:

- Fix problems that prevent users from using installation resources
- Allocate resources among users in the best way possible
- Plan for future resource requirements.

---

### Collecting Information about System Events

You can use VM/ESA to help you collect information about system events by starting a console log at your operator's console.

Your production system may also have facilities that can help you collect information about system events.

### Starting a Console Log

When you bring up the VM/ESA system, CP automatically logs activity at the primary system operator's console in a console log. The console log contains all the commands you enter and all of the responses you receive while you are logged on to the operator's virtual machine. It also contains any error or informational messages that CP sends you. If the system abends, CP saves the console log in a spool file, which you can print later. Information in the console log can help support personnel determine the cause of the abend.

## Collecting Information about System Operation

“Making Sure CP Is Logging Operator Console Activity” on page 42 discusses how to make sure CP is logging activity at your operator's virtual console. If you are not logged on the primary system operator's logon ID, CP may not be automatically logging your console's activity.

To find out whether CP is recording your console's activity in a console log, enter:

```
query virtual console
```

On the first line of CP's response, you see either START or STOP. If it says START, CP is already logging your console activity.

If it says STOP, enter:

```
spool console start
```

CP then starts logging the activity at your operator's console.

## Adding Comments to the Console Log

To add comments to your console log, enter:

```
* comment
```

where *comment* is whatever comment you wish to make.

For example, if you want to add a comment to your console spool file that says, “support asked me to enter the following command,” enter:

```
* support asked me to enter the following command
```

The comment and the asterisk are placed in the console log.

## Printing the Console Log

To print the console log, enter:

```
close console
```

This command closes the console spool file, places it in the queue of files to be printed, and opens another console spool file. CP normally assigns class T to console spool files.

To print the closed file, follow the procedures in “Printing Spool Files on a 3800” on page 147 or “Printing Spool Files on an Impact Printer” on page 158.

## Stopping the Console Log

To stop logging your console's activity in a console log, enter:

```
spool console stop
```

CP then stops logging activity at your console but does not close the current file.

## Restarting the Console Log

To resume logging your console's activity, enter:

```
spool console start
```

CP then starts logging activity at your console again, opening a new console spool file if necessary.

---

## Collecting Performance Information

To collect performance information, you may use facilities provided by:

- VM/ESA

You may enter performance commands and have the responses recorded in the console log.

- CP monitor facility

You may collect selected performance information in a discontinuous shared segment (DCSS) and use the MONWRITE sample program to write the data to a tape or disk. For more information about this facility, see the *VM/ESA: Planning and Administration* book.

- Your production system

Your production system may have facilities to help you collect information about performance. For more information, see the appropriate publication listed in the Bibliography.

- Your processor complex

Your processor complex may also have facilities to help you collect performance information. The system activity display (SAD) frames provide information about the use of central processors and channels. For more information, see the appropriate publication listed in the Bibliography.

The next sections discuss how you can use VM/ESA to help you collect information about performance.

## Entering Performance Commands for the Console Log

You can enter CP commands to find out the following about VM/ESA's performance:

- Load on the system
- Users waiting for I/O devices
- Users waiting for pages
- Users in queue for dispatching
- Active and loaded Vector Facility users
- Resource information for a particular user.

If CP is recording your console's activity in a console log, CP records your commands and its responses.

### Finding Out about the Load on the System

To find out what the system workload is, enter:

```
indicate load
```

To find out what the workload is for a specific system in the cross system extensions (CSE) complex, enter:

```
indicate load at sysname
```

To find out what the workload is for the system you are logged on to, enter:

```
indicate load at *
```

## Collecting Information about System Operation

CP's response to the above commands indicates:

- Average time each processor is running (by percentage)
- How much storage CP is using (by percentage)
- How much Expanded Storage is used for paging (in pages per second)
- How much Expanded Storage is used for minidisk cache (in pages per second)
- How much Expanded Storage is migrating to DASD (in pages per second)
- How much CP is paging (in pages per second)
- Average time each Vector Facility is being used (by percentage)
- How many users are loading users
- How many users are in the dispatch, eligible, and dormant lists
- How many users are active Vector Facility users and how many Vector Facilities are available to be shared
- Percentage of reserved and referenced pages stolen from dispatched and eligible users during pass two and the emergency pass.

The value CP displays for the paging rate reflects the number of paging requests that are queued for I/O.

The loading users are users whose transactions were not completed during their previous stay in the dispatch list.

For dedicated processors, the value CP displays for the paging rate may differ from the number shown on a system activity display when certain assists are installed on the real processor. Although the response from the INDICATE LOAD command may show 100% use, the amount displayed on the SAD is the actual amount the guest is using.

### Finding Out Whether a User Is Waiting for an I/O Device

To find out whether a user is waiting for an I/O device, use the INDICATE I/O command. Because it provides a snapshot of the system at a particular instant, enter the command several times before you conclude that there is a problem with a particular device. Enter:

```
indicate i/o
```

CP's response to this command indicates:

- Each user who is waiting for I/O to complete on a device
- The real device number of the device.

### Finding Out Which Users Are Waiting for Pages

To find out which users are waiting for pages, enter:

```
indicate paging wait
```

CP's response to this command indicates:

- Each user who is waiting for paging to occur
- The number of pages of Expanded Storage allocated for this user.

## Finding Out Which Users Are in Queue for Dispatching

To find out which users are in queue for dispatching, enter:

```
indicate queues
```

CP's response to this command indicates the users that are in the dispatch and eligible lists and the virtual CP number. For each user, the response also indicates whether the user is:

- Running, and on which processor (Rnn)
- Waiting for pages (PG)
- Waiting for I/O to complete (IO)
- Waiting for instruction simulation to complete (EX)
- In an enabled wait state (PS).

To find out expanded information about the users in the queue, enter:

```
indicate queues exp
```

CP's response to this command includes, in addition to the information described by the INDICATE QUEUES command, each user's priority, status, and expanded information about processor affinity. Status information indicates whether the user is:

- Receiving HOT SHOT
- Receiving LOCK SHOT
- Receiving INTERACTIVE BIAS
- Past the eligible list deadline
- Exceeding the maximum WSS
- Returning to the eligible list because of preemption
- Returning to the eligible list for exceeding the WSS growth limit
- In the eligible list after having been in the dispatch list for lock shot
- A loading user
- In test-idle state (TI)
- In ready state (R).

## Finding Out Which Users are Vector Facility Users

An *active Vector Facility user* is a virtual machine that is either in the dispatch list or in the eligible list and has used a Vector Facility during its last dispatching time slice. A *loaded Vector Facility user* is a virtual machine that has at least one virtual Vector Facility loaded in a real Vector Facility.

To find out which users are active and loaded Vector Facility users, enter:

```
indicate vector
```

In response, CP lists these two types of Vector Facility users:

- The active Vector Facility users. For each virtual processor that used a Vector Facility in its last time slice, CP displays the logon ID and the virtual processor address.
- The loaded Vector Facility users. For each virtual processor, CP shows the logon ID and virtual processor address, along with the address of the real Vector Facility in which the virtual Vector Facility is loaded.

### Finding Out Resource Information for a Particular User

To find out resource information for a particular user, enter:

indicate user *userid*

where *userid* is the logon ID of the virtual machine user on which you are checking.

CP's response to this command indicates:

- The user's logon ID (USERID).
- Which mode the virtual machine is running in (MACH):

370  
XA  
ESA  
XC

Table 13 contains a summary of virtual machine designations with their resulting architecture modes.

Virtual-machine Designation	Resulting Virtual Machine Architecture on an ESA/370 Processor	Resulting Virtual Machine Architecture on an ESA/390 Processor
370	System/370	System/370
XA	ESA/370	ESA/390
ESA	ESA/370	ESA/390
XC	(incorrect request)	ESA/XC

\* ESA/390 is upward compatible with ESA/370.

- The user's virtual machine storage size (STOR), in megabytes (MB) or kilobytes (KB).
- If the user is running a V=R, V=F, or V=V machine (VIRT).
- If the Expanded Storage is dedicated to the user's virtual machine, and its size in megabytes (XSTORE).
- The virtual device number or name of the named saved system that was on the last IPL command the user entered (IPLSYS).
- The number of devices attached to the user (DEVNUM).
- The number of virtual storage pages that are in real storage (RES), in the working set (WS), locked (LOCK), or reserved (RESVD).
- The number of pages, owned by the user, residing on DASD.
- The number of page reads (READS) and page writes (WRITES) for this user since logon.
- The number of the virtual processor to which the following information refers.
- The user's connect time (CTIME), virtual time (VTIME), and virtual and simulation time (TTIME).

For dedicated processors, the time CP displays for a user may differ from the number shown on a system activity display when certain assists are installed

on the real processor. The time displayed on the SAD is the actual time the guest has been running.

- The total number of nonspooled I/O requests the user has made (IO).

A plus sign (+) indicates that the virtual machine has used the start interpretive execution assist. Therefore, the number of I/O requests may actually be larger than shown. This number resets to zero each time you enter the ACNT command for a user.

- The number of virtual cards the user has read (RDR) and punched (PCH), and the number of virtual lines the user has printed (PRT) since logon or since the last ACNT command was entered.

Each time you enter the ACNT command for a user, those numbers reset to zero.

- If one or more Vector Facilities are installed, and the user's virtual Vector Facility time (VVECTIME) and total Vector Facility time (TVECTIME).

The virtual time indicates the user's Vector Facility use since logon. The total time equals the virtual time plus the time CP has used a Vector Facility for user.

---

## Collecting Accounting Information

VM/ESA normally creates and records accounting records when certain system events occur. Your installation can use these accounting records to analyze overall system operation, to find out if enough resources are available for the system's users, and to bill users for computer services.

Your production system may also have facilities to help you collect accounting information.

## How Accounting Information Is Organized

Information about VM/ESA accounting is organized as follows:

- The *VM/ESA: Planning and Administration* book tells you how to set up accounting virtual machines. It also describes the format of each type of accounting record CP creates and records.
- The rest of this section tells you how to control accounting on VM/ESA. To control the collection of accounting information, you must be able to:
  - Understand how accounting works on VM/ESA
  - Find out the status of accounting
  - Control accounting record recording
  - Control accounting record retrieval
  - Process recorded accounting information.

### How Accounting Works on VM/ESA

On VM/ESA, accounting involves three steps.

- Accounting records are created by CP and authorized machines. CP records important system events. Authorized virtual machines such as CMS Shared File System servers can record any information they wish, typically resource usage. The creation of accounting records can be controlled or eliminated by using the CP RECORDING command. The accounting records are placed in system storage to await processing.
- Then a special virtual machine called the *accounting virtual machine* must transfer the records from storage to disk. You may have more than one accounting virtual machine.
- Finally, you must process the records on disk in a way that helps your installation analyze VM/ESA system use.

All three steps are essential to complete accounting:

- CP must create the accounting records; otherwise, system events go unrecorded.
- The accounting virtual machine must move the records to disk; otherwise, you cannot access them to process their information. Further, if the accounting virtual machine does not retrieve the records, they remain in storage, building up as CP creates them. *If you perform a cold start, you lose any accounting records that are in storage.*
- Finally, you must process the records on disk; otherwise, your installation cannot use the information to analyze system operation.

### Creating Accounting Records

CP creates and records accounting records when particular system events occur. By default, CP sets accounting on when you bring up VM/ESA. You can control the setting with the RECORDING command.

Once accounting is on, CP creates an accounting record whenever one of the following events occurs:

- A virtual machine logs off or detaches a virtual processor.
- A user detaches a dedicated device.
- A user releases temporary disk space.
- A virtual machine issues a DIAGNOSE code X'4C'
- A SNA/CCS terminal session ends.
- The system checkpoints (during shutdown, for example).
- You enter the ACNT command.

When one of these events occurs, CP creates and stores an accounting record that describes the event. Then CP notifies the accounting virtual machine of the new record. Accounting records remain in storage until the accounting virtual machine retrieves them.

The default limit for accounting is 20 records. If the number of records in storage reaches that number, CP notifies you, the primary system operator. The buildup of records in storage indicates that retrieval is not active. You can change the limit with the RECORDING command.

## Retrieving an Accounting Record

The accounting virtual machine retrieves an accounting record when:

- The virtual machine is defined
- It has started the RETRIEVE program
- It has room on its A disk for new accounting records.

Normally, during system generation, your installation sets up a permanent accounting virtual machine. When you bring up VM/ESA, CP automatically logs on this virtual machine. However, you may use the RETRIEVE command to assign the retrieval of accounting records to other virtual machines, if the system programmer has authorized that virtual machine in the IUCV directory control statement. See "Specifying a New Accounting Virtual Machine" on page 244.

After CP logs it on, the permanent accounting virtual machine normally starts retrieving automatically. However, you may also start accounting record retrieval manually. See "Starting Manual Retrieval of Accounting Records" on page 244.

Over time, the accounting virtual machine's A disk fills with accounting records. CP sends a message to you, the primary system operator, when the A disk is 75% full, 90% full, and completely full. You can also log on the accounting virtual machine and check the disk yourself. When the disk is full, you must process some of the old records and erase some files to make room for new ones.

## Processing Accounting Records

When enough accounting records accumulate, you can log on the accounting virtual machine and process the records in some way. For example, if your installation writes a program that formats the accounting data, you can run it to produce reports. Your installation's administrator can use these reports to analyze VM/ESA system use.

You can also dump the accounting file to tape for later processing or send the accounting file to another user for processing. For more information, see "Processing Accounting Information" on page 247.

## Finding Out the Status of Accounting

To check the status of accounting record creation and retrieval, enter:

```
query recording
```

In response, CP displays the status of accounting, EREP, and symptom record creation and retrieval. (For more information on error recording and symptom record recording, see "Collecting Hardware Error Information" on page 247 and "Collecting Symptom Record Information" on page 260.) The format of the response is similar to this:

```
RECORDING   COUNT LMT USERID   COMMUNICATION
ACCOUNT ON   00012 020 DISKACNT INACTIVE
EREP        ON   00000 002 EREP      ACTIVE
SYMPTOM    ON   00000 002 CPSYMP  ACTIVE
```

On the line that says ACCOUNT, the information in the various columns is as follows:

- **RECORDING** is the status of accounting record recording by CP. The status may say ACCOUNT ON or ACCOUNT OFF. In this example, it says

## Collecting Information about System Operation

ACCOUNT ON, indicating that CP will create and record new accounting records in response to new events.

- **COUNT** is the number of accounting records in storage waiting for retrieval. In this example, the number is 12. Because the number is nonzero, the accounting virtual machine may not be retrieving.
- **LMT** is the number of accounting records that must accumulate in storage before CP notifies you, the primary system operator. In this example, the number is 20, the default limit for accounting.
- **USERID** is the logon ID of the accounting virtual machine. In this example it is DISKACNT.
- **COMMUNICATION** is the status of record retrieval by the accounting virtual machine. The status may be INACTIVE, ACTIVE, or ACTIVE PENDING. In this example, the status is INACTIVE, which indicates that the accounting virtual machine is not retrieving. By contrast, the EREP virtual machine and the symptom virtual machine are retrieving, as indicated by their ACTIVE status in the example.

Persistent ACTIVE PENDING status indicates that the accounting virtual machine is not retrieving properly.

If accounting record retrieval is INACTIVE or ACTIVE PENDING, or if a large number of accounting records are waiting in storage, restart retrieval manually. See “Starting Manual Retrieval of Accounting Records” on page 244.

## Controlling Recording of Accounting Records

After finding out its status, you may need to control various aspects of the recording of accounting record. For example, you may need to:

- Stop or start CP creation of accounting records
- Produce specific accounting records
- Control the accounting record limit.

### Stopping and Starting the Recording of Accounting Records

By default, CP creates and records accounting records when certain events occur. If you want CP to stop recording accounting records, enter:

```
recording account off
```

In response, CP stops creating accounting records.

When you want CP to start recording accounting records again, you must first purge or retrieve the accounting records queued, then enter:

```
recording account on
```

### Purging Accounting Records

To purge any accounting records that are in storage, enter:

```
recording account purge
```

In response, CP purges any accounting records that are in storage.

## Producing Specific Accounting Records

Use the ACNT command to produce accounting records for one or more logged-on users, for the system, or both.

A user accounting record shows the system resources a particular user has consumed since the user logged on or since you last entered the ACNT command for this user, whichever is more recent.

A system accounting record shows the system resources charged to the system rather than to a specific user. The record reflects use since you last brought up VM/ESA, or since you last entered the ACNT command for the system, whichever is more recent.

**Example 1—Producing Accounting Records for Specific Users:** To produce records that account for the system resources users MVSOPR1 and CMSOPR1 have consumed, enter:

```
acnt mvsopr1 cmsopr1
```

In response, CP produces an accounting record for each user. CP also resets the resource use counters for these two users.

**Example 2—Producing System Accounting Records:** To produce records that account for system resources not charged to a specific user, enter:

```
acnt system
```

In response, CP produces an accounting record that reflects resource use by the system. CP also resets the resource use counters for the system.

**Example 3—Producing Accounting for All System Resource Use:** To produce records that account for system resources consumed by both the system and all logged-on users, enter:

```
acnt all
```

In response, CP produces accounting records for all logged-on users, as well as the system. CP also resets all the resource use counters.

## Controlling the Accounting Record Limit

By default, CP lets 20 accounting records accumulate in storage before it notifies you that the records are not being retrieved. If you prefer, you may change this limit. For example, if you want to set the limit to 15 records, enter:

```
recording account limit 15
```

## Controlling Retrieval of Accounting Records

Once accounting records are being created, you may need to control various aspects of their retrieval. For example, you may need to:

- Specify a new accounting virtual machine
- Start accounting record retrieval manually
- Stop accounting record retrieval
- Disassociate a user ID from accounting record retrieval
- Resume accounting record retrieval
- Find out how much room is on the accounting virtual machine's A disk.

### Specifying a New Accounting Virtual Machine

Normally, your installation sets up particular virtual machines to be the accounting virtual machines. If you want to have additional virtual machines collect accounting records, do the following:

1. Make sure the new accounting virtual machine has an A disk available to receive the accounting records.
2. Make sure the system programmer authorizes the new virtual machine to receive the records in the IUCV directory statement. The directory entry of the user entering the RETRIEVE utility must have an IUCV directory control statement authorizing the virtual machine to connect to the CP system service which supports the type of record being collected. \*ACCOUNT must be specified for ACCOUNT records.
3. Follow the steps outlined in the next section, "Starting Manual Retrieval of Accounting Records."

### Starting Manual Retrieval of Accounting Records

Ordinarily, the accounting virtual machine starts retrieving automatically when you bring up VM/ESA. But there may be times when you need to start retrieval manually. For example, you may find out through error messages or by entering the QUERY RECORDING command that the accounting virtual machine has stopped retrieving. Or your installation may not set up the accounting virtual machine to start retrieval automatically. In either case, you may start retrieval manually, as follows:

1. If necessary, disconnect from the operator's virtual machine by entering:  
`disconnect`
2. Log on the accounting virtual machine.
3. Clear any activity in the virtual machine (including retrieval) by entering:  
`#cp system reset`
4. Load CMS into storage by entering:  
`ipl 190`  
or, if your installation has installed CMS in a named saved system,  
`ipl cmsname`  
where *cmsname* is the name of your CMS system. If you IPL a named system, (CMS) 16MB of storage may suffice. However, if you IPL 190, then you will need 19MB of storage.
5. Make sure there is room on the accounting virtual machine's A disk for more accounting records. To find out how full the A disk is, enter:  
`query disk a`  
If the A disk is almost full, process some of the accounting records. Then erase the old files to free space on the A disk.
6. Start retrieval of accounting records by entering:  
`retrieve account`
7. Disconnect the accounting virtual machine by entering:  
`#cp disconnect`

You may now use the display for another virtual machine.

8. If necessary, reconnect the operator's virtual machine.

### Stopping Retrieval of Accounting Records

Some tasks require you to stop accounting record retrieval. For example, before you can process records stored on the accounting virtual machine's A disk or check how full the A disk is, you must stop retrieval.

To stop retrieval of accounting records:

1. If necessary, disconnect from the operator's virtual machine by entering:

```
disconnect
```

2. Log on the accounting virtual machine.

3. Stop accounting retrieval by entering:

```
#cp external
```

In response, you receive a prompt: HCPRET592A ENTER END OR SUMMARY

Enter:

```
end
```

This stops the retrieval of accounting information. CP continues to store new accounting records in real storage until you resume accounting record retrieval.

**Note:** If you enter SUMMARY instead of END, CP displays the number of accounting records retrieved since the last RETRIEVE command, and retrieval continues. To stop retrieval, you must enter the #CP EXTERNAL command again and respond to the prompt with END.

### Disassociating a User ID from the Retrieval of Accounting Records

1. Stop the recording of ACCOUNT records for this user ID. To do this from a user ID authorized for the class **A** or **B** version of the CP RECORDING command, enter:

```
recording account off qid userid
```

Or, the user ID being removed (must be authorized for the class **C**, **E**, or **F** version of the recording command), enter:

```
recording account off
```

2. If there are accounting records queued in CP storage for this user ID and you want to save the data, log on the user ID to be deleted and enter:

```
retrieve account
```

This will place the accounting records in the proper file for later processing. Disconnect this user by entering:

```
#cp disconnect
```

Log back on the authorized user ID.

3. If the accounting records queued in CP storage for this user ID are not wanted, they may be purged. To do this from a user ID authorized for the class **A** or **B** version of the CP RECORDING command, enter:

```
recording account purge qid userid
```

## Collecting Information about System Operation

Or, the user ID being removed (must be authorized for the class **C**, **E**, or **F** version of the recording command), enter:

```
recording account purge
```

This will PURGE all the accounting records queued in CP storage for this user ID.

4. Verify the record count is zero and recording is off for this user ID. To do this, enter:

```
query recording
```

**Note:** The deleted user ID remains in the warm start data and in the output of the QUERY RECORDING command until VM is restarted with the COLD option.

5. If the user ID is specified on the SYSTEM\_USERIDS statement in the system configuration file or on the SYSACNT macroinstruction in HCPSYS, remove that user ID.

**Note:** The user ID OPERACCT is the default if the SYSACNT macroinstruction is omitted and no user ID for accounting is specified in the system configuration file.

### Resuming Retrieval of Accounting Records

Ordinarily, after you have processed accounting records or checked on the A disk, CMS is still running in the accounting virtual machine. So, to resume accounting record retrieval, you do not need to go through the whole procedure described in "Starting Manual Retrieval of Accounting Records" on page 244. Instead, perform the following steps:

1. Restart accounting record retrieval by entering:

```
retrieve account
```

2. Disconnect the accounting virtual machine by entering:

```
#cp disconnect
```

You can now use the display for another virtual machine.

3. If necessary, reconnect the operator's virtual machine.

### Finding Out How Full the Accounting A Disk Is

When the accounting virtual machine's A disk is full, it cannot retrieve any more records. If your installation uses the IBM-supplied PROFILE EXEC to start up the accounting virtual machine, you receive a message about the A disk's status when the virtual machine IPLs CMS. Also, CP sends you, the primary system operator, a message when the A disk is 75% full, 90% full, and completely full. Between messages, you may wish to check the disk yourself.

To see how much room there is on the accounting virtual machine's A disk:

1. Stop accounting record retrieval.

To do this, see "Stopping Retrieval of Accounting Records" on page 245.

2. Enter:

```
query disk a
```

In response, CMS tells you how full the A disk is.

3. Resume accounting record retrieval.

To do this, see “Resuming Retrieval of Accounting Records.”

### Processing Accounting Information

From time to time, you must process the accounting records stored on the accounting virtual machine's A-disk and make room for new ones. You may do this when you notice the A-disk is nearly full or at intervals set by your installation. In either case, you must:

1. Stop accounting record retrieval.

To do this, see “Stopping Retrieval of Accounting Records” on page 245.

2. Process the accounting information.

You can process the accounting records on the A-disk in one of several ways:

- You can run a program to format the accounting data if such a program is available.
- You can use the CMS command, TAPE DUMP, to dump the accounting files to tape for later processing.
- You can send the files to another user for processing.

To send a file to another virtual machine user, first set up your virtual punch so that CP sends all punch files to the reader of the other virtual machine. Enter:

```
spool punch to userid reader
```

where *userid* is the logon ID of the virtual machine to which you are sending the file.

Then use the CMS command, DISK DUMP, to send the file to the user.

After you have processed the accounting records, use the CMS command, ERASE, to erase the old files. Erasing the files makes room on the A-disk for new records.

3. Resume accounting record retrieval.

To do this, see “Resuming Retrieval of Accounting Records” on page 246.

---

### Collecting Hardware Error Information

CP normally generates error recording (EREP) records when certain hardware errors occur. Your installation can use these EREP records to help support personnel diagnose and fix hardware problems.

You can also use the SET MITIME command to control how often CP notifies you of missing interrupts on a device. A console log that contains these messages can help support personnel diagnose problems with the device.

Finally, your production system may have facilities to help you collect hardware error information.

### How Error Recording Information Is Organized

Information about VM/ESA error recording is organized as follows:

- The *VM/ESA: Planning and Administration* book tells you how to set up an EREP virtual machine.
- The *Environmental Record Editing and Printing Program User's Guide and Reference* book tells you about the environmental record editing and printing (EREP) program, its options, and the format of each type of EREP record. You use the EREP program to format and print EREP records.
- The *VM/ESA: CP Command and Utility Reference* book tells you how to invoke the EREP program through the CPEREPXA utility.
- The rest of this section tells you how to control error recording on VM/ESA. To control the collection of EREP information, you must be able to:
  - Understand how error recording works on VM/ESA
  - Find out the status of error recording
  - Control EREP record creation
  - Control EREP record retrieval
  - Process recorded EREP information.

### How Error Recording Works on VM/ESA

On VM/ESA, error recording involves three steps.

- First, CP must create and store EREP records.
  - CP generates error records when creating a hard abend, soft abend, SA dump or VM dump.
  - For VM dumps, virtual machines can pass error records with guest information, which CP updates and records.
- Then a special virtual machine called the *EREP virtual machine* must transfer the records from storage to disk. You may have more than one EREP virtual machine.
- Finally, you must process the records on disk in a way that helps your installation diagnose and fix hardware problems.

All three steps are essential to complete error recording:

- CP must create the EREP records; otherwise, system events go unrecorded.
- The EREP virtual machine must move the records to disk; otherwise, you cannot access them to process their information. Further, if the EREP virtual machine does not retrieve the records, they remain in storage, building up as CP creates them. *If you perform a cold start, you lose any EREP records that are in storage.*
- Finally, you must process the records on disk; otherwise, your installation cannot use the information to diagnose and fix hardware problems.

### EREP Record Recording

CP creates and records EREP records when particular system events occur. By default, CP sets error recording on when you bring up VM/ESA. You can control the setting with the RECORDING command.

Once error recording is on, CP creates and records an EREP record whenever one of the following events occurs:

- A hardware error occurs while CP is active.
- A hardware error occurs while a virtual machine is active in virtual supervisor state and has previously issued the SET SVC76 CP command.

CP does not create EREP records for virtual machines in virtual problem state. A virtual machine creates its own EREP records if the user enters the CP SET SVC76 VM command. Therefore, CP does not create EREP records for these virtual machines.

**Note:** Sometimes the same error can be presented to CP for recording twice, once by the hardware as part of normal CP hardware error recording and once by a virtual machine as part of SVC 76 simulation. CP records such errors only once. Therefore, when a virtual machine sets SVC 76 to the CP setting, CP creates a complete and unduplicated set of hardware error records.

When an error occurs that directly affects VM/ESA, CP creates one or more of the following types of EREP records:

- MCHREC—Machine check record
- MDRREC—Miscellaneous data record
- MITREC—XA mode missing interrupt record
- OBRREC—Outboard recording record
- SLHREC—Subchannel logout record
- CRWREC—Channel report word record.

At a virtual machine's request, CP creates one or more of the following types of EREP records:

- OBRREC—Outboard recording record
- MIRREC—370 mode missing interrupt record
- MITREC—XA mode missing interrupt record
- MDRREC—Miscellaneous data record
- DDRREC—Device reconfiguration record
- Software error records.

All these record types are described in the *Environmental Record Editing and Printing Program User's Guide and Reference* book.

After CP creates and stores the EREP record, CP notifies the EREP virtual machine of the new record. EREP records remain in storage until the EREP virtual machine retrieves them.

The default limit for EREP is two records. If the number of records in storage reaches that number, CP notifies you, the primary system operator. The buildup of records in storage indicates that retrieval is not active. You can change the limit with the RECORDING command.

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### EREP Record Retrieval

The EREP virtual machine retrieves an EREP record when all of the following are true:

- The virtual machine is defined
- It has started the RETRIEVE program
- It has room on its A disk for new EREP records.

Normally during system generation, your installation sets up a permanent EREP virtual machine. When you bring up VM/ESA, CP automatically logs on this virtual machine. However, you may use the RETRIEVE command to assign the retrieval of EREP records to other virtual machines if the system programmer has authorized that virtual machine in the IUCV directory control statement. See "Specifying a New EREP Virtual Machine" on page 253.

After CP logs it on, the permanent EREP virtual machine normally starts retrieving automatically. However, you can also start EREP record retrieval manually. See "Starting EREP Record Retrieval Manually" on page 253.

Over time, the EREP virtual machine's A disk fills up with EREP records. CP sends a message to you, the primary system operator, when the A disk is 75% full, 90% full, and completely full. You can also log on the EREP virtual machine and check the disk yourself. When the disk is full, you must process some of the old records and erase some files to make room for new ones.

### EREP Record Processing

When enough EREP records accumulate, you can log on the EREP virtual machine and process them, using the EREP program. Your installation's support personnel can use the resulting reports to diagnose and fix hardware problems.

You can also dump the EREP file to tape for later processing or send the EREP file to another user for processing. For more information, see "Processing EREP Information" on page 256.

## Finding Out the Status of Error Recording

To check the status of EREP record creation and retrieval, enter:

```
query recording
```

In response, CP displays the status of accounting, EREP, and symptom record creation and retrieval. (For more information on accounting and symptom record recording, see "Collecting Accounting Information" on page 239 and "Collecting Symptom Record Information" on page 260.) The format of the response is similar to this:

```
RECORDING   COUNT LMT USERID   COMMUNICATION
ACCOUNT  ON  00000 020 DISKACNT ACTIVE
EREP     ON  00001 002 EREP     INACTIVE
SYMPTOM  ON  00000 002 CPSYMP  ACTIVE
```

On the line that says EREP, the information in the various columns is as follows:

- **RECORDING** is the status of EREP record creation by CP. The status may say EREP ON or EREP OFF. In this example, it says EREP ON, indicating that CP will create new EREP records in response to new events.

- **COUNT** is the number of EREP records in storage waiting for retrieval. In this example, the number is 1. Because the number is nonzero, the EREP virtual machine may not be retrieving.
- **LMT** is the number of EREP records that must accumulate in storage before CP notifies you, the primary system operator. In this example, the number is 2, the default limit for EREP.
- **USERID** is the logon ID of the EREP virtual machine. In this example it is EREP.
- **COMMUNICATION** is the status of record retrieval by the EREP virtual machine. The status may be INACTIVE, ACTIVE, or ACTIVE PENDING. In this example, the status is INACTIVE, which indicates that the EREP virtual machine is not retrieving. By contrast, the accounting virtual machine and the symptom virtual machine are retrieving, as indicated by their ACTIVE status in the example.

Persistent ACTIVE PENDING status indicates that the EREP virtual machine is not retrieving properly.

If EREP record retrieval is INACTIVE or ACTIVE PENDING, or if a large number of EREP records are waiting in storage, restart retrieval manually. See “Starting EREP Record Retrieval Manually” on page 253.

### Controlling EREP Record Recording

After finding out its status, you may need to control various aspects of EREP record recording. For example, you may need to:

- Stop or start CP creation of EREP records
- Control the EREP record limit
- Intensify error recording for a device.

#### Stopping and Starting EREP Record Recording

By default, CP creates and records EREP records when certain events occur. If you want CP to stop recording EREP records, enter:

```
recording erep off
```

In response, CP stops creating EREP records.

When you want CP to start creating EREP records again, you must first purge or retrieve the EREP records queued, then enter:

```
recording erep on
```

#### Purging EREP Records

To purge any EREP records that are in storage, enter:

```
recording erep purge
```

In response, CP purges any EREP records that are in storage.

You can also control the recording of recoverable processor errors. If you do not want CP to create EREP records for these errors, or you (the primary system operator) do not wish to receive messages when they occur, enter:

```
set mode retry quiet
```

When you want CP to resume creating EREP records for recoverable processor errors, enter:

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```
set mode retry record
```

### Controlling the EREP Record Limit

By default, CP lets two EREP records accumulate in storage before it notifies you that the records are not being retrieved. If you prefer, you may change this limit. For example, if you want to set the limit to 12 records, enter:

```
recording erep limit 12
```

### Intensifying Error Recording for an I/O Device

If an I/O device is causing frequent errors, you can intensify error recording for the device. To do this, enter:

```
set record on rdev limit nn byte ww bit y and byte xx bit z
```

where:

*rdev*

is the real device number of the I/O device.

*nn* is the number of I/O errors that must occur before a record is created.

*y* is a bit in sense byte *ww*.

*z* is a bit in sense byte *xx*.

For an error to be counted against the limit *nn*, the sense bytes produced by the error must match the sense bytes specified.

In response, CP creates an EREP record the next time an I/O error occurs that sets the sense bytes to the specified values. After the error occurs *nn* more times, CP creates another EREP record for the device. CP continues this until 10 EREP records are created or until you enter:

```
set record off
```

#### Notes:

1. If you want CP to create EREP records when the sense bytes contain either of the values specified on the BYTE operands, use the OR operand on the SET RECORD command instead of the AND operand.
2. Intensive error recording can be in effect for only one device at a time. If you enter the SET RECORD command for another device, intensive error recording ceases for the first device, even if fewer than 10 records have been created.
3. The SET RECORD command may cause error records to be generated for errors that do not require logging. Later when processing the error records using EREP, error messages may be generated indicating that these error records cannot be processed.

## Gathering Device Statistics Dynamically

Some devices maintain statistical data counters that may be useful for hardware service management. Miscellaneous data records (record type MDRREC) containing the statistical information are created when the counters overflow. Other events, such as the issuing of a VARY OFFLINE command, will also trigger the creation of a miscellaneous data record for the device. However, these events occur infrequently.

To force the creation of miscellaneous data records (MDRs), use the CP SYNCMDRS command from any virtual machine having a privilege class of A, B, or F:

```
syncmdrs
```

SYNCMDRS will cause MDRs to be created for all online devices that maintain statistical counters. The EREP machine will retrieve these MDRs as part of its usual error record processing.

### Controlling EREP Record Retrieval

Once EREP records are being created, you may need to control various aspects of their retrieval. For example, you may need to:

- Specify a new EREP virtual machine
- Start EREP record retrieval manually
- Stop EREP record retrieval
- Disassociate a user ID from EREP record retrieval
- Resume EREP record retrieval
- Find out how much room is on the EREP virtual machine's A disk.

### Specifying a New EREP Virtual Machine

Normally, your installation sets up particular virtual machines to be the EREP virtual machines. If you want to have additional virtual machines collect EREP records, then you must do the following:

1. Make sure the new EREP virtual machine has an A disk available to receive the EREP records.
2. Make sure the system programmer had authorized the new virtual machine to receive the records in the IUCV directory statement. The directory entry of the user entering the RETRIEVE utility must have an IUCV directory control statement authorizing the virtual machine to connect to the CP system service which supports the type of record being collected. \*LOGREC must be specified for EREP records.
3. Follow the steps outlined in the next section, "Starting EREP Record Retrieval Manually."

### Starting EREP Record Retrieval Manually

Ordinarily, the EREP virtual machine starts retrieving automatically when you bring up VM/ESA. But there may be times when you need to start retrieval manually. For example, you may find out through error messages or by entering the QUERY RECORDING command that the EREP virtual machine has stopped retrieving. Or your installation may not set up the EREP virtual machine to start retrieval automatically. In either case, you can start retrieval manually, as follows:

1. If necessary, disconnect from the operator's virtual machine by entering:  

```
disconnect
```
2. Log on the EREP virtual machine.
3. Clear any activity in the virtual machine (including retrieval) by entering:  

```
#cp system reset
```
4. Load CMS into storage by entering:  

```
ipl 190
```

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or, if your installation has installed CMS in a named saved system:

```
ipl cmsname
```

where *cmsname* is the name of your CMS system.

5. Make sure there is room on the EREP virtual machine's A disk for more EREP records. To find out how full the A disk is, enter:

```
query disk a
```

If the A disk is almost full, process some of the EREP records. Then erase the old files to free space on the A disk.

6. Start EREP record retrieval by entering:

```
retrieve erep
```

7. Disconnect the EREP virtual machine by entering:

```
#cp disconnect
```

You may now use the display for another virtual machine.

8. If necessary, reconnect the operator's virtual machine.

### Stopping EREP Record Retrieval

Some tasks require you to stop EREP record retrieval. For example, before you can process records stored on the EREP virtual machine's A disk or check how full the A disk is, you must stop retrieval.

To stop EREP record retrieval:

1. If necessary, disconnect from the operator's virtual machine by entering:

```
disconnect
```

2. Log on the EREP virtual machine.

3. Stop EREP retrieval by entering:

```
#cp external
```

In response, you receive a prompt:

```
HCPRET592A ENTER END OR SUMMARY
```

Enter:

```
end
```

This stops the retrieval of EREP information. CP continues to store new EREP records in real storage until you resume EREP record retrieval.

**Note:** If you enter SUMMARY instead of END, CP displays the number of EREP records that have been retrieved since the last RETRIEVE command, and retrieval continues. To stop retrieval, you must enter the #CP EXTERNAL command again and respond to the prompt with END.

### Disassociating a User ID from the Retrieval of EREP Records

1. Stop the recording of EREP records for this user ID. To do this from a user ID authorized for the class **A** or **B** version of the CP RECORDING command, enter:

```
recording erep off qid userid
```

Or, the user ID being removed (must be authorized for the class **C**, **E**, or **F** version of the recording command), enter:

```
recording erep off
```

2. If there are EREP records queued in CP storage for this user ID and you want to save the data, log on the user ID to be deleted and enter:

```
retrieve erep
```

This will place the EREP records in the proper file for later processing.

Disconnect this user by entering:

```
#cp disconnect
```

Log back on the authorized user ID.

3. If the EREP records queued in CP storage for this user ID are not wanted, they may be purged. To do this from a user ID authorized for the class **A** or **B** version of the CP RECORDING command, enter:

```
recording erep purge qid userid
```

Or, the user ID being removed (must be authorized for the class **C**, **E**, or **F** version of the recording command), enter:

```
recording erep purge
```

This will PURGE all the EREP records queued in CP storage for this user ID.

4. Verify the record count is zero and recording is off for this user ID. To do this, enter:

```
query recording
```

**Note:** The deleted user ID remains in the warm start data and in the output of the QUERY RECORDING command until VM is restarted with the COLD option.

5. If the user ID is specified on the SYSTEM\_USERIDS statement in the system configuration file or on the SYSEREP macroinstruction in HCPSYS, remove that user ID.

**Note:** The user ID OPEREREP is the default if the SYSEREP macroinstruction is omitted and no user ID for EREP is specified in the system configuration file.

### Resuming EREP Record Retrieval

Ordinarily, after you process EREP records or check on the A disk, CMS is still running in the EREP virtual machine. So, to resume EREP record retrieval, you do not have to go through the whole procedure described in "Starting EREP Record Retrieval Manually" on page 253. Instead, perform the following steps:

1. Restart EREP record retrieval by entering:

```
retrieve erep
```

2. Disconnect the EREP virtual machine by entering:

```
#cp disconnect
```

You can now use the display for another virtual machine.

3. If necessary, reconnect the operator's virtual machine.

### Finding Out How Full the EREP A-Disk Is

When the EREP virtual machine's A disk is full, it cannot retrieve any more records. If your installation uses the IBM-supplied PROFILE EXEC to start up the EREP virtual machine, you receive a message about the A disk's status when the virtual machine IPLs CMS. Also, CP sends you, the primary system operator, a message when the A disk is 75% full, 90% full, and completely full. Between messages, you may wish to check the disk yourself.

To see how much room there is on the EREP virtual machine's A disk:

1. Stop EREP record retrieval.

To do this, see "Stopping EREP Record Retrieval" on page 254.

2. Enter:

```
query disk a
```

In response, CMS tells you how full the A disk is.

3. Resume EREP record retrieval.

To do this, see "Resuming EREP Record Retrieval."

## Processing EREP Information

From time to time, you must process the EREP records stored on the EREP virtual machine's A-disk and make room for new ones. You may do this when you notice the A-disk is nearly full or at intervals set by your installation. In either case, you must:

1. Stop EREP record retrieval.

To do this, see "Stopping EREP Record Retrieval" on page 254.

2. Process the EREP information.

You can process the EREP records on the A-disk in one of several ways:

- You can run the EREP program to format and print the records.  
For more information, see the next section.
- You can use the CMS command, TAPE DUMP, to dump the EREP files to tape for later processing.
- You can send the files to another user for processing.

To send a file to another virtual machine user, first set up your virtual punch so that CP sends all punch files to the reader of the other virtual machine. Enter:

```
spool punch to userid reader
```

where *userid* is the logon ID of the virtual machine to which you are sending the file.

Then use the CMS command, DISK DUMP, to send the file to the user.

After you process the EREP records, use the CMS command, ERASE, to erase the old files. Erasing the files makes room on the A-disk for new records.

3. Resume EREP record retrieval.

To do this, see "Resuming EREP Record Retrieval" on page 255.

### Running the CPEREPXA Utility

The environmental record editing and printing (EREP) program formats and prints EREP records. On VM/ESA, you invoke the program through the CPEREPXA utility.

When you run the EREP program, you must specify options. For a description of the EREP options, see the *VM/ESA: CP Command and Utility Reference* book and the *Environmental Record Editing and Printing Program User's Guide and Reference* book.

You can enter these options in two ways, either interactively or through an options file.

**Entering EREP Options Interactively:** To run the EREP program and enter options interactively, enter:

```
cperepxa
```

In response, CP sends you the following prompt:

```
ENTER:
```

You can now enter CPEREPXA options according to the rules in the *VM/ESA: CP Command and Utility Reference* book.

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**Entering EREP Options through an Options File:** To run the EREP program using an options file:

1. Create the options file.

The file type for this file can be any 8-character name that is not reserved.

The following lists the reserved file types. Some are file types used by functions or licensed programs that VM/ESA does not support.

\$B\$B\$B\$B	FTnn001	PLIOPT
\$HLPxxxx	GCS	PROC
AMSERV	GLOBALV	RPGII
ASM3705	GROUP	SCRIPT
ASSEMBLE	HELPxxxx	SYMDMP
AUXxxxx	LDTFDIx	SYNONYM
CMSUT1	LISTING	SYSUTx
CNTRL	LKEDIT	SYS00x
COBOL	LOADLIB	TESTCOB
COPY	MACLIB	TESTFORT
DIRECT	MACRO	TEXT
DOSLIB	MAP	TXTLIB
DOSLNK	MEMO	UPDATE
ESERV	MODULE	UPDLOG
EXEC	NAMES	UPDTxxxx
EXPAND	NETLOG	VSBASIC
FORTRAN	NOTEBOOK	VSBDATA
FREEFORT	PLI	ZAP

2. Enter:

```
cperepxa filename filetype
```

where *filename* and *filetype* are the file name and file type of the options file, respectively.

CPEREPXA uses the options in the file to process the EREP records and does not prompt you for additional options.

**Example—Running CPEREPXA with an Options File:** The options file you create, with the name RECORD OPTIONS A1, looks like this:

```
00000 * * * TOP OF FILE * * *
00001 ACC=Y,DATE=(83125,83130),DEV=(3350),
00002 LINECT=40,PRINT=PT,SHORT=N,TYPE=CHMO
00003 * * * END OF FILE * * *
```

To run CPEREPXA with this file, enter:

```
cperepxa record options
```

## Specifying How Often CP Checks for Missing Interrupts

CP periodically checks I/O devices for missing interrupts. A missing interrupt is an I/O request to which a device has not responded. When CP detects a missing interrupt for a device, CP either handles the condition itself or reflects the condition to the virtual machine requesting the I/O. When CP reflects a missing interrupt condition to a virtual machine, CP also sends messages to the primary system console to tell you that an interrupt is pending for the device. The messages tell you:

- The type and real device number of the device

- Some information that describes the last interrupt that occurred (IRB)
- The logon ID of the virtual machine that is waiting for a response from the device (USERID).

When you receive these messages, you may need to reset the device. The virtual machine must then reenter the I/O request.

To find out how often CP is checking for missing interrupts, enter:

```
query mitime
```

CP's response indicates how often it checks for missing interrupts on various types of devices. The rate is expressed in minutes and seconds, as *mm:ss*. If the response says OFF for any device, CP is not checking it for missing interrupts.

**Note:** Missing interrupt detection is not provided for the Asynchronous Data Mover Facility. A preferred guest is required to provide full error recovery for missing interrupt conditions pertaining to its use.

The response to QUERY MITIME includes the following types of devices:

- **DASD** for DASD
- **GRAF** for display devices, except 328x devices
- **TAPE** for tape drives
- **UR** for unit record devices, except 3800
- **SWCH** for dynamic switching devices
- **MISC** for miscellaneous devices (3851, 328x, 3800, and any DASD defined as a mass storage subsystem device).

To change the rate at which CP is checking for missing interrupts, enter:

```
set mitime devtype mm:ss
```

where:

*devtype* is DASD, TAPE, GRAF, UR, MISC, SWCH, or the real device number of one or more specific devices.

*mm:ss* indicates how often, in minutes and seconds, you want CP to check the specified devices. CP rounds up the value you specify for *mm:ss* to the nearest multiple of 5 seconds.

You can also specify how often CP checks for missing interrupts for a range of devices. For example, if you want CP to check the six DASD with real device numbers 190 through 195 once every 30 seconds instead of once every 15 seconds, enter:

```
set mitime 190-195 00:30
```

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If these are the only DASD attached to your system, you can enter the following command to obtain the same result:

```
set mitime dasd 00:30
```

## Routing EREP Records to Another User ID

The RETRIEVE command lets you route certain error records to another user ID after a specified time interval has elapsed. Routing of error records is useful if your installation uses a centralized hardware service program.

To route error records, specify the LOGROUTE operand on the RETRIEVE command. For example, to direct error records to user SERVMACH at node CORPVM7 every 60 minutes, specify:

```
retrieve erep logroute to servmach at corpvm7 for 60
```

LOGROUTE can be specified when you manually start RETRIEVE processing or when RETRIEVE processing is automatically started. In the latter case, add the LOGROUTE operand to the RETRIEVE command in the PROFILE EXEC of the EREP machine.

RETRIEVE processing accumulates error records in a CMS file on file mode A of the EREP machine, and uses the CMS SENDFILE command to route the error records to the specified user. The destination can be either a VM system or a TSO system.

Accumulated error records are also sent when service alert (type A3) or serial incident (type A2) error records are retrieved.

---

## Collecting Symptom Record Information

VM/ESA normally includes symptom records in every dump. When CP/ESA is loaded into storage, the CP \*SYMPTOM system service can record symptom records in a CMS file separate from dumps, processor errors, or I/O (LOGREC) errors, and can send the records to authorized virtual machines for recording. Your installation can use these symptom records to identify known problems and their fixes without first reading dumps.

Your production system may have facilities to help you collect symptom record information.

## How Symptom Record Recording Information Is Organized

Information about VM/ESA symptom record recording is organized as follows:

- The *VM/ESA: Planning and Administration* book tells you how to set up symptom record recording virtual machines.
- The rest of this section tells you how to control symptom record recording on VM/ESA. To control the collection of symptom information, you must be able to:
  - Understand how symptom record recording works on VM/ESA
  - Find out the status of symptom record recording
  - Control symptom record creation
  - Control symptom record retrieval
  - Process recorded symptom information.

## How Symptom Record Recording Works on VM/ESA

On VM/ESA, symptom record recording involves three steps. They are essential to complete symptom record recording.

- CP must create and record the symptom records; otherwise, system events go unrecorded.
  - CP generates symptom records when creating a hard abend, soft abend, SA dumps and VM dumps
  - For VM dumps, virtual machines can pass symptom records with guest information, which CP updates and records.
- The symptom record recording virtual machine must move the records to disk; otherwise, you cannot access them to process their information. Further, if the symptom record recording virtual machine does not retrieve the records, they remain in storage, building up as CP creates them. You may have more than one symptom record recording virtual machine. *If you perform a cold start, you lose any symptom records that are in storage.*
- Finally, you must process the records on disk; otherwise, your installation cannot use the information to identify and fix the problems.

### Symptom Record Recording

CP creates symptom records when particular system events occur. By default, CP sets symptom record recording on when you bring up VM/ESA. You can control the setting with the RECORDING command.

Once symptom record recording is on, CP records a symptom record whenever one of the following events occurs:

- A VM component or IBM Licensed Product requests a VMDUMP or that a symptom record be recorded
- A CP abend dump occurs.

When one of these events occurs, CP creates and stores the symptom record. The \*SYMPTOM system service collects the symptom records and notifies the authorized symptom record recording virtual machines. The symptom records remain in storage until the symptom record recording virtual machine retrieves them.

The default limit for symptom records is two. If the number of records in storage reaches that number, CP notifies you, the primary system operator. The buildup of records in storage indicates that retrieval is not active. You can change the limit with the RECORDING command.

### Symptom Record Retrieval

The symptom record recording virtual machine retrieves a symptom record when all of the following are true:

- The virtual machine is defined
- It starts the RETRIEVE program
- It has room on its A disk for new symptom records.

Normally, during system generation, your installation sets up a permanent symptom record recording virtual machine. When you bring up VM, CP automatically logs on this virtual machine. However, you may use the RETRIEVE command to assign the retrieval of symptom records to other virtual machines if the system

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programmer authorizes that virtual machine in the IUCV directory control statement. See “Specifying a New Symptom Record Recording Virtual Machine” on page 264.

After CP logs it on, the permanent symptom record recording virtual machine normally starts retrieving automatically. However, you can also start symptom record retrieval manually. See “Stopping and Starting Symptom Record Recording” on page 263.

Over time, the symptom record recording virtual machine's A disk fills up with symptom records. CP sends a message to you, the primary system operator, when the A disk is 75% full, 90% full, and completely full. You can also log on the symptom record recording virtual machine and check the disk yourself. When the disk is full, you must process some of the old records and erase some files to make room for new ones.

### Symptom Record Processing

When enough symptom records accumulate, you can log on the symptom record recording virtual machine and use the VIEWSYM command to identify known problems.

You can also dump the symptom record files to tape for later processing or send the symptom record files to another user for processing. For more information, see “Processing Symptom Record Information” on page 267.

## Finding Out the Status of Symptom Record Recording

To check the status of symptom record creation and retrieval, enter:

```
query recording
```

In response, CP displays the status of accounting, EREP, and symptom record creation and retrieval. (For more information on accounting and error recording, see “Collecting Accounting Information” on page 239 and “Collecting Hardware Error Information” on page 247.) The format of the response is similar to this:

```
RECORDING   COUNT LMT USERID   COMMUNICATION
ACCOUNT  ON   00000 020 DISKACNT ACTIVE
EREP     ON   00000 002 EREP     ACTIVE
SYMPTOM  ON   00001 002 CPSYMP  INACTIVE
```

On the line that says SYMPTOM, the information is as follows:

- **RECORDING** is the status of symptom record creation by CP. The status may say SYMPTOM ON or SYMPTOM OFF. In this example, it says SYMPTOM ON, indicating that CP creates new symptom records in response to new events.
- **COUNT** is the number of symptom records in storage waiting for retrieval. In this example, the number is 1. Because the number is nonzero, the symptom record recording virtual machine may not be retrieving.
- **LMT** is the number of symptom records that must accumulate in storage before CP notifies you, the primary system operator. In this example, the number is 2, the default limit for symptom records.
- **USERID** is the logon ID of the symptom record recording virtual machine. In this example it is CPSYMP.

- **COMMUNICATION** is the status of record retrieval by the symptom record recording virtual machine. The status may be INACTIVE, ACTIVE, or ACTIVE PENDING. In this example, the status is INACTIVE, which indicates that the symptom record recording virtual machine is not retrieving. By contrast, the accounting virtual machine and the EREP virtual machine are retrieving, as indicated by their ACTIVE status in the example.

Persistent ACTIVE PENDING status indicates that the symptom record recording virtual machine is not retrieving properly.

If symptom record retrieval is INACTIVE or ACTIVE PENDING, or if a large number of symptom records are waiting in storage, restart retrieval manually. See “Starting Manual Retrieval of Symptom Records” on page 264.

### Controlling Symptom Record Recording

After finding out its status, you may need to control various aspects of symptom record recording. For example, you may need to:

- Stop or start CP creation of symptom records
- Control the symptom record limit.

#### Stopping and Starting Symptom Record Recording

By default, CP creates and records symptom records when certain events occur. If you want CP to stop recording symptom records, enter:

```
recording symptom off
```

In response, the CP \*SYMPTOM system service stops collecting symptom records.

When you want CP to start creating symptom records again, you must first purge or retrieve the symptom records queued, then enter:

```
recording symptom on
```

#### Purging Symptom Records

To purge any symptom records that are in storage, enter:

```
recording symptom purge
```

In response, CP purges any symptom records that are in storage.

#### Controlling the Symptom Record Limit

By default, CP lets two symptom records accumulate in storage before it notifies you that the records are not being retrieved. If you prefer, you can change this limit. For example, if you want to set the limit to 12 records, enter:

```
recording symptom limit 12
```

### Controlling Symptom Record Retrieval

Once symptom records are being created, you may need to control various aspects of their retrieval. For example, you may need to:

- Specify a new symptom record recording virtual machine
- Start symptom record retrieval manually
- Stop symptom record retrieval
- Disassociate a user ID from symptom record retrieval
- Resume symptom record retrieval

## Collecting Information about System Operation

- Find out how much room is on the symptom record recording virtual machine's A disk.

### Specifying a New Symptom Record Recording Virtual Machine

Normally, your installation sets up a particular virtual machine to be the symptom record recording virtual machine. If you want to have additional virtual machines collect symptom records, then you must do the following:

1. Make sure the new symptom record recording virtual machine has an A disk available to receive the symptom records.
2. Make sure the system programmer authorizes the new virtual machine to receive the records in the IUCV directory statement. The directory entry of the user entering the RETRIEVE utility must have an IUCV directory control statement authorizing the virtual machine to connect to the CP system service which supports the type of record being collected. \*SYMPTOM must be specified for SYMPTOM records. For more information about IUCV, see the *VM/ESA: CP Programming Services* book.
3. Follow the steps outlined in the next section, "Starting Manual Retrieval of Symptom Records."

### Starting Manual Retrieval of Symptom Records

Ordinarily, the symptom record recording virtual machine starts retrieving automatically when you bring up VM/ESA. However, there may be times when you need to start retrieval manually. For example, you may find out through error messages or by entering the QUERY RECORDING command that the symptom recording virtual machine has stopped retrieving. You may also start retrieval manually, as follows:

1. If necessary, disconnect from the operator's virtual machine by entering:  
`disconnect`
2. Log on the symptom record recording virtual machine.
3. Clear any activity in the virtual machine (including retrieval) by entering:  
`#cp system reset`
4. Load CMS into storage by entering:  
`ipl 190`  
or, if your installation has installed CMS in a named saved system,  
`ipl cmsname`  
where *cmsname* is the name of your CMS system.
5. Make sure there is room on the symptom record recording virtual machine's A disk for more symptom records. To find out how full the A disk is, enter:  
`query disk a`  
If the A disk is almost full, process some of the symptom records. Then erase the old files to free space on the A disk.
6. Start symptom record retrieval by entering:  
`retrieve symptom`
7. Disconnect the symptom record recording virtual machine by entering:  
`#cp disconnect`

You can now use the display for another virtual machine.

8. If necessary, reconnect the operator's virtual machine.

### Stopping Symptom Record Retrieval

A task might require you to stop symptom record retrieval. For example, before you can process records stored on the symptom record recording virtual machine's A disk you must stop retrieval.

To stop symptom record retrieval:

1. If necessary, disconnect from the operator's virtual machine by entering:

```
disconnect
```

2. Log on the symptom record recording virtual machine.

3. Stop symptom record retrieval by entering:

```
#cp external
```

**Note:** If the symptom record recording virtual machine enters the CMS DEBUG environment when you enter #CP EXTERNAL, enter GO to return to CMS.

In response, you receive a prompt:

```
HCPRET592A ENTER END OR SUMMARY
```

Enter:

```
end
```

This stops the retrieval of symptom record information. CP continues to store new symptom records in real storage until you resume symptom record retrieval.

**Note:** If you enter SUMMARY instead of END, CP displays the number of symptom records that have been retrieved since the last RETRIEVE command, and retrieval continues. To stop retrieval, you must enter the #CP EXTERNAL command again and respond to the prompt with END.

### Disassociating a User ID from the Retrieval of Symptom Records

1. Stop the recording of SYMPTOM records for this user ID. To do this from a user ID authorized for the class **A** or **B** version of the CP RECORDING command, enter:

```
recording symptom off qid userid
```

Or, the user ID being removed (must be authorized for the class **C**, **E**, or **F** version of the recording command), enter:

```
recording symptom off
```

2. If there are symptom records queued in CP storage for this user ID and you want to save the data, log on the user ID to be deleted and enter:

```
retrieve symptom
```

This will place the symptom records in the proper file for later processing. Disconnect this user by entering:

```
#cp disconnect
```

Log back on the authorized user ID.

## Collecting Information about System Operation

3. If the symptom records queued in CP storage for this user ID are not wanted, they may be purged. To do this from a user ID authorized for the class **A** or **B** version of the CP RECORDING command, enter:

```
recording symptom purge qid userid
```

Or, the user ID being removed (must be authorized for the class **C**, **E**, or **F** version of the recording command), enter:

```
recording symptom purge
```

This will PURGE all the symptom records queued in CP storage for this user ID.

4. Verify the record count is zero and recording is off for this user ID. To do this, enter:

```
query recording
```

**Note:** The deleted user ID remains in the warm start data and in the output of the QUERY RECORDING command until VM is restarted with the COLD option.

5. If the user ID is specified on the SYSTEM\_USERIDS statement in the system configuration file or on the SYSSYMP macroinstruction in HCPSYS, remove that user ID.

**Note:** The user ID OPERSYMP is the default if the SYSSYMP macroinstruction is omitted and no user ID for SYMPTOM is specified in the system configuration file.

### Resuming Symptom Record Retrieval

Ordinarily, after you have stopped symptom record retrieval to view symptom records or to check on the A disk, CMS is still running in the symptom record recording virtual machine. So, to resume symptom record retrieval, you do not have to go through the whole procedure described in "Starting Manual Retrieval of Symptom Records" on page 264. Instead, perform the following steps:

1. Restart symptom record retrieval by entering:

```
retrieve symptom
```

2. Disconnect the symptom record recording virtual machine by entering:

```
#cp disconnect
```

You may now use the display for another virtual machine.

3. If necessary, reconnect the operator's virtual machine.

### Finding Out How Full the Symptom Record A-Disk Is

When the symptom record recording virtual machine's A disk is full, it cannot retrieve any more records. If your installation uses the IBM-supplied PROFILE EXEC to start up the symptom record recording virtual machine, you, the primary system operator, receive a message about the A disk's status when the virtual machine IPLs CMS. CP sends you a message when the A disk is 75% full, 90% full, and completely full. Between messages, you may wish to check the disk yourself.

To view the symptom records, you would use the LINK command so that a second virtual machine could access or link to the symptom record recording virtual

machine's A disk. You would then be able to view the symptom records without interrupting the symptom record retrieval process.

### Processing Symptom Record Information

From time to time, you must process the symptom records stored on the symptom record recording virtual machine's A-disk and make room for new ones. You can do this when you notice the A-disk is nearly full or at intervals set by your installation. In either case, you must:

1. Stop symptom record retrieval.

To do this, see "Stopping Symptom Record Retrieval" on page 265.

2. Process the symptom record information.

You can process the symptom records on the A-disk in one of several ways:

- You can run a program to format the symptom records if such a program is available.
- You can use the VIEWSYM command to view selected symptom records. For more information, see the *VM/ESA: Dump Viewing Facility* book.
- You can use the CMS command, TAPE DUMP, to dump the symptom record files to tape for later processing.
- You can send the files to another user for processing.

To send a file to another virtual machine user, first set up your virtual punch so that CP sends all punch files to the reader of the other virtual machine. Enter:

```
spool punch to userid reader
```

where *userid* is the logon ID of the virtual machine to which you are sending the file.

Then use the CMS command, DISK DUMP, to send the file to the user.

After you process the symptom records, use the CMS command, ERASE, to erase the old files. Erasing the files makes room on the A-disk for new records.

3. Resume symptom record retrieval.

To do this, see "Resuming Symptom Record Retrieval" on page 266.

---

## Summary of Collecting Information about System Operation

As the real system operator, you are responsible for collecting and providing reports of system events, system performance, accounting, error recording, and symptom record recording information.

You provide these reports so that your installation can:

- Fix problems that prevent users from using installation resources
- Identify and fix known problems
- Allocate resources among users in the best way possible
- Plan for future resource requirements.

To collect information about the system's operation, you may use either VM/ESA facilities or facilities provided by your production system.

## Collecting Information about System Operation

You can use VM/ESA facilities to collect information as follows:

- To collect information about system events, start a console log for your operator's virtual machine.
- To collect information about performance, enter one of the following commands:
  - INDICATE LOAD
  - INDICATE LOAD AT *sysname*
  - INDICATE LOAD AT \*
  - INDICATE I/O
  - INDICATE PAGING WAIT
  - INDICATE QUEUES
  - INDICATE VECTOR
  - INDICATE USER
- To collect information about accounting, use the following commands:
  - QUERY RECORDING
  - RECORDING ACCOUNT
  - ACNT
  - RETRIEVE ACCOUNT
- To collect information about hardware errors, use the following commands:
  - QUERY RECORDING
  - RECORDING EREP
  - SET MODE RETRY
  - SET RECORD
  - RETRIEVE EREP
  - CPEREPXA
  - QUERY MITIME
  - SET MITIME
- To collect information about symptom records, use the following commands:
  - QUERY RECORDING
  - RECORDING SYMPTOM
  - RETRIEVE SYMPTOM

---

## Chapter 9. Performing Data Management Services

This chapter discusses VM/ESA facilities you can use to perform data management services. After reading this chapter, you can:

- Use the major data management services
- Understand the importance of data management
- Locate information about VM/ESA facilities you can use for data management
- Use the SPXTAPE command to back up standard spool files and system data files
- Use the SPTAPE command to move files between VM/SP, VM/SP HPO, VM/XA SP, or VM/ESA 370 Feature systems and VM/ESA
- Locate information about production system facilities used for data management.

---

### Overview of Data Management Services

As the real system operator, your job is to make the real resources of your computer installation available to users so that they can get their work done. A resource that is very important to users is their data. A significant part of your job, therefore, is providing services to users to help them manage it. These data management services include:

- Controlling user access to data
- Backing up system and user data
- Moving data between systems
- Archiving user data
- Initializing data storage media.

You can use VM/ESA facilities to help you perform these services. Your production system may also have facilities that can help you manage your installation's data.

---

### Controlling User Access to Data

Part of operating a VM/ESA system is controlling user access to data. Data is usually considered to be a vital asset. The responsibility for safeguarding it from unauthorized persons rests partly on operations.

As an operator you may have to:

- Control how users enter passwords
- Keep track of tapes and disk packs.

### Controlling the Display of Passwords

When a user enters a LOGON command to log on a virtual machine, CP prompts the user for the password. CP masks the password as it is entered, preventing an unauthorized person from reading it on the display screen.

If your installation does not require logon passwords to be kept confidential, you can allow users to enter the password on the same line as the LOGON command. To do this, enter:

```
set password logon include
```

## Performing Data Management Services

To reset the system to require the more secure procedure, enter:

```
set password logon separate
```

When a user enters an AUTOLOG command to log on to the system automatically, CP prompts the user for the autolog password. CP masks the password as it is entered, preventing an unauthorized person from reading it on the display screen.

If your installation does not require autolog passwords to be kept confidential, you can specify that users must enter the password on the same line as the AUTOLOG command. To do this, enter:

```
set password autolog include
```

To reset the system to require the more secure procedure, enter:

```
set password autolog separate
```

When a user enters an XAUTOLOG command to log on to the system automatically, CP prompts the user for the xautolog password. CP masks the password as it is entered, preventing an unauthorized person from reading it on the display screen.

If your installation does not require XAUTOLOG passwords to be kept confidential, you can allow users to enter the password on the same line as the XAUTOLOG command. To do this, enter:

```
set password xautolog include
```

To reset the system to require the more secure procedure, enter:

```
set password xautolog separate
```

VM/ESA users can share the data they have on minidisks by using the LINK command. VM/ESA enables your installation to choose whether a user may enter a link password on the input line with the LINK command.

When you first bring up the VM/ESA system, CP requires all users to enter the link password on a separate line from the LINK command. When a user enters a LINK command, CP prompts the user for the link password. CP masks the password as it is entered, preventing an unauthorized person from reading it on the display screen.

If your installation does not require link passwords to be kept confidential, you can allow users to enter the link password on the same line as the LINK command. To do this, enter:

```
set password link include
```

To reset the system to require the more secure procedure, enter:

```
set password link separate
```

## Controlling the Journaling of Incorrect Password Use

When a user enters a LOGON command or a LINK command, CP prompts the user for the password. You can begin or end the creation of accounting records that are generated each time a user enters an incorrect password. To collect accounting records and receive a message when a user enters an incorrect LINK password, enter:

```
set journal link on
```

To halt record creation, enter:

```
set journal link off
```

To collect accounting records and receive a message when a user enters an incorrect LOGON, AUTOLOG, or XAUTOLOG password, enter:

```
set journal logon on
```

To halt record creation, enter:

```
set journal logon off
```

To determine whether CP is generating accounting records, enter:

```
query journal
```

For more information on the SET JOURNAL and QUERY JOURNAL commands, see the *VM/ESA: CP Command and Utility Reference* book.

## Clearing Temporary Disk (TDISK) Space

You may want to prevent a user from accessing sensitive data remaining on a temporary disk from a previous user. To request that all temporary disks be cleared, specify ENABLE TDISK\_CLEARING on the FEATURES statement in the system configuration file or SYSRES SYSCLR=YES in HCPSYS ASSEMBLE. This causes all temporary disk space to be cleared:

- At IPL
- When CP volumes containing TDISK space are attached to the system
- When a user detaches a TDISK.

To determine whether CP is clearing TDISK space, enter:

```
query tdiskclr
```

For more information on the QUERY TDISKCLR command, see the *VM/ESA: CP Command and Utility Reference* book.

## Keeping Track of Tapes and Disk Packs

Most installations have a library where they keep tapes and disk packs. Depending on the size of the installation, the responsibilities of the operator who serves as the librarian can be substantial.

In a large installation, a librarian may have to:

- Label tapes and disk packs
- Control the physical location of the tapes and disk packs
- Inventory tapes and disk packs
- Replace defective tapes and packs
- Maintain an adequate supply of scratch tapes and disk packs
- Maintain lists of authorized users
- Follow special security procedures for sensitive tapes and packs
- Conduct periodic audits.

### Backing Up System and User Data

Backing up system and user data is another important part of operating a VM/ESA system. Data is usually considered to be a vital asset. The responsibility for keeping backup copies in case originals are inadvertently destroyed rests partly on operations.

As an operator you may have to back up:

- Data that resides on disk or tape
- Spool files and system data files.

### Backing Up Data on Disk or Tape

To back up data on disk or tape, you may have to:

- Copy data from one disk to another
- Dump data from disk to tape
- Restore data from tape to disk
- Copy data from one tape to another.

#### Copying Data from One Disk to Another

If you need to copy data from one disk to another, use the DASD Dump Restore program that IBM provides with VM/ESA. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

#### Dumping Data from Disk to Tape

If you need to dump all or part of the data on DASD to a tape, use the DASD dump restore utility that IBM provides with VM/ESA. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

If you want to dump one or more CMS files to tape, use the CMS TAPE DUMP command, or the vmfplc2 command.

For example, if you want to dump to tape all of the files on your A disk with a file type of ACCOUNT, and:

- You want CMS to write a tape mark after each file
- You want a printout of the names of the files that were dumped
- The tape drive dedicated to your virtual machine is assigned virtual device number 184. Enter:

```
tape dump * account a (wtm print tap4
```

The asterisk indicates that you want to dump all of the files on your A disk with the file type of ACCOUNT. If you want to dump only a specific file, specify the file's name instead of the asterisk.

**Note:** The records in these CMS files can be of either fixed or variable length. However, none of the files can be larger than one DASD volume.

## Restoring Data to Disk from Tape

If you need to restore data to DASD from a tape, and you used the DASD dump restore utility to create the tape, use the same utility to restore it. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

If you want to load one or more CMS files from a tape onto a CMS minidisk, and you used the CMS TAPE DUMP command to dump them, use the CMS TAPE LOAD command to load them.

For example, if you want to load some CMS files onto your K disk that were previously dumped to tape, and:

- You want CMS to display the names of all of the files that were loaded
- The tape drive on which the tape is mounted is assigned the virtual device number 183. Enter:

```
tape load * * k (term tap3
```

The asterisks indicate that you want CMS to load all of the files. If you want CMS to load only a specific file, specify the file's name and type instead of the asterisks.

## Copying Tapes

If you need to copy data from one tape to another, use the DASD dump restore utility that IBM provides with VM/ESA. For more information, see “Running the DASD Dump Restore (DDR) Utility” on page 307.

## Backing Up Standard Spool Files and System Data Files

Much of your installation's data resides on disk, a significant portion of it in the spooling system as standard spool files and system data files. Standard spool files include files in the reader, printer, and punch queues. System data files include image libraries, named saved systems, saved segments, national language support files (such as message repository files), system trace files, and user class restructure files.

You may want to back up standard spool files under one of the following circumstances:

- When you plan to perform a clean start or cold start (because all standard spool files are lost)
- When CP runs out of either spooling space or spool file identification numbers to assign to new spool files.

In either of these situations, you can dump some or all of your system's standard spool files to tape. Then, after you bring the system back up, or when you have less spooling activity, you can restore the files for processing as usual.

You can do the same thing with system data files. VM/ESA does not save system data files over a clean start. Although VM/ESA does save system data files over a cold start, it is still a good idea to make backup copies of them. Although you may not have many of these files, it might take users or support personnel a long time to recreate them. Having a copy of the files on tape allows you to restore them quickly in case of a DASD or other unexpected error.

To accomplish either of these tasks, use the SPXTAPE command. It allows you to dump standard spool files and system data files to tape and restore them.

**Note:** Although the SPTAPE command is still supported for these tasks, SPXTAPE is faster and uses fewer tapes. SPXTAPE also provides certain functions not available with SPTAPE, such as the ability to dump to and load from multiple tape drives. Keep in mind that SPXTAPE and SPTAPE are not compatible. You cannot use one to load or scan files dumped by the other. The primary role of SPTAPE is in moving files between VM systems that do not support SPXTAPE.

### Dumping Standard Spool Files to Tape

Use the SPXTAPE DUMP command to save copies of standard spool files on tape. SPXTAPE processes only closed reader, printer, and punch files; open or in-use files cannot be dumped. By default, the files are dumped regardless of their hold status.

To dump all the standard spool files to tape:

1. Find one or more free tape drives (it is recommended that you use at least two drives to allow overlapping tape mounting) and mount scratch tapes on them.

A free tape drive is one that is not offline, in use, or dedicated to another virtual machine. The tape drive must be fully supported by VM/ESA. For a list of supported devices, see the *VM/ESA: General Information* book. To find out the status of all of your tape drives, enter:

```
query tapes all
```

If the status of any tape drive is FREE, mount the scratch tape, which has been enabled for writing, and go to the next step. To write-enable a tape reel, make sure the tape has a write-enable ring. To write-enable a tape cartridge, turn the thumbwheel on the cartridge so the white dot does not show.

If the status of any tape drive is OFFLINE, enter:

```
vary online rdev
```

where *rdev* is the tape drive's real device number. Then mount the scratch tape, enabled for writing, and go to the next step.

2. Attach each tape drive to your virtual machine. Enter:

```
attach rdev to * as vdev
```

where *vdev* is an available virtual device number.

3. Spool your console to wherever you want the SPXTAPE log files to go. For example, spool the console to yourself so the logs are sent to your reader. Enter:

```
spool cons *
```

**Note:** If you spool your console *after* entering the SPXTAPE command, the logs may be sent to different destinations.

4. If necessary, use the CMS TAPE command to position each tape to where CP can begin dumping files. The tape must be positioned either at the beginning of the volume or following a tape mark.

5. Dump all the standard spool files to tape. Enter:

```
spxtape dump vdev1-vdev2 std all run
```

where *vdev1-vdev2* is the range of virtual device numbers of the tape drives you are using. If you are using only one drive, you can enter a single virtual

device number. The RUN operand rewinds and unloads the tape when processing to that volume completes.

In response, CP dumps a copy of each closed reader, printer, and punch spool file to tape without removing the files from their queues on the system. All the available tape drives in the specified range are used concurrently; while one file is still being written to a tape, the next file is written to the next available tape. As it processes the files, CP reports its progress at the interval requested with the PROGRESS\_interval option (or about every 15 seconds by default) by displaying a message on the screen.

**Note:** If CP is running out of either spooling space or spool file identification numbers to assign to new files, you may wish to have CP purge each file after dumping the file to tape. If you do, use the PURGE operand as follows:

```
spxtape dump vdev1-vdev2 std all run purge
```

CP responds as before, except it removes each dumped file from the queue. CP also tells the file owner (you or another user) it has purged the file.

CP records information about the dump in two or more logs. The command summary log contains information about the progress and status of the logical SPXTAPE command. A logical SPXTAPE command can be either one independent command or a sequence of appended commands (entered with the APPEND operand). The volume log contains information about the files processed by the logical SPXTAPE command that are associated with a particular tape volume. Therefore, several volume logs are created for one logical SPXTAPE command if more than one tape drive is used or if more than one tape volume is mounted on any drive.

If any tape is filled before all the files are dumped, CP sends you a response that:

- a. Asks you to mount the next tape on that device
- b. Indicates the number of files and spool pages processed so far.

If you are using more than one tape drive, CP continues dumping to the other drives. When you mount and ready the new tape, CP starts dumping to that drive again. When CP has dumped all the files, it tells you the dump function is complete.

6. Remove the tapes from the tape drives.
7. If you want to find out what files have been dumped, you can look at the volume logs. Each volume log has a unique name (file name and file type) related to both the tape volume and the SPXTAPE command that caused the creation of the log. For example, the volume log for the first volume processed on virtual device 181 for an SPXTAPE DUMP command has the name:

```
xxyyD181 hhmss01
```

where xxyy is the month and day the command was issued, D indicates the operation was DUMP, 181 is the virtual device number of the tape drive, hhmss is the time stamp, and 01 is the volume sequence number.

The volume log contains the following entry for each file written to the volume:

```
USERID FILE QUEUE FILENAME FILETYPE OPENDATE OPENTIME ORIGINID SIZE SEG_STAT HOLDSTAT RECCOUNT C FORM DEST LASTPAGE
userid file queue filename filetype opendate opentime originid size COMPLETE holdstat reccount c form dest lastpage
```

## Performing Data Management Services

**Note:** The heading is included only once for each uninterrupted series of entries.

If the SEG\_STAT field contains PARTIAL instead of COMPLETE, the file is split between this volume and one or more other volumes, and this is *not* the part that completes the file (the last part dumped). If all parts of the file have dumped correctly, the volume log entry for the last part dumped contains COMPLETE in the SEG\_STAT field.

The preceding steps tell you how to dump all the standard spool files to tape. You can also select the spool files to be dumped by queue, user ID, spool file identification number or range, class, destination value, form name, file name pattern, file type pattern, hold status, CSE copy status, or combinations of these attributes. A file name or file type pattern can be either a complete file name or file type or a string containing wild cards (\* and %). The following example shows you how to dump particular classes of files from the reader and printer queues.

For more information about the SPXTAPE logs and the options you can specify on the SPXTAPE DUMP command, see the *VM/ESA: CP Command and Utility Reference* book.

**Example—Dumping Particular Classes of Reader and Printer Spool Files to Tape:** You are planning to shut down the system and bring up a new maintenance level of VM/ESA with a cold start. Your installation decides to save the class S files in the reader queue and the class T files in the printer queue and restore them after the cold start. Because there is no shortage of spooling space, you do not have to purge any files from the system.

To dump only the class S reader files and class T printer files to tape:

1. Find one or more free tape drives. Enter:

```
query tapes all
```

CP's response tells you the status of tape drives 5C0 and 61B is FREE. Both are 3420s, so you mount a scratch tape on each with a write-enable ring.

2. Attach the tape drives to your virtual machine. Virtual device numbers 181 and 182 are available, so you enter:

```
attach 5c0 to * as 181
attach 61B to * as 182
```

3. Spool your console. To spool the console to yourself, enter:

```
spool cons *
```

4. If necessary, use the CMS TAPE command to position each tape to the beginning of the volume or following a tape mark.

5. Start the dump. Enter:

```
spxtape dump 181-182 reader class s append
spxtape dump 181-182 printer class t run
```

Specifying the APPEND operand on the first command combines these two commands into a single logical command. CP begins processing the files as soon as you enter the first command in the sequence. CP displays progress responses, requests to mount new tapes (if necessary), and a final response when the dump function is complete. Each file dumped is recorded in the volume log for that tape volume.

6. Remove the tapes from the tape drives.

### Restoring Standard Spool Files from Tape

Use the SPXTAPE LOAD command to restore copies of VM/ESA standard spool files that were previously saved on tape by SPXTAPE DUMP.

To restore all the standard spool files from tape:

1. Find one or more free tape drives (it is recommended that you use at least two drives to allow overlapping tape mounting) and mount the tapes that hold the spool files to be loaded.

The order in which you mount the tapes does not matter, as long as the files were dumped with one logical SPXTAPE command and you use one logical SPXTAPE command to load them. A logical SPXTAPE command can be either one independent command or a sequence of appended commands (entered with the APPEND operand). If a file is split across two or more tape volumes, CP fits the parts together correctly.

A free tape drive is one that is not offline, in use, or dedicated to another virtual machine. The tape drive must be fully supported by VM/ESA. For a list of supported devices, see the *VM/ESA: General Information* book. To find out the status of all of your tape drives, enter:

```
query tapes all
```

If the status of any tape drive is FREE, mount a dump tape, which has been enabled for reading only, and go to the next step. To enable a tape reel as read-only, make sure the tape does not have a write-enable ring. To enable a tape cartridge as read-only, turn the thumbwheel on the cartridge so the white dot shows.

If the status of any tape drive is OFFLINE, enter:

```
vary online rdev
```

where *rdev* is the tape drive's real device number. Then mount the tape, enabled for reading only, and go to the next step.

2. Attach each tape drive to your virtual machine. Enter:

```
attach rdev to * as vdev
```

where *vdev* is an available virtual device number.

3. Spool your console to wherever you want the SPXTAPE log files to go. For example, spool the console to yourself so the logs are sent to your reader.

Enter:

```
spool cons *
```

**Note:** If you spool your console *after* entering the SPXTAPE command, the logs may be sent to different destinations.

4. If necessary, use the CMS TAPE command to position each tape to where CP can begin reading data. The tape must be positioned either at the beginning of the volume or at the beginning of a tape file (following the tape mark at the end of the previous tape file).
5. If you want to find out what standard spool files are on tape before you do the load, and the volume logs for the dump are not available, you can use the SPXTAPE SCAN command.

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- a. To scan the tape, enter:

```
spxtape scan vdev1-vdev2 std all run
```

where *vdev1-vdev2* is the range of virtual device numbers for the tape drives you are using. If you are using only one drive, you can enter a single virtual device number. The RUN operand rewinds and unloads the tape when processing to that volume completes.

**Note:** If you have only one tape to scan on each tape drive, you may prefer to use the REWIND operand, which rewinds the tape but does not unload it from the drive. If the tape contains multiple tape files dumped by multiple logical SPXTAPE DUMP commands, you must use multiple logical SPXTAPE SCAN commands to scan them. In that case, you may want to use the LEAVE operand, which leaves the tape positioned to process the next tape file.

In response, CP scans each reader, printer, and punch file in the selected tape file on each tape. As it processes the files, CP reports its progress at the interval requested with the PROGRESS\_interval option (or about every 15 seconds by default) by displaying a message on the screen.

CP records information about the scan in two or more logs. The command summary log contains information about the progress and status of the logical SPXTAPE command. The volume log contains information about the files processed by the logical SPXTAPE command that are associated with a particular tape volume. Therefore, several volume logs are created for one logical SPXTAPE command if more than one tape drive is used or if more than one tape volume is mounted on any drive.

- b. If you entered the SPXTAPE SCAN command with the RUN disposition, CP sends you a response when processing of a tape volume is complete that:

- 1) Asks you to mount the next tape on that device
- 2) Indicates the number of files and spool pages processed so far.

If there are other tapes to be processed, mount the next tape. If you are using more than one tape drive, CP continues scanning on the other drives. When you mount and ready the new tape, CP starts scanning on that drive again.

If there are no other tapes to be mounted, and all tapes currently mounted have finished processing (you have received the “mount next tape” response for each drive), use the SPXTAPE END command to end the operation. Enter:

```
spxtape end vdev1-vdev2
```

where *vdev1-vdev2* is same virtual device range you specified on the SPXTAPE SCAN command. The tape is positioned according to the disposition specified on the SPXTAPE SCAN command.

- c. To see the results of the scan, look at the volume logs. Each volume log has a unique name (file name and file type) related to both the tape volume and the SPXTAPE command that caused the creation of the log. For example, the volume log for the second volume processed on virtual device 181 for an SPXTAPE SCAN command has the name:

```
xyyyS181 hhmms02
```

where *xxyy* is the month and day the command was issued, *S* indicates the operation was SCAN, *181* is the virtual device number of the tape drive, *hhmmss* is the time stamp, and *02* is the volume sequence number.

The volume log contains the following entry for each file scanned on the volume:

```
USERID FILE QUEUE FILENAME FILETYPE OPENDATE OPENTIME ORIGINID SIZE SEG_STAT HOLDSTAT RECCOUNT C FORM DEST LASTPAGE
userid file queue filename filetype opendate opentime originid size COMPLETE holdstat reccount c form dest lastpage
```

**Note:** The heading is included only once for each uninterrupted series of entries.

If the *SEG\_STAT* field contains *PARTIAL* instead of *COMPLETE*, it means one of the following:

- The file is split between this volume and one or more other volumes, and this part is *not* the one that completes the file (the last part scanned). If all parts of the file have scanned correctly, the volume log entry for the last part scanned contains *COMPLETE* in the *SEG\_STAT* field.

**Note:** The last part scanned may contain the end of the file, the beginning, or some section in between, depending on the order in which the tape volumes were mounted.

- CP encountered an I/O error or some other problem trying to read the file from the tape. In that case, you also receive error messages describing the problem. The error messages are recorded in the command summary log.

6. If necessary, use the *CMS TAPE* command to position each tape to the beginning of the tape file you want to load.

7. Load all the standard spool files. Enter:

```
spxtape load vdev1-vdev2 std all run
```

where *vdev1-vdev2* is the range of virtual device numbers of the tape drives you are using. If you are using only one drive, you can enter a single virtual device number. The *RUN* operand rewinds and unloads the tape when processing of that volume completes.

**Note:** If the tape contains tape files dumped by multiple logical *SPXTAPE DUMP* commands, you must use multiple logical *SPXTAPE LOAD* commands to load them. In that case, you may prefer to use the *LEAVE* operand, which leaves the tape positioned to process the next tape file.

In response, CP reads each reader, printer, and punch file from the selected tape file on each tape and adds it to the appropriate spooling system queue. All the available tape drives in the specified range are used concurrently; while one file is still being loaded from a tape, the next file is read from the next available tape. As it processes the files, CP reports its progress at the interval requested with the *PROGRESS\_interval* option (or about every 15 seconds by default) by displaying a message on the screen. As it loads each file, CP assigns a new spool file identification number to it. CP also sends a response to the owner of the file (if the owner is logged on and has *IMSG* set *ON*).

CP records information about the load in two or more logs. The command summary log contains information about the progress and status of the logical

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SPXTAPE command. The volume log contains information about the files processed by the logical SPXTAPE command that are associated with a particular tape volume. Therefore, several volume logs are created for one logical SPXTAPE command if more than one tape drive is used or if more than one tape volume is mounted on any drive.

8. If you entered the SPXTAPE LOAD command with the RUN disposition, CP sends you a response when processing of a tape volume is complete that:
  - a. Asks you to mount the next tape on that device
  - b. Indicates the number of files and spool pages processed so far.

If there are other tapes to be processed, mount the next tape. If you are using more than one tape drive, CP continues loading from the other drives. When you mount and ready the new tape, CP starts loading from that drive again.

If there are no other tapes to be mounted, and all tapes currently mounted have finished processing (you have received the "mount next tape" response for each drive), use the SPXTAPE END command to end the operation. Enter:

```
spxtape end vdev1-vdev2
```

where *vdev1-vdev2* is same virtual device range you specified on the SPXTAPE LOAD command. The tape is positioned according to the disposition specified on the SPXTAPE LOAD command.

9. Remove the tapes from the tape drives.
10. If you want to find out what files have been loaded, you can look at the volume logs. Each volume log has a unique name (file name and file type) related to both the tape volume and the SPXTAPE command that caused the creation of the log. For example, the volume log for the second volume processed on virtual device 182 for an SPXTAPE LOAD command has the name:

```
xxyyL182 hhmms02
```

where *xxyy* is the month and day the command was issued, *L* indicates the operation was LOAD, *182* is the virtual device number of the tape drive, *hhmms* is the time stamp, and *02* is the volume sequence number.

The volume log contains the following entry for each file loaded from the volume:

```
USERID FILE QUEUE FILENAME FILETYPE OPENDATE OPENTIME ORIGINID SIZE SEG_STAT HOLDSTAT RECCOUNT C FORM DEST LASTPAGE  
userid file queue filename filetype opendate opentime originid size COMPLETE holdstat reccount c form dest lastpage
```

**Note:** The heading is included only once for each uninterrupted series of entries.

If the SEG\_STAT field contains PARTIAL instead of COMPLETE, it means of one the following:

- The file is split between this volume and one or more other volumes, and this part is *not* the one that completes the file (the last part loaded). If all parts of the file have loaded correctly, the volume log entry for the last part loaded contains COMPLETE in the SEG\_STAT field.

**Note:** The last part loaded may contain the end of the file, the beginning, or some section in between, depending on the order in which the tape volumes were mounted.

- CP encountered an I/O error or some other problem trying to read the file from the tape or write it to DASD. In that case, you also receive error messages describing the problem. The error messages are recorded in the command summary log.

The preceding steps tell you how to restore all the standard spool files dumped to tape. You can also select the spool files to be loaded by queue, user ID, spool file identification number or range, class, destination value, form name, file name pattern, file type pattern, hold status, or combinations of these attributes. A file name or file type pattern can be either a complete file name or file type or a string containing wild cards (\* and %). The following example shows you how to restore a particular class of files to the reader and printer queues.

For more information about the SPXTAPE logs and the other options you can specify on the SPXTAPE LOAD command, see the *VM/ESA: CP Command and Utility Reference* book.

**Example—Loading a Particular Class of Reader and Printer Spool Files from Tape:** You bring up a new maintenance level of VM/ESA with a cold start. Before you shut down the VM/ESA system, you dumped all the standard spool files to tape. But your installation decides to restore only the class A reader files and printer files.

To load only the class A reader and printer files from tape:

1. Find one or more free tape drives. Enter:

```
query tapes all
```

CP's response tells you the status of tape drives 5C0 and 61B is FREE. Both are 3420s, so you mount a dump tape on each without a write-enable ring.

2. Attach the tape drives to your virtual machine. Virtual device numbers 181 and 182 are available, so you enter:

```
attach 5c0 to * as 181
attach 61b to * as 182
```

3. Spool your console. To spool the console to yourself, enter:

```
spool cons *
```

4. If necessary, use the CMS TAPE command to position each tape to the beginning of the tape file that contains the files you want to load.

5. Start the load. Enter:

```
spxtape load 181-182 reader class a append
spxtape load 181-182 printer class a run
```

Specifying the APPEND operand on the first command combines these two commands into a single logical command. CP begins processing the files after you enter the last command in the sequence. CP displays progress responses and requests to mount new tapes. Each file loaded is recorded in the volume log for that tape volume.

**Note:** The previous procedure assumes the files were saved on tape using one logical SPXTAPE DUMP command. If independent SPXTAPE DUMP commands were used to save the files (for example, if they were saved at different times), you must use independent (not appended) SPXTAPE LOAD commands to restore them. Wait for the first

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command to finish processing before you enter the second command. The disposition operand (RUN, REWIND, or LEAVE) you use on each command depends on whether the files are contained on one tape volume or multiple tape volumes.

6. When there are no more tapes to be processed (all tapes currently mounted have finished processing and there are no more tapes to be mounted), end the SPXTAPE LOAD operation. Enter:

```
spxtape end 181-182
```

7. Remove the tapes from the tape drives.

### Dumping System Data Files to Tape

Use the SPXTAPE DUMP command to save copies of system data files on tape.

To dump all the system data files to tape:

1. Find one or more free tape drives (it is recommended that you use at least two drives to allow overlapping tape mounting) and mount scratch tapes on them.

A free tape drive is one that is not offline, in use, or dedicated to another virtual machine. The tape drive must be fully supported by VM/ESA. For a list of supported devices, see the *VM/ESA: General Information* book. To find out the status of all of your tape drives, enter:

```
query tapes all
```

If the status of any tape drive is FREE, mount the scratch tape, which has been enabled for writing, and go to the next step. To write-enable a tape reel, make sure the tape has a write-enable ring. To write-enable a tape cartridge, turn the thumbwheel on the cartridge so the white dot does not show.

If the status of any tape drive is OFFLINE, enter:

```
vary online rdev
```

where *rdev* is the tape drive's real device number. Then mount the scratch tape, enabled for writing, and go to the next step.

2. Attach each tape drive to your virtual machine. Enter:

```
attach rdev to * as vdev
```

where *vdev* is an available virtual device number.

3. Spool your console to wherever you want the SPXTAPE log files to go. For example, spool the console to yourself so the logs are sent to your reader. Enter:

```
spool cons *
```

**Note:** If you spool your console *after* entering the SPXTAPE command, the logs may be sent to different destinations.

4. If necessary, use the CMS TAPE command to position each tape to where CP can begin dumping files. The tape must be positioned either at the beginning of the volume or following a tape mark.

5. Dump all the system data files to tape: Enter:

```
spxtape dump vdev1-vdev2 sdf all run
```

where *vdev1-vdev2* is the range of virtual device numbers of the tape drives you are using. If you are using only one drive, you can enter a single virtual

device number. The RUN operand rewinds and unloads the tape when processing to that volume completes.

In response, CP dumps a copy of each image library, named saved system, saved segment, national language support file, system trace file, and user class restructure file to tape without removing the files from their queues on the system. All the available tape drives in the specified range are used concurrently; while one file is still being written to a tape, the next file is written to the next available tape. As it processes the files, CP reports its progress at the interval requested with the PROGRESS\_interval option (or about every 15 seconds by default) by displaying a message on the screen.

CP records information about the dump in two or more logs. The command summary log contains information about the progress and status of the logical SPXTAPE command. A logical SPXTAPE command can be either one independent command or a sequence of appended commands (entered with the APPEND operand). The volume log contains information about the files processed by the logical SPXTAPE command that are associated with a particular tape volume. Therefore, several volume logs are created for one logical SPXTAPE command if more than one tape drive is used or if more than one tape volume is mounted on any drive.

If any tape is filled before all the files are dumped, CP sends you a response that:

- a. Asks you to mount the next tape on that device
- b. Indicates the number of files and spool pages processed so far.

If you are using more than one tape drive, CP continues dumping to the other drives. When you mount and ready the new tape, CP starts dumping to that drive again. When CP has dumped all the files, it tells you the dump function is complete.

6. Remove the tapes from the tape drives.
7. If you want to find out what files have been dumped, you can look at the volume logs. Each volume log has a unique name (file name and file type) related to both the tape volume and the SPXTAPE command that caused the creation of the log. For example, the volume log for the first volume processed on virtual device 181 for an SPXTAPE DUMP command has the name:

*xxyyD181 hhmms01*

where *xxyy* is the month and day the command was issued, D indicates the operation was DUMP, 181 is the virtual device number of the tape drive, *hhmms* is the time stamp, and 01 is the volume sequence number.

The volume log contains the following entry for each file written to the volume:

```

USERID FILE QUEUE FILENAME FILETYPE OPENDATE OPENTIME ORIGINID SIZE SEG_STAT HOLDSTAT RECCOUNT C FORM DEST LASTPAGE
userid file queue filename filetype opendate opentime originid size COMPLETE NONE reccount c lastpage
    
```

**Note:** The heading is included only once for each uninterrupted series of entries.

If the SEG\_STAT field contains PARTIAL instead of COMPLETE, the file is split between this volume and one or more other volumes, and this is *not* the part that completes the file (the last part dumped). If all parts of the file have dumped correctly, the volume log entry for the last part dumped contains COMPLETE in the SEG\_STAT field.

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The preceding steps tell you how to dump all the system data files to tape. You can also select the system data files to be dumped by queue, user ID (system trace files only), spool file identification number or range, class, file name pattern, file type pattern, or combinations of these attributes. A file name or file type pattern can be either a complete file name or file type or a string containing wild cards (\* and %). The following example shows you how to dump a particular class of image libraries and national language support files.

For more information about the SPXTAPE logs and the options you can specify on the SPXTAPE DUMP command, see the *VM/ESA: CP Command and Utility Reference* book.

**Example—Dumping a Class of Image Libraries and National Language Support Files to Tape:** Your installation decides to save, for backup purposes, all the active (class A) image libraries and national language support files.

To dump only the class A image libraries and national language support files to tape:

1. Find one or more free tape drives. Enter:  

```
query tapes all
```

CP's response tells you the status of tape drives 5C0 and 61B is FREE. Both are 3420s, so you mount a scratch tape on each with a write-enable ring.
2. Attach the tape drives to your virtual machine. Virtual device numbers 181 and 182 are available, so you enter:  

```
attach 5c0 to * as 181  
attach 61b to * as 182
```
3. Spool your console. To spool the console to yourself, enter:  

```
spool cons *
```
4. If necessary, use the CMS TAPE command to position each tape to the beginning of the volume or following a tape mark.
5. Start the dump. Enter:  

```
spxtape dump 181-182 img class a append  
spxtape dump 181-182 nls class a run
```

Specifying the APPEND operand on the first command combines these two commands into a single logical command. CP begins processing the files as soon as you enter the first command in the sequence. CP displays progress responses, requests to mount new tapes (if necessary), and a final response when the dump function is complete. Each file dumped is recorded in the volume log for that tape volume.
6. Remove the tapes from the tape drives.

### Restoring System Data Files from Tape

Use the SPXTAPE LOAD command to restore copies of VM/ESA system data files that were previously saved on tape by SPXTAPE DUMP.

To restore all the system data files from tape:

1. Find one or more free tape drives (it is recommended that you use at least two drives to allow overlapping tape mounting) and mount the tapes that hold the system data files to be loaded.

The order in which you mount the tapes does not matter, as long as the files were dumped with one logical SPXTAPE command and you use one logical SPXTAPE command to load them. A logical command can be either one independent command or a sequence of appended commands (entered with the APPEND operand). If a file is split across two or more tape volumes, CP fits the parts together correctly.

A free tape drive is one that is not offline, in use, or dedicated to another virtual machine. The tape drive must be fully supported by VM/ESA. For a list of supported devices, see the *VM/ESA: General Information* book. To find out the status of all of your tape drives, enter:

```
query tapes all
```

If the status of any tape drive is FREE, mount a dump tape, which has been enabled for reading only, and go to the next step. To enable a tape reel as read-only, make sure the tape does not have a write-enable ring. To enable a tape cartridge as read-only, turn the thumbwheel on the cartridge so the white dot shows.

If the status of any tape drive is OFFLINE, enter:

```
vary online rdev
```

where *rdev* is the tape drive's real device number. Then mount the tape, enabled for reading only, and go to the next step.

2. Attach each tape drive to your virtual machine. Enter:

```
attach rdev to * as vdev
```

where *vdev* is an available virtual device number.

3. Spool your console to wherever you want the SPXTAPE log files to go. For example, spool the console to yourself so the logs are sent to your reader. Enter:

```
spool cons *
```

**Note:** If you spool your console *after* entering the SPXTAPE command, the logs may be sent to different destinations.

4. If necessary, use the CMS TAPE command to position each tape to where CP can begin reading data. The tape must be positioned either at the beginning of the volume or at the beginning of a tape file (following the tape mark at the end of the previous tape file).
5. If you want to find out what system data files are on tape before you do the load, and the volume logs for the dump are not available, you can use the SPXTAPE SCAN command.

- a. To scan the tape, enter:

```
spxtape scan vdev1-vdev2 sdf all run
```

where *vdev1-vdev2* is the range of virtual device numbers for the tape drives you are using. If you are using only one drive, you can enter a single virtual device number. The RUN operand rewinds and unloads the tape when processing to that volume completes.

**Note:** If you have only one tape to scan on each tape drive, you may prefer to use the REWIND operand, which rewinds the tape but does not unload it from the drive. If the tape contains multiple tape files dumped by multiple logical SPXTAPE DUMP commands, you

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must use multiple SPXTAPE SCAN commands to scan them. In that case, you may want to use the LEAVE operand, which leaves the tape positioned to process the next tape file.

In response, CP scans each image library, named saved system, saved segment, national language support file, system trace file, and user class restructure file in the selected tape file on each tape. As it processes the files, CP reports its progress at the interval requested with the PROGRESS\_interval option (or about every 15 seconds by default) by displaying a message on the screen.

CP records information about the scan in two or more logs. The command summary log contains information about the progress and status of the logical SPXTAPE command. The volume log contains information about the files processed by the logical SPXTAPE command that are associated with a particular tape volume. Therefore, several volume logs are created for one logical SPXTAPE command if more than one tape drive is used or if more than one tape volume is mounted on any drive.

- b. If you entered the SPXTAPE SCAN command with the RUN disposition, CP sends you a response when processing of a tape volume is complete that:

- 1) Asks you to mount the next tape on that device
- 2) Indicates the number of files and spool pages processed so far.

If there are other tapes to be processed, mount the next tape. If you are using more than one tape drive, CP continues scanning on the other drives. When you mount and ready the new tape, CP starts scanning on that drive again.

If there are no other tapes to be mounted, and all tapes currently mounted have finished processing (you have received the "mount next tape" response for each drive), use the SPXTAPE END command to end the operation. Enter:

```
spxtape end vdev1-vdev2
```

where *vdev1-vdev2* is same virtual device range you specified on the SPXTAPE SCAN command. The tape is positioned according to the disposition specified on the SPXTAPE SCAN command.

- c. To see the results of the scan, look at the volume logs. Each volume log has a unique name (file name and file type) related to both the tape volume and the SPXTAPE command that caused the creation of the log. For example, the volume log for the second volume processed on virtual device 181 for an SPXTAPE SCAN command has the name:

```
xxyyS181 hhmms02
```

where *xxyy* is the month and day the command was issued, *S* indicates the operation was SCAN, *181* is the virtual device number of the tape drive, *hhmms* is the time stamp, and *02* is the volume sequence number.

The volume log contains the following entry for each file scanned on the volume:

```
USERID FILE QUEUE FILENAME FILETYPE OPENDATE OPENTIME ORIGINID SIZE SEG_STAT HOLDSTAT RECCOUNT C FORM DEST LASTPAGE  
userid file queue filename filetype opendate opentime originid size COMPLETE NONE reccount c lastpage
```

**Note:** The heading is included only once for each uninterrupted series of entries.

If the SEG\_STAT field contains PARTIAL instead of COMPLETE, it means one of the following:

- The file is split between this volume and one or more other volumes, and this part is *not* the one that completes the file (the last part scanned). If all parts of the file have scanned correctly, the volume log entry for the last part scanned contains COMPLETE in the SEG\_STAT field.

**Note:** The last part scanned may contain the end of the file, the beginning, or some section in between, depending on the order in which the tape volumes were mounted.

- CP encountered an I/O error or some other problem trying to read the file from the tape. In that case, you also receive error messages describing the problem. The error messages are recorded in the command summary log.

6. If necessary, use the CMS TAPE command to position each tape to the beginning of the tape file you want to load.

7. Load all the system data files. Enter:

```
spxtape load vdev1-vdev2 sdf all run
```

where *vdev1-vdev2* is the range of virtual device numbers of the tape drives you are using. If you are using only one drive, you can enter a single virtual device number. The RUN operand rewinds and unloads the tape when processing of that volume completes.

**Notes:**

- a. If the tape contains tape files dumped by multiple logical SPXTAPE DUMP commands, you must use multiple logical SPXTAPE LOAD commands to load them. In that case, you may prefer to use the LEAVE operand, which leaves the tape positioned to process the next tape file.
- b. You can prevent the loading of any file that duplicates a file already on the system. Use the NODUP operand, as follows:

```
spxtape load vdev1-vdev2 sdf all run nodup
```

However, the NODUP operand requires the system to do *considerable* additional processing. Before using this operand, see the information in the description of the SPXTAPE LOAD command in the *VM/ESA: CP Command and Utility Reference*.

In response, CP reads each image library, named saved system, saved segment, national language support file, system trace file, and user class restructure file from the tape and adds it to the appropriate spooling system queue. All the available tape drives in the specified range are used concurrently; as one file is still being loaded from a tape, the next file is read from the next available tape. As it processes the files, CP reports its progress at the interval requested with the PROGRESS\_interval option (or about every 15 seconds by default) by displaying a message on the screen. As it loads each file, CP assigns a new spool file identification number to it. CP also sends a response to the owner of the file (if the owner is logged on and has IMSG set ON).

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CP records information about the load in two or more logs. The command summary log contains information about the progress and status of the logical SPXTAPE command. The volume log contains information about the files processed by the logical SPXTAPE command that are associated with a particular tape volume. Therefore, several volume logs are created for one logical SPXTAPE command if more than one tape drive is used or if more than one tape volume is mounted on any drive.

8. If you entered the SPXTAPE LOAD command with the RUN disposition, CP sends you a response when processing of a tape volume is complete that:
  - a. Asks you to mount the next tape on that device
  - b. Indicates the number of files and spool pages processed so far.

If there are other tapes to be processed, mount the next tape. If you are using more than one tape drive, CP continues loading from the other drives. When you mount and ready the new tape, CP starts loading from that drive again.

If there are no other tapes to be mounted, and all tapes currently mounted have finished processing (you have received the “mount next tape” response for each drive), use the SPXTAPE END command to end the operation. Enter:

```
spxtape end vdev1-vdev2
```

where *vdev1-vdev2* is the same virtual device range you specified on the SPXTAPE LOAD command. The tape is positioned according to the disposition specified on the SPXTAPE LOAD command.

9. Remove the tapes from the tape drives.
10. If you want to find out what files have been loaded, you can look at the volume logs. Each volume log has a unique name (file name and file type) related to both the tape volume and the SPXTAPE command that caused the creation of the log. For example, the volume log for the second volume processed on virtual device 182 for an SPXTAPE LOAD command has the name:

```
xxyyL182 hhmms02
```

where *xxyy* is the month and day the command was issued, *L* indicates the operation was LOAD, *182* is the virtual device number of the tape drive, *hhmms* is the time stamp, and *02* is the volume sequence number.

The volume log contains the following entry for each file loaded from the volume:

```
USERID FILE QUEUE FILENAME FILETYPE OPENDATE OPENTIME ORIGINID SIZE SEG_STAT HOLDSTAT RECCOUNT C FORM DEST LASTPAGE  
userid file queue filename filetype opendate opentime originid size COMPLETE NONE reccount c lastpage
```

**Note:** The heading is included only once for each uninterrupted series of entries.

If the SEG\_STAT field contains PARTIAL instead of COMPLETE, it means of one the following:

- The file is split between this volume and one or more other volumes. and this part is *not* the one that completes the file (the last one loaded). If all parts of the file have loaded correctly, the volume log entry for the last part loaded contains COMPLETE in the SEG\_STAT field.

**Note:** The last part loaded may contain the end of the file, the beginning, or some section in between, depending on the order in which the tape volumes were mounted.

- CP encountered an I/O error or some other problem trying to read the file from the tape or write it to DASD. In that case, you also receive error messages describing the problem. The error messages are recorded in the command summary log.

**Note:** If you used the NODUP operand on the SPXTAPE LOAD command, duplicate files are not loaded but are indicated by entries in the volume log with DUP\_FILE in the SEG\_STAT field.

11. To see what system data files are on the system, you can check the various system data file queues. If you did not use the NODUP operand on the SPXTAPE LOAD command, this will show if you loaded any duplicate files. If you find duplicate files, contact the person who maintains your installation's system data files to find out which files to purge.

To check the named saved systems and saved segments, enter:

```
query nss
```

To see whether any named saved system is defined using the VMGROUP option, enter:

```
query nss map
```

To check the image libraries, enter:

```
query img
```

To check the user class restructure files, enter:

```
query ucr
```

To check the national language support files, enter:

```
query nls
```

To check the system trace files, enter:

```
query trf
```

In response to each of these commands, CP lists all the files in the specified system data file queue.

**Note:** If an external security manager (ESM) is installed on your system, the RECS, FILENAME, and FILETYPE fields in the response may contain asterisks. Asterisks are used to mask fields the user is not authorized to view while logged on with the current security label. For additional information, contact your security administrator.

To get only a count of a particular type of system data file, use the COUNT operand. For example, to get a count of all the class S (skeleton) named saved systems and saved segments, enter:

```
query nss class s count
```

To get a count of all the system data files, enter:

```
query sdf
```

In response to this command, CP displays a count of each type of system data file.

The preceding steps tell you how to restore all the system data files dumped to tape. You can also select the system data files to be loaded by queue, user ID (system trace files only), spool file identification number or range, class, file name pattern, file type pattern, or combinations of these attributes. A file name or file

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type pattern can be either a complete file name or file type or a string containing wild cards (\* and %). The following example shows you how to restore particular classes of image libraries, named saved systems, and saved segments.

For more information about the SPXTAPE logs and the options you can specify on the SPTAPE LOAD command, see the *VM/ESA: CP Command and Utility Reference* book.

**Example—Loading Particular Classes of Image Libraries, Named Saved Systems, and Saved Segments from Tape:** You previously backup up all the system data files. Now you want to restore only the class A image libraries and the class A and S named saved systems and saved segments.

To load only the class A image libraries and class A and S named saved systems and saved segments from tape:

1. Find one or more free tape drives. Enter:

```
query tapes all
```

CP's response tells you the status of tape drives 5C0 and 61B is FREE. Both are 3420s, so you mount a dump tape on each without a write-enable ring.

2. Attach the tape drives to your virtual machine. Virtual device numbers 181 and 182 are available, so you enter:

```
attach 5c0 to * as 181  
attach 61b to * as 182
```

3. Spool your console. To spool the console to yourself, enter:

```
spool cons *
```

4. If necessary, use the CMS TAPE command to position each tape to the beginning of the tape file that contains the files you want to load.

5. Start the load. Enter:

```
spxtape load 181-182 img class a append  
spxtape load 181-182 nss class as run
```

Specifying the APPEND operand on the first command combines these two commands into a single logical command. CP begins processing the files after you enter the last command in the sequence. CP displays progress responses and requests to mount new tapes. Each file loaded is recorded in the volume log for that tape volume.

**Note:** The previous procedure assumes the files were saved on tape using one logical SPXTAPE DUMP command. If independent SPXTAPE DUMP commands were used to save the files (for example, if they were saved at different times), you must use independent (not appended) SPXTAPE LOAD commands to restore them. Wait for the first command to finish processing before you enter the second command. The disposition operand (RUN, REWIND, or LEAVE) you use on each command depends on whether the files are contained on one tape volume or multiple tape volumes.

6. When there are no more tapes to be processed (all tapes currently mounted have finished processing and there are no more tapes to be mounted), end the SPXTAPE LOAD operation. Enter:

```
spxtape end 181-182
```

- Remove the tapes from the tape drives.

---

## Moving User Data between Systems

You may need to transfer user data between VM/ESA and a non-ESA VM system. This is a particularly important migration task when your installation is in transition from one production operating system to another. Specifically, VM/ESA provides you with the ability to transfer spool files from a VM/SP, VM/SP HPO, VM/XA SP, or VM/ESA 370 Feature system to VM/ESA, and from VM/ESA to these other systems.

IBM supports spool file migration to and from VM/ESA for the VM/SP, VM/SP HPO, VM/XA SP, and VM/ESA 370 Feature releases listed in Table 14.

*Table 14. Supported VM Releases for Spool File Migration*

Product	Releases
VM/SP	3, 4, 5, 6
VM/SP HPO	3.2, 3.4, 3.6, 4.0, 4.2, 5.0, 6.0
VM/XA SP	2.0, 2.1
VM/ESA 370 Feature	1.0, 1.5

For the purposes of discussing spool file migration, the terms “VM/SP”, “VM/SP HPO”, “VM/XA SP”, and “VM/ESA 370 Feature” refer to these supported releases.

## Moving VM/SP, VM/SP HPO, or VM/ESA 370 Feature Spool Files to VM/ESA

To move spool files from a VM/SP, VM/SP HPO, or VM/ESA 370 Feature system to VM/ESA:

- On the VM/SP, VM/SP HPO, or VM/ESA 370 Feature system, use that system's SPTAPE DUMP command to write the spool files to tape.
- On VM/ESA, use the SPTAPE LOAD command to restore the spool files from the tape.

**Note:** The VM/ESA SPTAPE command skips over any file whose format is specific to the VM/SP, VM/SP HPO, or VM/ESA 370 Feature system. Such files include those that contain VM/SP, VM/SP HPO, or VM/ESA 370 Feature CPabend or stand-alone dumps, and files created by the following VM/SP, VM/SP HPO, or VM/ESA 370 Feature commands: ACNT, CPTRAP, MONITOR, and VMDUMP.

In addition, suppose you have a spool file that originates in a VM/SP, VM/SP HPO, or VM/ESA 370 Feature system. If you move that file to a VM/ESA system, it loses those file attributes that do not have VM/ESA equivalents. Therefore, if you move the same file back to the VM/SP, VM/SP HPO, or VM/ESA 370 Feature system, it is not identical with the original file.

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To load spool files from a tape:

1. Find a free tape drive and mount the tape that holds the dumped spool files.

A free tape drive is one that is not offline, in use, or dedicated to another virtual machine. The tape drive must be fully supported by VM/ESA. For a list of supported devices, see the *VM/ESA: General Information* book. To find out the status of all of your tape drives, enter:

```
query tapes all
```

If the status of any tape drive is FREE, mount the tape, which has been enabled for reading only, and go to the next step. To enable a tape reel as read-only, make sure the tape does not have a write-enable ring. To enable a tape cartridge as read-only, turn the thumbwheel on the cartridge so the white dot shows.

If the status of any tape drive is OFFLINE, enter:

```
vary online rdev
```

where *rdev* is the tape drive's real device number. Then mount the tape, enabled for reading only, and go to the next step.

2. Restore to the system all the spool files from the reader queue that are on the tape. Enter:

```
sptape load rdev reader all rewind
```

where *rdev* is the tape drive's real device number.

In response, CP loads from the tape each reader file and places it on the system's reader queue. As it loads each file, CP assigns a new spool file identification number and sends both you and the file owner a message. If you are the owner of a file that CP loads, you receive two messages. When CP has loaded all the files, it tells you the load function is complete and rewinds the tape.

3. Restore to the system all the spool files from the print queue that are on the tape. Enter:

```
sptape load rdev printer all rewind
```

where *rdev* is the tape drive's real device number.

In response, CP loads from the tape each print file and places it on the system's print queue. As it loads each file, CP assigns a new spool file identification number and sends both you and the file owner a message. If you are the owner of a file that CP loads, you receive two messages. When CP has loaded all of the files, it tells you the load function is complete and rewinds the tape.

4. Restore to the system all the spool files from the punch queue that are on the tape. Enter:

```
sptape load rdev punch all rewind
```

where *rdev* is the tape drive's real device number.

In response, CP loads from the tape each punch file and places it on the system's punch queue. As it loads each file, CP assigns a new spool file identification number and sends both you and the file owner a message. If you are the owner of a file that CP loads, you receive two messages. When CP has loaded all of the files, it tells you the load function is complete and rewinds the tape.

5. Check the spool file queues to make sure CP restored all of the files.

To check the files in the system's reader queue, enter:

query reader

To check the files in the system's print queue, enter:

query printer

To check the files in the system's punch queue, enter:

query punch

In response, CP lists all of the files in the reader, print, and punch queues, respectively.

6. Remove the tape from the tape drive.

For the other options you can specify on the SPTAPE LOAD command, see the *VM/ESA: CP Command and Utility Reference* book.

## Moving VM/ESA Spool Files to VM/SP, VM/SP HPO, or VM/ESA 370 Feature

To move spool files from VM/ESA to VM/SP, VM/SP HPO, or VM/ESA 370 Feature:

1. On VM/ESA, use the SPTAPE DUMP command to dump selected classes of spool files to tape.
2. On the VM/SP, VM/SP HPO, or VM/ESA 370 Feature system, use that system's SPTAPE LOAD command to restore the spool files from tape.

You can restore most VM/ESA spool files to a VM/SP, VM/SP HPO, or VM/ESA 370 Feature system, but some are specific to VM/ESA. If you try to use the SPTAPE LOAD command on VM/SP, VM/SP HPO, and VM/ESA 370 Feature systems to load one of these files from a tape, the command ends processing. So do not dump:

- CP abend dump spool files (usually class D)
- Virtual machine dump spool files (usually class V)
- Named saved systems or saved segments
- Image libraries
- User class restructure files
- National language support files, such as message repository files
- System trace files.

In addition, suppose you have a spool file that originates in a VM/SP, VM/SP HPO, or VM/ESA 370 Feature system. If you move that file to a VM/ESA system, it loses those file attributes that do not have VM/ESA equivalents. Therefore, if you move the same file back to the VM/SP, VM/SP HPO, or VM/ESA 370 Feature system, it is not identical with the original file.

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To dump particular classes of spool files to tape:

1. Find a free tape drive and mount a scratch tape on it.

A free tape drive is one that is not offline, in use, or dedicated to another virtual machine. The tape drive must be fully supported by VM/ESA. For a list of supported devices, see the *VM/ESA: General Information* book. To find out the status of all of your tape drives, enter:

```
query tapes all
```

If the status of any tape drive is FREE, mount the scratch tape, which has been enabled for writing, and go to the next step. To write-enable a tape reel, make sure the tape has a write-enable ring. To write-enable a tape cartridge, turn the thumbwheel on the cartridge so the white dot does not show.

If the status of any tape drive is OFFLINE, enter:

```
vary online rdev
```

where *rdev* is the tape drive's real device number. Then mount the scratch tape, enabled for writing, and go to the next step.

2. Dump selected classes of spool files in the reader queue to tape.

Enter:

```
sptape dump rdev reader class abcdefgh leave
```

where:

*rdev*

is the tape drive's real device number.

*abcdefgh*

is a string of one to eight spool file classes.

In response, CP dumps to tape a copy of each closed spool file in the reader queue of the selected class. As it dumps each file, CP sends you a message. If the tape becomes full before you dump all the files, CP rewinds the tape and unloads it from the tape drive. You receive a message that:

- Asks you to mount a new tape
- Identifies the last file dumped.

When you mount and ready the new tape, CP continues processing. When CP dumps all the files, it tells you the dump function is complete. The LEAVE option causes the tape to be positioned after the last reader file.

Repeat this step until you have dumped all of the desired spool files.

3. Dump selected classes of spool files in the print queue to tape.

Enter:

```
sptape dump rdev printer class abcdefgh leave
```

where:

*rdev*

is the tape drive's real device number.

*abcdefgh*

is a string of one to eight spool file classes.

In response, CP dumps to tape a copy of each closed spool file in the print queue of the selected class. As it dumps each file, CP sends you a message. If the tape becomes full before you dump all the files, CP rewinds the tape and unloads it from the tape drive. You receive a message that:

- Asks you to mount a new tape
- Identifies the last file dumped.

When you mount and ready the new tape, CP continues processing. When CP dumps all the files, it tells you the dump function is complete. The LEAVE option causes the tape to be positioned after the last print file.

Repeat this step until you have dumped all of the desired spool files.

4. Dump selected classes of spool files in the punch queue to tape and rewind the tape.

Enter:

```
sptape dump rdev punch class abcdefgh leave
sptape dump rdev punch class abcdefgh leave
:
sptape dump rdev punch class abcdefgh rewind
```

where:

*rdev*

is the tape drive's real device number.

*abcdefgh*

is a string of 1 to 8 spool file classes.

The LEAVE option causes the tape to be positioned after the last punch file. Specify the REWIND option on the command you use to dump the last set of files to rewind the tape.

In response to each command, CP dumps to tape a copy of each closed spool file in the punch queue of each selected class. As it dumps each file, CP sends you a message. If the tape becomes full before you dump all the files, CP rewinds the tape and unloads it from the tape drive. You receive a message that:

- Asks you to mount a new tape
- Identifies the last file dumped.

When you mount and ready the new tape, CP continues processing. When CP dumps all the files, it tells you the dump function is complete.

5. Check the tape to make sure all of the files are on it. Enter:

```
sptape scan rdev run
```

where *rdev* is the tape drive's real device number.

In response, CP scans the tape for any spool files and then, because of the RUN option, rewinds and unloads the tape. You should receive a message for each spool file you have dumped. When CP finishes, it tells you the scan function is complete.

6. Remove the tape from the tape drive.

For the other options you can specify on the SPTAPE DUMP command, see the *VM/ESA: CP Command and Utility Reference* book.

### Moving VM/XA SP Spool Files to VM/ESA

To move spool files from VM/XA SP to VM/ESA:

1. Use the SPTAPE DUMP command on the VM/XA SP system to put all necessary spool files on tape before migration.
2. IPL the new system with a COLD start.
3. Use the SPTAPE LOAD command on the VM/ESA system to move the spool files from tape to the new system.

**Note:** You may want to allocate SPOL space differently on your new system. You may want to remove a cylinder or extent of SPOL space during conversion of your system and make it PERM space for that minidisk. When the minidisk owner formats that space, any spool file that was chained through a page that was changed from SPOL space to PERM space will then be destroyed. So, migrate your spool files using the procedure just described to avoid this potential data loss.

---

### Archiving User Data

Another part of operating a VM/ESA system is archiving user data. Because the resources of the installation are limited, you need to archive the old data to make room for current data. The responsibility for setting archiving policies and performing archiving operations rests on operations. As an operator you may have to use VM/ESA archiving facilities and use production system archiving facilities.

VM/ESA allows you to archive data by storing it on tape. For more information on how you can use VM/ESA facilities to move data to tape, see "Backing Up System and User Data" on page 272.

Some production systems have products that help you perform archiving operations.

---

### Initializing DASD Volumes

Finally, you sometimes have to initialize the storage media on which data resides, specifically, DASD volumes. This is particularly important when the volume formerly contained sensitive data. The responsibility for safeguarding data from unauthorized persons rests partly on operations.

If you need to initialize a DASD volume so that it can be used as a VM/ESA system volume, use the Device Support Facilities program (ICKDSF). It is the preferred method of CP volume maintenance and is required for certain DASD type. For more information on running this program operation, see "Formatting and Allocating a System Volume" on page 123.

If you need to initialize a DASD volume so that it can be used in another operating system's environment, you should also use the Device Support Facilities program (ICKDSF). For more information on running this program, see "Running the Device Support Facilities Program" on page 315.

---

## Chapter 10. Running Utility Programs

This chapter provides guidance and reference information for utilities that can be run either stand-alone or under VM/ESA. After reading this chapter, you can:

- Locate information on running IOCP for an ESA/370 or ESA/390 processor
- Run the Stand-alone Program Loader Creation Utility (SALIPL)
  - Stand-alone on a real ESA/370 or ESA/390 processor
  - Stand-alone in an XA, ESA, or XC virtual machine
  - Under CMS in a 370, XA, ESA or XC virtual machine
- Run the stand-alone dump utility
- Determine when to use the DASD dump restore (DDR) utility IBM provides with VM/ESA
- Run DDR
  - Stand-alone on a real ESA/370 or ESA/390 processor
  - In an ESA virtual machine
  - Under CMS/ESA in a System/370 virtual machine.
- Locate information on running the device support facilities program
- Find information about utilities that run in a production system.

---

### Running IOCP

An Input/Output Configuration Program (IOCP) defines the real I/O device configuration to your processor complex.

If your processor complex is a 3090\* or ES9000 processor, you can run IOCP under VM/ESA. For information about running IOCP under VM/ESA on these processors, see the *3090 Processor Complex Input/Output Configuration Program User's Guide and Reference* book.

---

### Running the Stand-Alone Loader Creation Utility (SALIPL)

Use the Stand-alone loader creation utility to install SAPL. SALIPL is available as a module that runs under CMS and as a stand-alone utility.

#### Before You Begin

Before you run the stand-alone program loader creation utility, you must know:

- Where the stand-alone program loader creation utility is located
- How you want to run the stand-alone program loader creation utility
- How you formatted the Stand-alone Program Loader.

Before you run SALIPL, you must know its location. The SALIPL executable module is on the system S-disk (190) when VM/ESA is shipped from IBM. During system generation, your installation puts a copy of the program either on tape or in a file on DASD. To find out where the program is, contact the person at your installation who generates your VM/ESA system.

Next, decide how you want to run the program. To run the program on a real processor, see "Running SALIPL on a Real Processor" on page 298. To run SALIPL in a virtual machine, see "Running SALIPL in a Virtual Machine" on page 299.

## Running Utility Programs

Finally, before you write SAPL on a DASD volume, it must have been formatted either by CMS or by the Device Support Facilities Program. For more information about the Device Support Facilities Program, see “Running the Device Support Facilities Program” on page 315.

## Running SALIPL on a Real Processor

To run SALIPL on a real processor, you first have to ensure that the program is loadable.

### Making SALIPL Loadable on a Real Processor

If SALIPL resides as a module file on DASD and SAL is already installed on a DASD volume, it is already loadable. If SALIPL resides on a tape, it is already loadable. If SALIPL resides as an IPL file on a DASD volume, do one of the following:

- Put a copy of the program on tape.
- Create a card deck of the program.

To put a copy of the program on tape, use the CMS FILEDEF and MOVEFILE commands. For example, suppose you want to dump to tape a loadable version of the SALIPL program. The program resides on the K-disk with a file name of IPL SALIPL. To put this file on tape, do the following:

1. Ask the operator to:
  - Mount on a tape drive a scratch tape enabled for writing.
  - Attach the tape drive to your virtual machine as virtual device number 181.

2. Define for the MOVEFILE command the file you want to move to tape. Enter:  

```
filedef in disk ipl salipl k
```

If you IPL a named system, (CMS) 16MB of storage may suffice. However, if you IPL 190, then you will need 19MB of storage.

3. Define for the MOVEFILE the tape drive to which you want to move the file. Enter:

```
filedef out tap1 (recfm f lrecl 80 block 80
```

4. Wait for CP to send you a message that the tape drive has been attached.

5. Move the SALIPL file from disk to tape. Enter:

```
movefile in out
```

To create a card deck of the program, first enter the CMS PUNCH command with the NOHEADER option. Then punch the resulting spool file on a real card punch.

### Loading SALIPL on a Real Processor

You are now ready to load the program on the real processor.

1. If necessary, shut down the program on the real processor.
2. Make sure the real processor is ready to run in ESA mode.
3. If SALIPL resides on a tape, mount the tape on a compatible tape drive. If it resides on a card deck, load the deck into a real reader.
4. If you are using SAPL to load SALIPL, you must specify the console to be used by SALIPL by entering its device number in the first four characters of the

LOADPARM on your processor console. If you are loading from cards or from tape, this is optional.

5. Using your processor complex's system console, IPL with the device number of the tape, card reader, or DASD volume containing SAPL.
6. If you are using SAPL, you must now specify the location of the minidisk containing the SALIPL module and the name of the module on the SAPL screen and hit the load key (PF10).

You are now ready to start running the program. See "Filling in the SALIPL Menu Screen" on page 301.

## Running SALIPL in a Virtual Machine

You can run SALIPL as a CMS command or as a stand-alone utility. For information on the SALIPL command, see the *VM/ESA: CP Command and Utility Reference* book. To run SALIPL as a stand-alone program, it must be loaded by SAPL. To run SALIPL in a virtual machine, you first have to ensure that the program is loadable.

### Making SALIPL Loadable in a Virtual Machine

If SALIPL resides as a MODULE file on DASD and SAPL is already installed on a DASD volume, it is already loadable. Running this utility as standalone is not recommended and for the most part is exceptional. The recommended and easiest method is to run SALIPL as a CMS command. For detailed information on running SALIPL under CMS you should refer to the SALIPL utility in the *VM/ESA: CP Command and Utility Reference*.

If SALIPL resides on a tape, it is already loadable. If SALIPL resides as an IPL file on a DASD volume, do one of the following:

- Dump a copy of the program to tape.
- Place a copy of the program in your virtual reader.

To put a copy of the program on tape, use the CMS FILEDEF and MOVEFILE commands. For example, suppose you want to dump to tape a loadable version of the SALIPL program. To put this file on tape, do the following:

1. Ask the operator to:
  - Mount on a tape drive a scratch tape enabled for writing.
  - Attach the tape drive to your virtual machine as virtual device number 181.
2. Define for the MOVEFILE command the file you want to move to tape. Enter:
 

```
filedef in disk ipl salipl k
```
3. Define for the MOVEFILE the tape drive to which you want to move the file. Enter:
 

```
filedef out tap1 (recfm f lrecl 80 block 80
```
4. Wait for CP to send you a message that the tape drive has been attached.
5. Move the SALIPL file from disk to tape. Enter:
 

```
movefile in out
```

To place a copy of the SALIPL program in your virtual reader:

## Running Utility Programs

1. If SALIPL does not reside on the CMS system module, link to the minidisk that contains the program.
2. Bring up CMS in your virtual machine. Enter:  
`ipl 190`  
Or, if your installation has installed CMS in a named saved system, enter:  
`ipl cmsname`  
where *cmsname* is the name of your CMS system.
3. Route punch spool files to your virtual reader. Enter:  
`spool punch *`
4. Punch a copy of the SALIPL program. Enter:  
`punch ipl salipl * (noheader`

You now have a copy of the SALIPL program in your virtual reader.

### Loading SALIPL in a Virtual Machine

You are now ready to load the program in your virtual machine.

**Loading SALIPL from Tape:** If SALIPL resides on a tape:

1. Ask the operator to mount the tape on a compatible tape drive and attach the tape drive to your virtual machine as virtual device number 181.
2. Wait for CP to send you a message that the tape drive has been attached.
3. Make sure your virtual machine is in ESA mode. Enter:  
`set machine esa`
4. Make sure your virtual console is in 3270 mode. Enter:  
`terminal conmode 3270`
5. Load the SALIPL program into your virtual machine storage. Enter:  
`ipl 181`  
or  
`ipl 181 loadparm vcon`  
where *vcon* is the virtual device number of your console.

You are now ready to start running the program. See "Filling in the SALIPL Menu Screen" on page 301.

**Loading SALIPL from Your Virtual Reader:** If SALIPL resides in your virtual reader:

1. Make the file ready to load and prevent CP from purging it from your reader. Enter:  
`change reader spoolid nohold keep`  
where *spoolid* is the spool file identification number that CP assigned the spool file when it placed it in your reader.
2. Put the SALIPL file first in your reader queue. Enter:  
`order reader spoolid`

where *spoolid* is the spool file identification number of the SALIPL reader file.

3. Make sure the reader can process the SALIPL file. Enter:

```
spool vdev class *
```

where *vdev* is the virtual device number of your virtual reader.

4. Make sure your virtual machine is in ESA mode. Enter:

```
set machine esa
```

5. Make sure your virtual console is in 3270 mode. Enter:

```
terminal conmode 3270
```

6. Load the SALIPL program into your virtual machine storage. Enter:

```
ipl vdev
```

or

```
ipl vdev loadparm vcon
```

where *vdev* is the virtual device number of your virtual reader and *vcon* is the virtual device number of your console.

You are now ready to fill in the SALIPL menu screen.

## Filling in the SALIPL Menu Screen

If your console was at device number 0009 or 001F or you specified your console address using the LOADPARM, you should get the SALIPL menu screen as soon as SALIPL is loaded into memory. If you do not get this screen, press ENTER without entering any data. Entering a null line tells SALIPL your console's device number; then, it can display the menu screen.

If you have non-console devices with device numbers of 0009 or 001F, or it is possible that a device other than the console you wish to use may generate attention interrupts, it is recommended that you use the LOADPARM to specify the device number of the console you wish to use.

```

STAND ALONE PROGRAM LOADER CREATION UTILITY: VM/ESA VERSION n RELEASE n.n
DEVICE NUMBER:  018B      MINIDISK OFFSET:  35      EXTENT:  -
MODULE NAME:    CPLOAD    LOAD ORIGIN:      1000
-----IPL PARAMETERS-----
cons=0ea0 fn=maine
-----COMMENTS-----
Secondary parm disks can be found on 18B at offset 185 and on 18A at offsets
35 and 185.
-----
9= FILELIST  10= WRITE  11= TOGGLE EXTENT/OFFSET

```

Figure 8. Stand-Alone Program Loader Creation Utility

## Running Utility Programs

The menu screen appears with defaults already filled in for some of the fields. You can, however, enter information in all fields except the EXTENT field. These fields define where the stand-alone program loader is to be written and what its default parameters are to be.

The Stand-alone program loader creation utility screen contains the following fields:

<b>DEVICE NUMBER</b>	specifies the device number of the DASD volume that SAPL is to be written to.
<b>MINIDISK OFFSET</b>	specifies the offset from the beginning of the DASD volume to the start of the CMS minidisk that SAPL is to use by default. Offset is the number of cylinders for count key devices and blocks for fixed block architecture devices.
<b>EXTENT</b>	specifies the extent number from 1 to 9 (first to ninth). This field may be used only with volumes that have been formatted using the Device Support Facilities Program and has an allocation map containing PARM extents written on them. When a valid extent is entered, the offset corresponding to the extent will be displayed in the MINIDISK OFFSET field.  <b>Note:</b> Only one of the fields, EXTENT or MINIDISK OFFSET, can be altered at a time. If the specified area(s) have not already been CMS- formatted, message 'FATAL DASD I/O ERROR CSW=0E00' may be encountered when PF10 (WRITE) is entered at the SALIPL creation menu screen.  Use PF11 to show you which field is currently alterable.
<b>MODULE NAME</b>	specifies the name of a module on the minidisk that will be loaded by default by SAPL.
<b>LOAD ORIGIN</b>	Specifies the location in memory (HEX address) into which SAPL will load relocatable modules. For CP, this is the address where the CP module will be loaded and is used to leave space for the V=R, VRFREE, and RIO370 areas. Any hexadecimal address can be specified. For CP, the address must be at least X'1000' and on a page boundary (for example, the address should end in three zeros).
<b>IPL PARAMETERS</b>	specifies the default data that will be passed to the loaded program by SAPL. The contents of this field depends on the program loaded by SAPL. For parameters valid for CP, see "IPL Parameters" on page 12

Once all of the fields have been filled in, press PF10 (WRITE) to write the IPL records (SAPL) to the dasd pack.

---

## Running the Stand-Alone Dump Utility

IBM provides the stand-alone dump utility with VM/ESA. If CP is unable to create an abend dump, this utility allows you to dump all of the VM/ESA system.

## Creating the Stand-alone Dump Utility

The *VM/ESA: Planning and Administration* book describes how to put the stand-alone dump utility on a tape or DASD volume and how to specify one or more dump devices for the utility. It also describes the devices this utility supports.

### Before You Begin

Before you run the stand-alone dump utility, you must know:

- The location of the stand-alone dump utility
- The real device number of the utilities *IPL device*
- The real device numbers of the utilities *dump devices*.

**Program Location:** The program resides on either a DASD volume or on a tape.

**IPL Device:** The IPL device may be either a DASD or a tape drive. If the utility resides on a DASD volume, the IPL device is the device on which the volume is mounted. If the program resides on tape, you must use the device already specified in the VM/ESA configuration as the IPL device. You can use the same tape drive as both the IPL device and the dump device.

**Dump Device:** Stand-alone dump devices may be either tape drives or printers.

### Setting Up to Run the Stand-alone Dump Utility

When an irrecoverable error occurs, CP tries to store status about the system in storage areas designated for this purpose. At this point, do the following:

1. If the stand-alone dump utility resides on tape, choose a tape drive from which to load (IPL) the utility.

The tape drive you choose as the IPL device must be the device already specified in the VM/ESA configuration.

2. Contact the operator of any other system that shares the IPL device or any devices which are neither 3480 nor a 3490 dump devices, and make sure the system is not using it. Follow your installation's normal procedures.

**ATTENTION:** The 3480 and 3490 tape drives are the only devices that the stand-alone dump utility supports sharing with other processor complexes. If you try to share a tape drive, which is neither a 3480 nor a 3490, while running this utility, you may lose data that the device is processing for another system.

Therefore, make sure the dump devices (except for 3480s and 3490s) are not in use by any other processor complex. Also, make sure that no other system is using the device from which you plan to load (IPL) the utility.

3. If the IPL device is a tape drive, remove any tape that is currently mounted.
4. If any dump device is a 3420, 3422, 3424, 3430, or 9348 tape drive, remove any tape that is currently mounted.
5. From the dump devices generated for the stand-alone dump utility, choose one to be the dump device for this run. Then, if the dump devices are 3480s or 3490s, go to step 6 on page 304. Otherwise, make all the other dump devices not ready.

The utility searches the list of dump devices in the order that your installation specified when it generated the utility. With one exception, the program chooses the first ready device. The exception is the IPL device. If a dump

## Running Utility Programs

device is also the IPL device, the utility chooses any other ready dump device first. Therefore, to make sure the utility chooses the dump device you want, make all the other dump devices not ready.

You do not need to make not ready a 3480 or 3490 dump device that is in use by another system. The stand-alone dump utility recognizes that the device is in use by another system and tries to find another dump device.

### 6. Make the stand-alone dump utility ready to load (IPL) on the IPL device.

The utility resides on either a tape or a DASD volume. Depending on its location, do one of the following:

- If the utility resides on a tape, mount the tape enabled for writing on the tape drive you chose for the IPL device. For a 3420, 3422, 3424, 3430, or 9348, make sure the tape has a write-enable ring. For a 3480 or 3490, turn the thumbwheel on the tape cartridge so that the white dot does not show.

Because the utility writes out some data to the IPL device, you *must* mount the tape enabled for writing. If you mount the tape for reading only, you cannot run the utility successfully.

- If the utility resides on a DASD volume, make sure the volume is mounted and the device write-enabled.

Because the utility writes out some data to the IPL device, you *must* make sure the DASD is write-enabled. If you IPL the utility without write-enabling the DASD, you cannot run the utility successfully.

### 7. Make the dump device ready to receive the dump.

The dump device is either a tape drive or a printer. Depending on its type, do one of the following:

- If the dump device is a tape drive and is the same as the IPL device, the IPL tape is already mounted. Go to step 8.

**Note:** If you use a tape drive as both the IPL device and the dump device, the utility starts writing the dump on the tape that contains the utility. You cannot change tapes between the time you IPL the utility and the time it starts to create the dump. However, the dump does not overwrite the utility on tape.

- If the dump device is a tape drive and is *not* the same as the IPL device, mount a scratch tape enabled for writing on the dump device. For a 3420, 3422, 3424, 3430, or 9348, make sure the tape has a write-enable ring. For a 3480 or 3490, turn the thumbwheel on the tape cartridge so that the white dot does not show.
- If the dump device is a printer, make the printer ready.

### 8. At your processor complex's system console, perform a store-status operation. This stores in assigned storage locations the values of the processor timer, clock comparator, current PSW, prefix register, floating point registers, general registers, access registers, and control registers.

You are now ready to load the stand-alone dump utility into storage.

## Running the Stand-Alone Dump Utility

To run the stand-alone dump utility:

1. Display locations X'0' to X'18' at the console. The stand-alone dump IPL sequence overlays these bytes, so they cannot be recovered.
2. Make sure the IPL device and dump device for this run are ready.

If the IPL device and dump device are not ready, the utility cannot run successfully. If the utility does not run successfully the first time you load it, you may lose some data when you try to run it again.

3. Unless your dump devices are 3480s or 3490s, make sure the dump devices you are not using for this run are not ready.

If other dump devices are ready, the utility may not choose the dump device you wish to use for this run.

4. Using your processor complex's system console, load (IPL) the utility into storage, specifying the IPL device's real device number.

**Note:** *Do not* use the LOAD CLEAR command to load the stand-alone dump utility. This command destroys the storage contents you are trying to dump.

As soon as the stand-alone dump utility is loaded, it starts to create the dump. The dump has the same format as an abend dump produced by VM/ESA.

## Monitoring Stand-alone Dump Utility Execution

The utility communicates various normal and error conditions to you by loading a wait-state PSW. To find out whether the utility has loaded a wait state, display the current PSW on your processor complex's system console. The wait-state number appears as a 3- or 4-digit number in the right half of the PSW.

### Normal Wait States

In normal operation, the stand-alone dump utility may enter three wait states:

#### Wait

#### State Meaning

- |             |   |
|-------------|---|
| <b>8200</b> | This is a disabled wait state indicating the Stand-alone Dump Utility is complete. The system has successfully placed the Stand-alone Dump Utility on its residence device, or it has successfully completed taking a stand-alone dump.   |
| <b>8202</b> | The utility has filled the tape on the dump device. To continue, remove the tape from the dump device. Then mount a new tape on the dump device with a write-enable ring or with the thumbwheel turned so that the white dot does not show, as appropriate. This wait is enabled to detect when the new tape is mounted.  |
| <b>909</b>  | The dump device is not ready and your intervention is required. For example, if a printer you are using runs out of paper, or if you forget to enable a tape for writing when you mount a new dump tape, the program loads a PSW with this wait state. To continue, correct the condition on the dump device and make it ready. This wait is enabled to detect when the device is ready to use. |

### Error Wait States

The stand-alone dump utility may also load a PSW with wait states for various error conditions. The following list briefly describes the error wait states and the corresponding messages you receive. For more details, see the *VM/ESA: System Messages and Codes* book.

#### Disabled

#### Wait

State	Meaning
9017	STAND-ALONE DUMP FAILURE; PROGRAM CHECK
9018	STAND-ALONE DUMP FAILURE; MACHINE CHECK
9019	STAND-ALONE DUMP FAILURE; FATAL I/O ERROR
8201	STAND-ALONE DUMP FAILURE; NO DUMP DEVICE AVAILABLE
8203	IPL DEVICE SPECIFIED HAS NO REAL CORRESPONDING DEVICE
8204	RESIDENT DEVICE IS NOT A CP FORMATTED VOLUME
8205	ERROR WRITING STAND-ALONE DUMP UTILITY TO RESIDENT DEVICE
8206	VERIFY PATH TO DUMP DEVICE; A POTENTIAL CONFIGURATION CHANGE WAS DETECTED

## Rerunning the Stand-alone Dump Utility

If the stand-alone dump utility fails for some reason, you can run the utility again. However, you should note that:

- Depending on the point of failure of the dump utility, you may lose at least the first six pages of storage, and possibly other pages.
- You lose any status you saved when you performed the store-status operation at the processor complex's console. This includes the values at the time of the system failure of the processor timer, clock comparator, current PSW, prefix register, floating point registers, general registers, access registers, and control registers.

## Restarting VM/ESA

After the dump is created, remove any scratch tapes you used and the stand-alone dump utility, if it resides on tape. Then remount any tapes VM/ESA requires.

To restart the system, use your processor complex's system console to load the VM/ESA Control Program into storage. Then bring up the VM/ESA system as you normally do.

## Viewing the Stand-alone Dump

Your installation's support personnel can use the dump viewing facility to look at, format, and print the stand-alone dump. For more information on the dump viewing facility, see the *VM/ESA: Dump Viewing Facility* book.

The stand-alone dump contains the following information:

1. The symptom record
2. A dump File Map record

3. For each processor attached to the system, beginning with the processor on which the stand-alone dump utility was loaded:
  - Processor address
  - General purpose registers
  - Control registers
  - Floating-point registers
  - Access registers
  - Clock comparator and CPU timer values.
4. The time-of-day clock for the processor on which the stand-alone dump utility was run
5. The following information for each processor in the configuration for which a prefix page is found:
  - The prefix register
  - External old and new PSWs
  - Supervisor call old and new PSWs
  - Program old and new PSWs
  - Machine-check old and new PSWs
  - Input/output old and new PSWs.
6. All nonzero pages of storage and the storage key of each page.

---

## Running the DASD Dump Restore (DDR) Utility

The DASD dump restore (DDR) utility runs:

- Stand-alone loaded from SAPL
- Stand-alone on a real ESA/370 or ESA/390 processor
- Stand-alone in an XA, ESA, or XC virtual machine
- Under CMS in a 370, XA or XC virtual machine.

You can use it to:

- Dump data from a DASD to tape
- Restore dumped data from a tape back to a DASD
- Copy data from DASD to DASD or from tape to tape
- Print or display records from DASD or tape.

You tell the program what to do through DDR control statements. You can either enter the control statements from your console or supply them from the device on which you load the program (the IPL device).

## Before You Begin

Before you run DDR, you must know its location. During system generation, your installation puts a copy of the program either on tape or in a file on DASD. To find out where the program is, contact the person at your installation who generates your VM/ESA system.

Also, decide how you want to submit the DDR control statements. You can either enter the statements from your console or supply them from the device on which you load the program (the IPL device). For more information, see “Supplying DDR Control Statements” on page 312.

## Running Utility Programs

Next, decide how you want to run the program. To run the program on a real processor, see the next section. To run it in a virtual machine, see “Running DDR in a Virtual Machine” on page 310.

Finally, before you restore or copy important data to a DASD volume, use the Device Support Facilities Program to inspect the volume for defective tracks. For more information, see “Running the Device Support Facilities Program” on page 315.

## Running DDR on a Real Processor

To run DDR on a real processor, you first have to ensure that the program is loadable.

### Making DDR Loadable on a Real Processor

If DDR resides on a tape, it is already loadable.

If the DDR program resides in a file on a DASD volume, do one of the following:

- Put a copy of the program on tape
- Create a card deck of the program.

To put a copy of the program on tape, use the CMS FILEDEF and MOVEFILE commands. For example, suppose you want to dump to tape a loadable version of the DDR program. You must run a file list (filel), or IPL DDRXA, to find the disk where the DDR module resides. To put this file on tape, do the following:

1. Ask the operator to:

- Mount on a tape drive a scratch tape enabled for writing
- Attach the tape drive to your virtual machine as virtual device number 181.

2. Define for the MOVEFILE command the file you want to move to tape. Enter:

```
filedef in disk ipl ddr * ( use the proper mode for * )
```

If you IPL a named system, (CMS) 16MB of storage may suffice. However, if you IPL 190, then you will need 18MB of storage.

3. Define for the MOVEFILE command the tape drive to which you want to move the file. Enter:

```
filedef out tap1 (recfm f lrecl 80 block 80
```

4. Wait for CP to send you a message that the tape drive has been attached.

5. Move the DDR file from disk to tape. Enter:

```
movefile in out
```

To create a card deck of the program, first enter the CMS PUNCH command with the NOHEADER option. Then, punch the resulting spool file on a real card punch.

### Loading DDR on a Real Processor

You are now ready to load the program on the real processor.

1. If necessary, shut down the VM/ESA system.
2. Make sure the real processor is ready to run in an ESA machine.
3. If DDR resides on a tape, mount the tape on a compatible tape drive. If it resides in a card deck, load the deck into a real card reader.
4. Using your processor complex's system console, IPL the DDR program.

You are now ready to start running the program. See "Supplying DDR Control Statements" on page 312.

### DDR and the IPL LOADPARM

As of VM/ESA Release 1.2 standalone DDR will use the loadparm passed from the system console IPL panel. Standalone DDR will use the device number specified in the loadparm field as it's console when the first four bytes of the field contain a valid device address (the field is generally eight bytes in length). When the loadparm field is not used to pass a console address DDR will attempt to use device 9, then 01F, if neither are found DDR will use the first device that presents an attention interrupt.

Terminals on a D/T3174, D/T3274 or other terminal control unit will display a PRG505 and lightning bolt when DDR is ipl'd on the hardware. An attention interrupt cannot be generated off these devices to start DDR. Failure to use the loadparm field may result in PROG505 appearing on the console that was meant to be used for DDR, the user may not be able to use DDR.

## Running DDR in a Virtual Machine

To run DDR in a virtual machine, you first have to ensure that the program is loadable.

### Making DDR Loadable in a Virtual Machine

If DDR resides on tape, it is already loadable.

If the DDR program resides in a file on a DASD volume, do one of the following:

- Dump a copy of the program to tape
- Place a copy of the program in your virtual reader.

To dump the DDR program to tape, use the CMS FILEDEF and MOVEFILE commands.

For example, suppose you want to dump to tape a loadable version of the DDR program. The program resides on the K disk with a file name and file type of IPL DDR. To put this file on tape, do the following:

1. Ask the operator to:
  - Mount on a tape drive a scratch tape enabled for writing
  - Attach the tape drive to your virtual machine as virtual device number 181.
2. Define for the MOVEFILE command the file you want to move to tape. Enter:  
`filedef in disk ipl ddr k`
3. Define for the MOVEFILE command the tape drive to which you want to move the file. Enter:  
`filedef out tap1 (recfm f lrecl 80 block 80`
4. Wait for CP to send you a message that the tape drive has been attached.
5. Move the DDR file from disk to tape. Enter:  
`movefile in out`

To place a copy of the DDR program in your virtual reader:

1. If DDR does not reside on the CMS system volume, link to the minidisk that contains the program.
2. Bring up CMS in your virtual machine. Enter:  
`ipl 190`

Or, if your installation has installed CMS in a named saved system, enter:

```
ipl cmsname
```

where *cmsname* is the name of your CMS system.

3. Route punch spool files to your virtual reader. Enter:

```
spool punch *
```

4. Punch a copy of the DDR program and name the resulting punch file IPL DDR. Enter:

```
punch ipl ddr * (noheader
```

You now have a copy of the DDR program in your virtual reader.

### Loading DDR in a Virtual Machine

You are now ready to load the program in your virtual machine.

**Loading DDR from Tape:** If DDR resides on a tape:

1. Mount the DDR tape on a 3420, 3422, 3424, 3430, 3480, 3490, or 9348 tape drive and attach the tape drive to your virtual machine as virtual device number 181.

To attach the tape drive to your virtual machine, enter:

```
attach rdev * 181
```

where *rdev* is the real device number of the tape drive.

2. Load the DDR program into your virtual machine storage. Enter:

```
ipl 181
```

You are now ready to start running the program. See “Supplying DDR Control Statements” on page 312.

**Loading DDR from Your Virtual Reader:** If DDR resides in your virtual reader:

1. Make the file ready to load, and prevent CP from purging it from your reader. Enter:

```
change reader spoolid nohold keep
```

where *spoolid* is the spool file identification number that was assigned to the spool file by CP when it placed it in your reader.

**Note:** Class D users can assign a security label to the DDR file if the following conditions are met:

- An external security manager (ESM) is installed
- Security label checking is enabled, and:
  - The user is exempt from ESM authorization checking, or
  - The system has been placed in a tranquil state by the security administrator.

To assign a security label to the DDR file, include the SECLABEL ssssssss option on the CHANGE command, where ssssssss is a 1- to 8-character alphanumeric value.

For additional information, contact your security administrator.

2. Put the DDR file first in your reader queue. Enter:

```
order reader spoolid
```

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where *spoolid* is the spool file identification number of the DDR reader file.

3. Make sure the reader can process the DDR file. Enter:

```
spool vdev class *
```

where *vdev* is the virtual device number of your virtual reader.

4. Load the DDR program into storage. Enter:

```
ipl vdev
```

where *vdev* is the virtual device number of your virtual reader.

You are now ready to start running the program.

## Supplying DDR Control Statements

You can supply control statements to DDR in one of two ways:

- You can enter DDR control statements from your console after you invoke the program.
- You can supply them from the device on which you load the program (the IPL device). This option requires you to set up the control statements before you invoke the program.

The syntax used with each DDR control statement is described in the *VM/ESA: CP Command and Utility Reference* book.

### Entering DDR Control Statements from Your Console

Normally, you enter DDR control statements interactively from your console.

As soon as you load DDR into storage, it begins executing and sends you the following initial prompt:

```
CP/ESA DASD DUMP/RESTORE PROGRAM  
ENTER CARD READER ADDRESS OR CONTROL STATEMENTS  
ENTER:
```

If you do not receive this prompt, press the ENTER key without any data. (Enter a null line.) Entering a null line tells DDR your console's device number, so that it can send you the prompt. (DDR initially assumes that your console has device number 0009 or 001F.) You may then start entering control statements interactively.

**Note:** When you run DDR on a real processor, and you have a nonconsole device at either real device number 0009 or 001F, make sure the device is not operational. Otherwise, results are unpredictable.

In response to the initial prompt, enter the first statement for the first function. Entering statements for different functions is discussed in the *VM/ESA: CP Command and Utility Reference* book. However, when you enter the statements, remember that:

- DDR reads only the first 71 characters of data per statement.
- DDR ignores any data you enter after the last possible operand of a statement.

After you enter the first one, DDR prompts you for additional statements. When you have entered all the statements for the first function, enter a null line if needed. Null lines delimit groups of statements for DUMP, COPY, and RESTORE functions. You do not need to enter a null line for PRINT or TYPE functions.

DDR performs the first function and prompts you for another statement. Enter the statements for the next function in the same manner.

To end the program after DDR has completed the last function, enter a null line. The program ends.

### Supplying DDR Control Statements from the IPL Device

Normally, you enter DDR control statements interactively after you IPL the program. However, if DDR resides on a DASD volume, you can direct DDR to read the control statements from the end of the file you IPL. To do this, you must set up the program and control statements before you IPL, as follows:

1. Edit the DDR program and put the control statements at the end of the file.
2. Transfer the program to tape, a card deck, or your virtual reader as usual.

The control statements transfer along with the program. Then you can load the program on the real processor (using the tape or the card deck) or in your virtual machine (using the tape or your virtual reader) as discussed previously.

After you load the program and receive the initial prompt, press ENTER. DDR reads all the control statements, completes the requested functions, and ends.

### Rules for Supplying DDR Control Statements from the IPL Device

When you prepare DDR control statements for entry from a tape or from a card reader, keep in mind the following rules:

- DDR reads only columns 1 to 71.
- DDR ignores any data you enter after the last possible operand of a statement.
- Each group of statements you include must define a single function: DUMP, RESTORE, COPY, PRINT, or TYPE.
- If you want DDR to perform the same function on different DASD extents, you must include a statement for each extent. You may not include more than 300 extent statements for the same function.

For example, suppose you want to dump to tape cylinders 1, 2, 3, 5, 7, 8, 10, 14, and 20 of a DASD. To do this, you must include six DUMP function statements, one for each noncontiguous set of cylinders (each extent).

- If you enter an incorrect statement, or if you enter the function statements in the wrong order, DDR sends you an error message. However, DDR continues to scan any remaining function statements for syntax errors.
- By default, DDR uses device number 00E as a printer. If you do not have a printer with device number 00E, use a SYSPRINT statement to define your printer. If the device specified on the SYSPRINT statement does not exist, DDR sends you an error message but checks any remaining statements for syntax errors.
- Start each group of statements that defines a DUMP, COPY, or RESTORE function with an INPUT or an OUTPUT statement.

INPUT and OUTPUT statements delimit the different functions you want DDR to perform on this run. When DDR reads an INPUT or OUTPUT statement that follows one or more function statements, it performs the function described by

## Running Utility Programs

the previous group of statements. It treats any function statements that follow as separate function requests.

## DDR Prompts and Responses

DDR may send you some of the following prompts or responses:

ENTER:

is the prompt you receive when DDR is waiting for you to enter more DDR statements from the console.

To start a new function (dump, copy, restore, print, or type), enter a control statement. When DDR prompts you again, enter the next statement. Continue until you have entered all the statements needed for the function. Then press the ENTER key without any data (enter a null line). Entering a null line ends input for the function and causes DDR to perform the function. When DDR prompts you again, you may end the program or enter statements for a new function.

If you wish to end the program, and you have not entered statements for a new function, enter a null line. DDR then ends.

ENTER CYLINDER EXTENTS

ENTER:

or

ENTER BLOCK EXTENTS

ENTER:

is the prompt you receive when DDR is waiting for you to define more cylinder or block extents. After you enter the first cylinder or block extent, DDR prompts you for the next:

ENTER NEXT EXTENT OR NULL LINE

ENTER:

When you have entered all of the cylinder or block extents, press ENTER without any data.

VOLID READ IS *valid1* [NOT *valid2*]

DO YOU WISH TO CONTINUE?

RESPOND YES, NO OR REREAD:

is the prompt you receive when DDR has read the DASD volume identifier of your input device. DDR waits for you to verify that the device with volume identifier *valid1* is the input device you want to use. If you entered a volume identifier on the INPUT control statement that does not match *valid1*, DDR displays the volume identifier you entered as *valid2*.

If you want DDR to continue, enter YES. If not, enter NO. If you want DDR to read the volume identifier again, enter REREAD.

DUMPING *valid*

COPYING *valid*

RESTORING *valid*

PRINTING *valid*

are the responses you receive when DDR begins a dump, copy, restore, or print function, respectively. The *valid* variable is the volume identifier described by the INPUT statement.

END OF VOLUME CYL xxxx HD xx, MOUNT NEXT TAPE

or

END OF VOLUME BLOCK xxxxxx, MOUNT NEXT TAPE

is the response you receive when DDR reaches the end of a tape and is waiting for you to mount the next one. DDR continues after you mount the next tape.

END OF DUMP

END OF COPY

END OF RESTORE

END OF PRINT

are the responses you receive when DDR completes a DUMP, COPY, RESTORE, or PRINT function, respectively.

END OF JOB

is the response you receive when DDR completes its processing.

---

## Running the Device Support Facilities Program

The device support facilities program is provided with VM/ESA. It normally resides on the CMS system volume.

You can use it to perform various operations on direct access storage devices (DASD). For example, you can use the device support facilities program to inspect a DASD volume for defective tracks, assign alternate tracks if defective ones are encountered, change a volume label or owner ID, or initialize a DASD volume so that it can be used in an operating system environment.

Under VM/ESA, the device support facilities program operates on:

- A user's minidisk
- A dedicated DASD.

To perform these operations, see the detailed descriptions in the *Device Support Facilities User's Guide and Reference* book.

---

## Running Production System Utility Programs

In addition to utilities provided with VM/ESA, you may need to run utility programs that are provided with your production system. For example, you may need to run one of the following stand-alone programs:

- The information management system/virtual storage (IMS/VS) log tape terminator utility
- The stand-alone dump utility for your production system.

### IMS/VS Log Tape Terminator (MVS)

If you are running IMS/VS under MVS/SP, MVS/XA, or MVS/ESA in a V=R preferred machine and VM/ESA terminates, CP tries to preserve the MVS operating environment. Even if it is unable to preserve the MVS operating environment, CP attempts to leave the contents of all V=R and V=F virtual machines' storage intact. This allows you to run the IMS/VS log tape terminator utility in a preferred virtual machine to recover any information that was in real storage when the system incident occurred.

**Note:** You can do this only if your MVS/SP, MVS/XA, or MVS/ESA production system has been running in a preferred virtual machine. For more information about V=R preferred machine recovery, see “Preferred Machine Recovery” on page 211.

For more information about the IMS/VS log tape terminator program, see the *IMS/VS Emergency Log Terminator Program Description/Operations* book.

### MVS Stand-Alone Dump Utility

If you are running an MVS/SP, MVS/XA, or MVS/ESA production system in a V=R preferred machine and VM/ESA terminates, CP tries to preserve the MVS operating environment. Even if it is unable to preserve the MVS operating environment, however, CP attempts to leave the contents of all the preferred virtual machines' storage intact. This allows you to run the appropriate stand-alone dump utility in a preferred virtual machine to dump any information that was in real storage when the system incident occurred.

**Note:** You can do this only if your MVS/SP, MVS/XA, or MVS/ESA production system has been running in a preferred virtual machine. For more information about V=R preferred machine recovery, see “Preferred Machine Recovery” on page 211.

For information about using the MVS stand-alone dump utility, see the appropriate MVS book.

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## Appendix A. Common Operator Commands for VM/ESA

This appendix summarizes the commands you commonly use as a VM/ESA operator. The appendix includes the commands to:

- Check the status of users
- Check the status of the CSE complex
- Check the commands and DIAGNOSE codes you can use
- Check the maximum number of spool files for the system
- Set the maximum number of users for the system
- Check whether a virtual machine is a quick dispatch virtual machine
- Check CP File System Status
- Control processors and storage
- Communicate with users
- Control channel paths and local devices
- Control spool files in the print, reader, and punch queues
- Defining and Setting Time Zones
- Shut down VM/ESA
- Collect information about system events, performance, accounting, and hardware errors
- Perform data management services.

---

### Check the Status of Users

QUERY USERS	Find out how many users are logged on and dialed.
QUERY USERS <i>userid</i>	Find out if a specific user is logged on. (The response gives the device number of the user's display.)
QUERY <i>userid</i>	Find out if a specific user is logged on. (The response gives the device number of the user's display.)
QUERY USERS AT ALL	Find out how many users are logged on and dialed for all systems in the CSE complex.
QUERY USERS <i>userid</i> AT ALL	Find out the user ID and device address of a user on all systems in the CSE complex.
QUERY NAMES	Find out which users are logged on, and the real or logical device number of the display to which each user is logged on. Included also are the logical unit names (lunames) owned by any active VTAM service machine that is connected to the system. Note that the response to this command could tie up your console with many thousands of names.
QUERY NAMES AT ALL	Find out which users are logged on, for all systems in a CSE complex and the logical device number of the displays where those users are connected. Note that the response to this command could tie up your console with many thousands of names.
INDICATE USER <i>userid</i>	Find out a user's system resource usage, or find out if a logon ID belongs to a V=R, V=F, or V=V virtual machine.
QUERY SHARE <i>userid</i>	Find out a user's scheduling share, or find out if a processor is dedicated to the user.
QUERY MAXUSERS	Find out the maximum number of users allowed to log on.

---

### Check the Status of the CSE Complex

XSPPOOL QUERY Find out the status of the cross system spooling complex. The response indicates whether or not the cross system spooling communication task is active.

---

### Check the Commands and DIAGNOSE Codes

COMMANDS Find out what commands you can enter from the ID you are using.  
QUERY D8ONECMD Find out if multiple commands in Diagnose code X'08'  
QUERY DIAGNOSE Find out the available DIAGNOSE instructions and status.

---

### Check the Maximum Number of Spool Files for the System

QUERY MAXSPOOL Find out the maximum number of spool files for the system.

---

### Set the Maximum Number of Users for the System

SET MAXUSERS *nnnn* Set the maximum number of users who can log on to the system.

---

### Check Whether a Virtual Machine Is a Quick Dispatch Virtual Machine

QUERY QUICKDSP *userid* Find out if the virtual machine is a quick dispatch virtual machine.

---

### Check CP file system status

CPACCESS Identifies a CMS-formatted minidisk to CP and makes the files on that minidisk available to CP by establishing a file mode letter for the files.  
CPRELEASE Releases a minidisk that was previously accessed using the CPACCESS command or the CP\_ACCESS statement in the system configuration file.  
CPLISTFILE Lists information on the files on a minidisk that you identified to CP by using either a CPACCESS command or a CP\_ACCESS statement in the system configuration file.  
CPTYPE Causes CP to display selected lines of a file on a minidisk that you identified to CP with either a CPACCESS command or on the CP\_ACCESS statement in the system configuration file.  
QUERY CPDISKS Displays what minidisk's CP has currently accessed.

---

### Control Processors

INDICATE LOAD Find out which processors are active.  
QUERY PROCESSORS Find out how CP is using the real processors.

---

## Control Vector Facilities

QUERY VECTOR	Find out the status of Vector Facilities.
INDICATE LOAD	Find out which Vector Facilities are in use.
QUERY VECTOR USERS	List the logon IDs of Vector Facility users.
INDICATE VECTOR	List the active and loaded Vector Facility users.

---

## Control Storage

QUERY FRAMES	Find out how real storage is allocated.
QUERY V=R	Find out how V=R storage is allocated.
QUERY VRFREE	Find out how much V=R recovery storage is allocated and how much is currently in use.
QUERY MDC	Find the status of mini disk caching allocation and usage for storage and XSTORE.

---

## Control Expanded Storage

QUERY XSTORE	Find out the status of expanded storage.
ATTACH XSTORE <i>userid</i>	Dedicate expanded storage to user <i>userid</i> .
DETACH XSTORE <i>userid</i>	Remove expanded storage from user <i>userid</i> .
RETAIN XSTORE	Reserve expanded storage for CP exclusive use.
QUERY MDC	Find the status of mini disk caching allocation and usage for storage and XSTORE.

---

## Communicate with VM/ESA Users

QUERY LOGMSG	Display the system log message.
SET LOGMSG <i>nn * text</i>	Change the system log message so that all users see the text of this line when they log on.
SET LOGMSG <i>nn text</i>	Change the system log message so that users must enter QUERY LOGMSG to read the text of this line.
SET LOGMSG <i>nn NULL</i>	Delete a line from the system log message.
SET LOGMSG NULL	Delete the entire system log message.
MESSAGE ALL <i>text</i>	Send a message to all users.
MESSAGE ALL AT ALL	Send a message to every user on every system in the CSE complex.
MESSAGE <i>userid text</i>	Send a message to a specific user.
WARNING ALL <i>text</i>	Send a warning message to all users.
WARNING ALL AT ALL	Send a warning message to every user on every system in the CSE complex.
WARNING <i>userid text</i>	Send a warning message to a specific user.

---

### Control Channel Paths and Programs

HALT <i>rdev</i>	Terminate execution of an active channel program on device <i>rdev</i> .
QUERY PATHS TO <i>rdev</i>	Find out the status of all channel paths installed (with IOCP) to device <i>rdev</i> .
QUERY CHPID <i>nn</i>	Find out the status of channel path <i>nn</i> for all devices to which it is installed.
QUERY CHPIDS	Used to display all 256 of the machine's channel paths and their physical status.
VARY OFFLINE PATH <i>nn</i> FROM <i>rdev</i>	Logically remove channel path <i>nn</i> from device <i>rdev</i> .
VARY ONLINE PATH <i>nn</i> TO <i>rdev</i>	Make channel path <i>nn</i> logically available to device <i>rdev</i> .

---

### Control Dynamic Switching Devices

QUERY SWCH ALL	Find out the status of all dynamic switching devices.
ATTACH <i>rdev userid vdev</i>	Dedicate dynamic switching device <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove dynamic switching device <i>rdev</i> from user <i>userid</i> .
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

---

### Control Local Displays, 3270 Printers, and Communication Lines

QUERY <i>rdev</i>	Find out the status of files to be printed on the printer <i>rdev</i> .
QUERY GRAF ALL	Find out the status of all displays and 3270 printers.
QUERY LINES ALL	Find out the status of all communication lines.
VARY ONLINE <i>rdev</i>	Make display, 3270 printer, or communication lines <i>rdev</i> available to the system.
ENABLE <i>rdev</i>	Enable display, 3270 printer, or communication lines <i>rdev</i> to be used by a VM/ESA user.
ATTACH <i>rdev userid vdev</i>	Dedicate display, 3270 printer, or communication lines <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove display, 3270 printer, or communication lines <i>rdev</i> from user <i>userid</i> .
DISABLE <i>rdev</i>	Disable display, 3270 printer, or communication lines <i>rdev</i> from being used by a VM/ESA user.
VARY OFFLINE <i>rdev</i>	Make a display, 3270 printer, or communication lines <i>rdev</i> unavailable to the system.
SET PF <i>nn</i> COPY <i>rdev</i>	Set up 3270 printer <i>rdev</i> to copy a display screen with the PF <i>nn</i> key. (This does not apply to communication lines.)
TRANSFER PRT CLASS <i>c userid1 all to from all * userid2 rdr prt pun</i>	Transfer spool files from the 3270 printer.
SET RDEVICE	Define device characteristics.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

---

## Control Local Direct Access Storage Devices (DASD)

COMMIT DEVICE <i>rdev</i>	Transfer cache fast write data from the cache to addressed device <i>rdev</i> .
DESTAGE SUBSYSTEM <i>rdev</i>	Force transfer of modified data in subsystem cache or NVS to backing storage device <i>rdev</i> .
DISCARD PINNED ALL CACHEFW <i>rdev</i>	Discard pinned data in device <i>rdev</i> in subsystem cache or nonvolatile storage (NVS).
DUPLEX <i>rdev</i> ON SUSPEND OFF	Perform duplex control operations (such as establishing or discontinuing a duplex pair).
QUERY DUPLEX <i>rdev</i>	Display status of duplex pairs of devices attached to a cache storage subsystem.
QUERY CACHEFW <i>rdev</i>	Display the cache fast write status for cache storage subsystem device <i>rdev</i> .
QUERY DASDFW <i>rdev</i>	Display the DASD fast write status of device <i>rdev</i> attached to the cache storage subsystem.
QUERY FENCES <i>rdev-rdev</i>	Display a list of internal fences for device <i>rdev</i> created by a 3990 models 3 or 6 subsystem.
QUERY NVS <i>rdev</i>	Display the status of NVS device <i>rdev</i> associated with a DASD storage subsystem.
QUERY PINNED DEVICE SUBSYSTEM <i>rdev1...rdevn</i>	Display the data tracks of one or more DASD <i>rdev1...rdevn</i> or the total amount of subsystem pinned and NVS storage data in <i>rdev1...rdevn</i> .
QUERY PENDING COMMANDS ALLUSERS <i>rdev</i>  ALL	Display the commands for device <i>rdev</i> or for all devices (ALL) that you have entered and, optionally, that other users have entered (ALLUSERS) for which the associated asynchronous function has not yet completed.
QUERY RSAW CLUSTER 0 1 ALL <i>rdev</i>	Generate and display the RSAW for storage cluster 0, 1, or all in the DASD subsystem for device <i>rdev</i> .
SET CACHE DEVICE ON OFF or SET CACHE SUBSYSTEM ON OFF FORCEOFF FOR <i>rdev</i>	Activate or deactivate caching by device or subsystem for device <i>rdev</i> in the 3990 models 3 or 6 subsystem. FORCEOFF indicates the cache is forced to be unavailable to device <i>rdev</i> .
SET CACHEFW SUBSYSTEM ON OFF <i>rdev</i>	Activate or deactivate the cache fast write function in a DASD subsystem for device <i>rdev</i> .
SET DASDFW DEVICE ON OFF FORCEOFF <i>rdev1...rdevn</i>	Activate or deactivate the DASD fast write function for devices <i>rdev1...rdevn</i> in a DASD subsystem.
SET NVS SUBSYSTEM ON OFF <i>rdev</i>	Make NVS available or unavailable within a DASD subsystem for device <i>rdev</i> .
QUERY <i>rdev</i>	Find out the status of a DASD <i>rdev</i> .
QUERY DASD ALL	Find out the status of all DASD.
QUERY CACHE <i>rdev</i>	Find out the caching status of a DASD <i>rdev</i> .
SET CACHE SUBSYSTEM ON <i>rdev</i>	Make the cache available to the subsystem for a DASD <i>rdev</i> .
SET CACHE DEVICE ON <i>rdev</i>	Activate the cache for a DASD <i>rdev</i> .
SET CACHE SUBSYSTEM OFF <i>rdev</i>	Make the cache unavailable to the subsystem for a DASD <i>rdev</i> .
SET CACHE DEVICE OFF <i>rdev</i>	Deactivate the cache for a DASD <i>rdev</i> .
QUERY DASD <i>valid</i>	Locate the DASD volume <i>valid</i> , and find out the status of the DASD on which it is mounted.
VARY ONLINE <i>rdev</i>	Make a DASD <i>rdev</i> available to the system.
ATTACH <i>rdev userid vdev</i>	Dedicate a DASD <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .

## Common Operator Commands for VM/ESA

ATTACH <i>rdev userid vdev control</i>	Dedicate a DASD <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> with the given level of <i>control</i> . NOCTL, DEVCTL, SYSCTL. <b>Note:</b> Deactivate, activate, and force deactivate DASD fast write are accepted for DEVCTL.
DETACH <i>rdev userid</i>	Remove a DASD <i>rdev</i> from user <i>userid</i> .
ATTACH <i>rdev</i> SYSTEM <i>valid</i>	Attach the system volume <i>valid</i> on a DASD <i>rdev</i> to the system.
DETACH <i>rdev</i> SYSTEM	Detach the system volume on a DASD <i>rdev</i> from the system.
VARY OFFLINE <i>rdev</i>	Make a DASD <i>rdev</i> unavailable to the system.
QUERY ALLOC ALL	Display a list of CP-owned system volumes that contain temporary disk, directory, paging, or spooling space.
QUERY ALLOC PAGE ALL	Display a list of all CP-owned system volumes that contain paging space.
QUERY ALLOC SPOOL ALL	Display a list of all CP-owned system volumes that contain spooling space.
QUERY ALLOC TDISK ALL	Display a list of all CP-owned system volumes that contain temporary disk space.
QUERY ALLOC DRCT ALL	Display a list of all CP-owned system volumes that contain directory space.
QUERY ALLOC MAP ALL	Display the allocation mapping of all CP-owned system volumes.
QUERY SYSTEM ALL	Find out how many users are using minidisks or temporary disks on system volumes.
CPFMTXA <i>vdev valid</i>	Under CMS, format and allocate volume <i>valid</i> on virtual device <i>vdev</i> for system use.
SET DUMP DASD IPL CP	Define a DASD as the dump device.
SET RDEVICE	Define device characteristics.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

---

## Control Local Tape Drives

QUERY <i>rdev</i>	Find out the status of tape drive <i>rdev</i> .
QUERY TAPES ALL	Find out the status of all tape drives.
VARY ONLINE <i>rdev</i>	Make tape drive <i>rdev</i> available to the system.
ATTACH <i>rdev userid vdev</i>	Dedicate tape drive <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove tape drive <i>rdev</i> from user <i>userid</i> .
DETACH <i>rdev userid</i> LEAVE	Remove tape drive <i>rdev</i> from user <i>userid</i> , but do not rewind or unload the tape.
DETACH <i>rdev userid</i> UNLOAD	Remove tape drive <i>rdev</i> from user <i>userid</i> and rewind and unload the tape.
VARY OFFLINE <i>rdev</i>	Make a tape drive <i>rdev</i> unavailable to the system.
SET DUMP <i>rdev</i> IPL CP	Define tape drive <i>rdev</i> as the dump device.
GIVE <i>vdev1</i> to <i>userid</i> as <i>vdev2</i>	Transfer control of the tape drive <i>vdev1</i> to the receiver <i>userid</i> in READ/WRITE mode as attached virtual device <i>vdev2</i> . The tape drive is to be returned in the position it was in when it was detached by the user
RETURN R/W LEAVE	
SET RDEVICE	Define device characteristics.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

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## Control Local Channel-to-Channel Adapters (CTCAs)

QUERY <i>rdev</i>	Find out the status of CTCA <i>rdev</i> .
QUERY CTCA ALL	Find out the status of all CTCAs.
VARY ONLINE <i>rdev</i>	Make a CTCA <i>rdev</i> available to the system.
ATTACH <i>rdev userid vdev</i>	Dedicate a CTCA <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove a CTCA <i>rdev</i> from user <i>userid</i> .
VARY OFFLINE <i>rdev</i>	Make a CTCA <i>rdev</i> unavailable to the system.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

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## Control Local Open Systems Adapters (OSAs)

QUERY <i>rdev</i>	Find out the status of OSA <i>rdev</i> .
QUERY OSA ALL	Find out the status of all OSAs.
VARY ONLINE <i>rdev</i>	Make an OSA <i>rdev</i> available to the system.
ATTACH <i>rdev userid vdev</i>	Dedicate an OSA <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove an OSA <i>rdev</i> from user <i>userid</i> .
VARY OFFLINE <i>rdev</i>	Make an OSA <i>rdev</i> unavailable to the system.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

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## Control Local Printers

QUERY <i>rdev</i>	Find out the status of printer <i>rdev</i> .
QUERY <i>ptid</i>	Find out the status of the virtual machine <i>ptid</i> that controls the print server printer.
QUERY PRINTER SECLABEL	Find out the security labels of the spool files in the printer queue.
QUERY UR ALL	Find out the status of all printers (and all other unit record devices).
VARY ONLINE <i>rdev</i>	Make printer <i>rdev</i> available to the system.
ATTACH <i>rdev userid vdev</i>	Dedicate printer <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove printer <i>rdev</i> from user <i>userid</i> .
VARY OFFLINE <i>rdev</i>	Make a printer <i>rdev</i> unavailable to the system.
QUERY IMG	Find out what 3800 image libraries are available.

## Common Operator Commands for VM/ESA

START UR <i>rdev</i> USER SYSTEM <i>options</i>	Start printing any user's files on 3800 <i>rdev</i> with the given options: CLASS <i>abcdefgh</i> FORM <i>operform</i> CHARS <i>cccc</i> FCB <i>fff</i> MANUAL, AUTO SEP, NOSEP ANY3800, BEG3800, NO3800 FLASH <i>name</i> , FLASH OFF IMAGE <i>name</i> HOLD, PURGE SECLABEL.
START UR <i>rdev</i> USER <i>userid options</i>	Start printing only the files owned by user <i>userid</i> on a 3800 <i>rdev</i> with the given options.
LOADBUF <i>rdev</i> UCS <i>name</i> VER	Load the UCS buffer <i>name</i> for impact printer <i>rdev</i> and verify it.
LOADBUF <i>rdev</i> FCB <i>name</i>	Load the FCB <i>name</i> for impact printer <i>rdev</i> .
START <i>rdev</i> USER SYSTEM <i>options</i>	Start printing any user's files on impact printer <i>rdev</i> with the given options: CLASS <i>abcdefgh</i> FORM <i>operform</i> DEST <i>dest</i> CHARS <i>cccc</i> FCB <i>fff</i> AFP, NOAFP IMAGE <i>name</i> SETUP, MANUAL, AUTO SEP, NOSEP NO3800, BEG3800, ANY3800 INDEX <i>nn</i> SECLABEL.
START UR <i>rdev</i> USER <i>userid options</i>	Start printing only the files owned by user <i>userid</i> on impact printer <i>rdev</i> with the given options.
DRAIN UR <i>rdev</i>	Stop printing on printer <i>rdev</i> after the current file.
DRAIN <i>prtId</i>	Stop printing on the AFP identified as <i>prtId</i> that is controlled by the print server virtual machine, after the current file.
FLUSH <i>rdev</i> HOLD	Stop printing on printer <i>rdev</i> immediately; put the current file on system hold.
FLUSH <i>rdev</i> ALL	Stop printing on printer <i>rdev</i> immediately; purge all copies of the current file.
FLUSH <i>prtId</i> HOLD	Stop printing on the print server printer controlled by virtual machine <i>prtId</i> immediately; put the current file in system hold.
FLUSH <i>prtId</i> ALL	Stop printing on the print server printer controlled by virtual machine <i>prtId</i> immediately; purge all copies of the current file.
BACKSPACE <i>rdev nnn</i>	Backspace the file printing on printer <i>rdev nnn</i> number of pages.
BACKSPACE <i>rdev</i> FILE	Backspace the file printing on printer <i>rdev</i> to the beginning of the file.
BACKSPACE <i>rdev nnn</i> EOF	Backspace the file printing on printer <i>rdev</i> to a point <i>nnn</i> pages from the end of the file.
SPACE <i>rdev</i>	Cause the file printing on printer <i>rdev</i> to print single-spaced.
REPEAT <i>rdev nnn</i>	Cause the file printing on printer <i>rdev</i> to print <i>nnn</i> more copies.
SET RDEVICE	Define device characteristics.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts

VARY OFFLINE SUBCHANNEL *rdev* Disable the subchannel for I/O interrupts

---

## Control Spool Files in the Print Queue

QUERY FILES	Find out how many files are in the print queue.
QUERY PRINTER	List the files in the print queue.
QUERY PRINTER EXP	Display expanded information about the files in the print queue.
QUERY PRINTER PSF	Display additional information about the files in the print queue.
ORDER <i>userid</i> PRINTER <i>nnnn</i>	Put file <i>nnnn</i> at the top of the print queue.
CHANGE <i>userid</i> PRINTER <i>nnnn</i> SYS	Put file <i>nnnn</i> (in the print queue) on system hold.
CHANGE <i>userid</i> PRINTER <i>nnnn</i> NOSYS	Release file <i>nnnn</i> (in the print queue) from system hold.
CHANGE <i>userid</i> PRINTER <i>nnnn</i> COPY <i>cpy</i>	Change the number of copies of file <i>nnnn</i> (in the print queue) to <i>cpy</i> .
CHANGE <i>userid</i> PRINTER <i>nnnn</i> SECLABEL <i>ssssssss</i>	Change the security label of file <i>nnnn</i> (in the print queue) to <i>ssssssss</i> .
CHANGE <i>userid</i> PRINTER <i>nnnn</i> DEST <i>dest</i>	Change the destination value of file <i>nnnn</i> (in the print queue) to <i>dest</i> .
CHANGE <i>userid</i> PRINTER <i>nnnn</i> UNCONV	Cancel all preprocessing to file <i>nnnn</i> (in the print queue) in order to use different options.
PURGE <i>userid</i> PRINTER <i>nnnn</i>	Purge file <i>nnnn</i> from the print queue.
TRANSFER PRT CLASS <i>c userid1 all</i> to from all * <i>userid2</i> rdr prt pun	Transfer spool files from the print queue.

---

## Control Local Card Readers

QUERY <i>rdev</i>	Find out the status of card reader <i>rdev</i> .
QUERY UR ALL	Find out the status of all card readers (and all other unit record devices).
QUERY READER SECLABEL	Find out the security labels of the spool files in the reader.
VARY ONLINE <i>rdev</i>	Make card reader <i>rdev</i> available to the system.
ATTACH <i>rdev</i> <i>userid</i> <i>vdev</i>	Dedicate card reader <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev</i> <i>userid</i>	Remove card reader <i>rdev</i> from user <i>userid</i> .
VARY OFFLINE <i>rdev</i>	Make a card reader <i>rdev</i> unavailable to the system.
START UR <i>rdev</i>	Start reading files on card reader <i>rdev</i> .
DRAIN UR <i>rdev</i>	Stop card reader <i>rdev</i> after the current file.
SET RDEVICE	Define device characteristics.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

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## Control Spool Files in the Reader Queue

QUERY FILES	Find out how many files are in the reader queue.
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## Common Operator Commands for VM/ESA

QUERY READER ALL	List the files in the reader queue. Note that the response to this command could tie up your console with many thousands of reader files.
QUERY READER SECLABEL	Find out the security labels of the spool files in the reader.
CHANGE <i>userid</i> READER <i>nnnn</i> SECLABEL <i>ssssssss</i>	Change the security label of file <i>nnnn</i> (in <i>userid</i> 's reader queue) to <i>ssssssss</i> .
ORDER <i>userid</i> READER <i>nnnn</i>	Put file <i>nnnn</i> at the top of the reader queue.
PURGE <i>userid</i> READER <i>nnnn</i>	Purge file <i>nnnn</i> from the reader queue.
TRANSFER RDR CLASS <i>c userid1 all</i> to from all * <i>userid2</i> rdr prt pun	Transfer spool files from the reader queue.

---

## Control Local Card Punches

QUERY <i>rdev</i>	Find out the status of card punch <i>rdev</i> .
QUERY UR ALL	Find out the status of all card punches (and all other unit record devices).
VARY ONLINE <i>rdev</i>	Make card punch <i>rdev</i> available to the system.
ATTACH <i>rdev userid vdev</i>	Dedicate card punch <i>rdev</i> to user <i>userid</i> as virtual device <i>vdev</i> .
DETACH <i>rdev userid</i>	Remove card punch <i>rdev</i> from user <i>userid</i> .
VARY OFFLINE <i>rdev</i>	Make a card punch <i>rdev</i> unavailable to the system.
CHANGE <i>userid</i> PUNCH CLASS <i>c</i> FORM <i>f</i> NOSYS	Release class <i>c</i> , form <i>f</i> files from system hold so that they may be punched.
CHANGE <i>userid</i> PUNCH <i>nnnn</i> SECLABEL <i>ssssssss</i>	Change the security label of file <i>nnnn</i> (in the card punch) to <i>ssssssss</i> .
START UR <i>rdev</i> CLASS <i>c</i> FORM <i>f</i> MANUAL	Start punching class <i>c</i> , form <i>f</i> files on card punch <i>rdev</i> .
START UR <i>rdev</i> USER <i>userid</i> CLASS <i>c</i> FORM <i>f</i> MANUAL	Start punching only the class <i>c</i> , form <i>f</i> files owned by user <i>userid</i> on card punch <i>rdev</i> .
DRAIN UR <i>rdev</i>	Stop punching on card punch <i>rdev</i> after the current file.
FLUSH <i>rdev</i> HOLD	Stop punching on card punch <i>rdev</i> immediately; put the current file in system hold.
FLUSH <i>rdev</i> ALL	Stop punching on card punch <i>rdev</i> immediately; purge all copies of the current file.
BACKSPACE <i>rdev</i> FILE	Backspace the file punching on card punch <i>rdev</i> to the beginning of the file.
REPEAT <i>rdev nnn</i>	Cause the file punching on card punch <i>rdev</i> to punch <i>nnn</i> more copies.
SET RDEVICE	Define device characteristics.
VARY ONLINE SUBCHANNEL <i>rdev</i>	Enable the subchannel for I/O interrupts
VARY OFFLINE SUBCHANNEL <i>rdev</i>	Disable the subchannel for I/O interrupts

---

## Control Spool Files in the Punch Queue

QUERY FILES	Find out how many files are in the punch queue.
QUERY PUNCH	List the files in the punch queue.
QUERY PUNCH ALL	Display additional information about the files in the punch queue.
QUERY PUNCH SECLABEL	Find out the security labels of the spool files in the punch queue.
ORDER <i>userid</i> PUNCH <i>nnnn</i>	Put file <i>nnnn</i> at the top of the punch queue.
CHANGE <i>userid</i> PUNCH <i>nnnn</i> SYS	Put file <i>nnnn</i> (in the punch queue) in system hold.
CHANGE <i>userid</i> PUNCH <i>nnnn</i> NOSYS	Release file <i>nnnn</i> (in the punch queue) from system hold.
CHANGE <i>userid</i> PUNCH <i>nnnn</i> COPY <i>cpy</i>	Change the number of copies of file <i>nnnn</i> (in the punch queue) to number <i>cpy</i> .
CHANGE <i>userid</i> PUNCH <i>nnnn</i> SECLABEL <i>ssssssss</i>	Change the security label of file <i>nnnn</i> (in the punch queue) to <i>ssssssss</i>
PURGE <i>userid</i> PUNCH <i>nnnn</i>	Purge file <i>nnnn</i> from the punch queue.
TRANSFER PUN CLASS <i>c userid1 all</i> to from all * <i>userid2</i> rdr prt pun	Transfer spool files from the punch queue.

---

## Defining and Setting Time Zones

QUERY TIME	Displays the following: <ul style="list-style-type: none"> <li>Current time.</li> <li>Time zone.</li> <li>Day of the week.</li> <li>Date.</li> <li>Connect time for the current session.</li> <li>Processor time for the current session.</li> </ul>
QUERY TIME OFFSET	Find out the difference between the system's current time zone and Coordinated Universal Time (UTC).
QUERY TIMEZONE	Displays the list of active and inactive time zone definitions on your system.
DEFINE TIMEZONE	Defines a new time zone or changes an existing time zone definition.
SET TIMEZONE	Changes the system's active time zone ID and time zone offset.  <b>Note:</b> Enter this command only when changing to standard or daylight savings time.

---

## Shut Down VM/ESA

WARNING ALL <i>text</i>	Send a warning message to all users.
DRAIN UR ALL	Drain all unit record devices.
SHUTDOWN	Shut down VM/ESA.

### Load an Alternate Nucleus

WARNING ALL <i>text</i>	Send a warning message to all users.
DRAIN UR ALL	Drain all unit record devices.
SHUTDOWN REIPL <i>rdev</i>	Shut down VM/ESA and bring it up with the nucleus residing at address <i>rdev</i> .

---

### Collect Information about System Events

SPOOL CONSOLE START	Start logging console activity in a console log.
* <i>text</i>	Add comment <i>text</i> to a console log.
CLOSE CONSOLE	Ready a console log for printing.
SPOOL CONSOLE STOP	Stop logging console activity in a console log.

---

### Collect Information about System Performance

INDICATE LOAD	Find out what the work load is for the VM/ESA system.
INDICATE LOAD AT <i>sysname</i>	Find out what the work load is for a specific system, <i>sysname</i> , in the CSE complex.
INDICATE LOAD AT *	Find out what the work load is for the system you are logged on.
INDICATE I/O	Find out the users that are waiting for devices.
INDICATE PAGING WAIT	Find out the users that are waiting for pages.
INDICATE QUEUES	Find out the users that are in queue for dispatching.
INDICATE QUEUES EXP	Find out the users that are in queue for dispatching with expanded information about their priority, processor affinity, and status.
INDICATE VECTOR	Find out the active and loaded Vector Facility users.
INDICATE USER <i>userid</i>	Find out a user's system resource use.
QUERY SCMEASURE	Display whether subchannel measurement data is being collected for a specific device or range of devices.
SET SCMEASURE	Enable or disable the collecting of subchannel measurement data for a specific device or range of devices.

---

### Collect Accounting Information

RECORDING ACCOUNT ON	Start creating accounting records.
ACNT ALL	Produce accounting records for all users and the system.
QUERY RECORDING	Find out the status of accounting.
RETRIEVE ACCOUNT	Start retrieval of the accounting records (issued by the accounting virtual machine).

---

### Collect Hardware Error Information

RECORDING EREP ON	Start creating EREP records.
-------------------	------------------------------

QUERY RECORDING	Find out the status of error recording.
RETRIEVE EREP	Start retrieval of the EREP records (issued by the EREP virtual machine).
CPEREPXA	Process EREP records (issued by the EREP virtual machine).
SYNCDMDRS DASD TAPE PRINTER ALL	Create Miscellaneous Data Records (MDRs) for the specified devices.
QUERY MITIME	Find out how often CP checks for missing interrupts.
SET MITIME <i>dev mm:ss</i>	Change the rate at which CP checks for missing interrupts for device type <i>dev</i> (DASD, GRAF, TAPE, UR, MISC, SWCH, or real device number).

---

## Collect Symptom Record Information

RECORDING SYMPTOM ON	Start creating symptom records.
QUERY RECORDING	Find out the status of symptom record recording.
RETRIEVE SYMPTOM	Start retrieval of the symptom records (issued by the symptom record recording virtual machine).

---

## Dump and Load Standard Spool Files and System Data Files

SPXTAPE SCAN <i>vdev</i> SPOOL REWIND	Scan a tape mounted on tape drive <i>vdev</i> for all dumped standard spool files and system data files and rewind the tape.
SPXTAPE SCAN <i>vdev</i> STD REWIND	Scan a tape mounted on tape drive <i>vdev</i> for all dumped standard spool files and rewind the tape.
SPXTAPE SCAN <i>vdev</i> SDF REWIND	Scan a tape mounted on tape drive <i>vdev</i> for all dumped system data files and rewind the tape.
SPXTAPE DUMP <i>vdev</i> READER	Dump all reader spool files to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> READER	Load all reader spool files from a tape mounted on tape drive <i>vdev</i> .
SPXTAPE DUMP <i>vdev</i> PRINTER	Dump all printer spool files to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> PRINTER	Load all printer spool files from a tape mounted on tape drive <i>vdev</i> .
SPXTAPE DUMP <i>vdev</i> PUNCH	Dump all punch spool files to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> PUNCH	Load all punch spool files from a tape mounted on tape drive <i>vdev</i> .
QUERY NSS	Find out what named saved systems and saved segments are available.
SPXTAPE DUMP <i>vdev</i> NSS	Dump all named saved systems and saved segments to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> NSS	Load all named saved systems and saved segments from a tape mounted on tape drive <i>vdev</i> .
QUERY IMG	Find out what image libraries are available.
SPXTAPE DUMP <i>vdev</i> IMG	Dump all image libraries to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> IMG	Load all image libraries from a tape mounted on tape drive <i>vdev</i> .
QUERY UCR	Find out what user class restructure files are available.
SPXTAPE DUMP <i>vdev</i> UCR	Dump all user class restructure files to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> UCR	Load all user class restructure files from a tape mounted on tape drive <i>vdev</i> .
QUERY NLS	Find out what national language support files are available.

## Common Operator Commands for VM/ESA

SPXTAPE DUMP <i>vdev</i> NLS	Dump all national language support files to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> NLS	Load all national language support files from a tape mounted on tape drive <i>vdev</i> .
QUERY TRF	Find out what system trace files are available.
SPXTAPE DUMP <i>vdev</i> TRF	Dump all system trace files to a tape mounted on tape drive <i>vdev</i> .
SPXTAPE LOAD <i>vdev</i> TRF	Load all system trace files from a tape mounted on tape drive <i>vdev</i> .

---

## Move User Data between Systems

SPTAPE SCAN <i>rdev</i> REWIND	Scan a tape mounted on tape drive <i>rdev</i> for dumped spool files and rewind the tape.
SPTAPE DUMP <i>rdev</i> READER ALL	Dump all reader spool files to a tape mounted on tape drive <i>rdev</i> .
SPTAPE LOAD <i>rdev</i> READER ALL	Load all reader spool files from a tape mounted on tape drive <i>rdev</i> .
SPTAPE DUMP <i>rdev</i> PRINTER ALL	Dump all print spool files to a tape mounted on tape drive <i>rdev</i> .
SPTAPE LOAD <i>rdev</i> PRINTER ALL	Load all print spool files from a tape mounted on tape drive <i>rdev</i> .
SPTAPE DUMP <i>rdev</i> PUNCH ALL	Dump all punch spool files to a tape mounted on tape drive <i>rdev</i> .
SPTAPE LOAD <i>rdev</i> PUNCH ALL	Load all punch spool files from a tape mounted on tape drive <i>rdev</i> .

---

## Commands with Security Label Options

QUERY READER SECLABEL	Find out the security labels of the spool files in the reader.
QUERY PRINTER SECLABEL	Find out the security labels of the spool files in the printer queue.
QUERY PUNCH SECLABEL	Find out the security labels of the spool files in the punch queue.
CHANGE <i>userid</i> READER <i>nnnn</i> SECLABEL <i>ssssssss</i>	Change the security label of file <i>nnnn</i> (in the reader queue) to <i>ssssssss</i> .
CHANGE <i>userid</i> PRINTER <i>nnnn</i> SECLABEL <i>ssssssss</i> .	Change the security label of file <i>nnnn</i> (in the print queue) to <i>ssssssss</i> .
CHANGE <i>userid</i> PUNCH <i>nnnn</i> SECLABEL <i>ssssssss</i>	Change the security label of file <i>nnnn</i> (in the card punch or the punch queue) to <i>ssssssss</i> .
LOGON <i>userid</i> SECLABEL <i>ssssssss</i>	Log on a user with a specific security label <i>ssssssss</i> .
START <i>rdev</i> USER SYSTEM SECLABEL <i>ssssssss</i>	Start printing any user's files on printer <i>rdev</i> with the security label <i>ssssssss</i> .

---

## Appendix B. Printer and Print File Status

This appendix explains the way VM/ESA presents both printer and printer spool file status. It discusses the responses to the QUERY command for 3800 and impact printers and for files in the print queue.

---

### Understanding Printer Status

To display information about a printer, enter:

```
query rdev
```

where *rdev* is the real device number of the printer.

In response, CP displays the printer's status. Figure 9 shows two sample responses, one for a 3800 printer and one for an impact printer.

Sections following Figure 9 describe its contents in detail.

#### Sample QUERY

##### *rdev* Response for an Active 3800 Printer:

```
PRT 0B32 DRAINING SYSTEM CLASS ABCD SEC JOBARO
PRT 0B32 FORM TTABT6 MANUAL SEP ANY3800 LIMIT
PRT 0B32 FLASH IMAGE IMAG3800 CHARS GF10 FCB 8 HOLD LPP 060
PRT 0B32 DEST BLDG1 DEST - NONE - DEST - NONE -
PRT 0B32 AFP MARK
PRT 0B32 PRINTING MAINT FILE 1603 RECS 4436 COPY 001 SEQ 001 CL A PRT
```

#### Sample QUERY

##### *rdev* Response for an Active Impact Printer:

```
PRT 0003 SETUP REQ MAINT CLASS EFGH SEC JOBARO
PRT 0003 FORM STANDARD SETUP SEP N03800 DEFFCB LIMIT NONE
PRT 0003 FOLD IMAGE IMAGIMP1 CHARS FCB FCB8 LPP 068
PRT 0003 DEST BLDG1 DEST - NONE - DEST - NONE - DEST - NONE -
PRT 0003 NOAFP
PRT 0003 PRINTING MAINT FILE 1610 RECS 5328 COPY 003 SEQ 001 CL A PRT
```

Figure 9. Sample QUERY Response for a Printer

### Device Type and Real Device Number

In Figure 9, the first two fields of each line show the *device type* and the *real device number*. The sample shows one response for a 3800 printer with real device number B32 and another for an impact printer with real device number 003.

### Printer State

The *printer state* indicates an active printer's basic state. In Figure 9, the 3800's printer state is DRAINING; the impact printer's is SETUP REQ. The printer state may be any of the following:

- **STARTED**—The printer is either ready to print or is actually printing any available files. An available file is a file with characteristics that match those the printer is set up to handle.

## Printer and Print File Status

If there is an active file on the printer, CP displays information about it. This information appears after the other printer status.

- **DRAINING**—The printer is getting ready to go idle by finishing the printing of any active file.
- **DRAINED**—The printer is idle and not available to print spool files.
- **INT REQ**—Your intervention is required to handle a condition such as a paper jam, an open door, or lack of paper.
- **SETUP REQ** (impact printers only)—The printer is waiting for you to check the alignment of the paper on the printer.
- **MOUNT REQ**—The printer is waiting for you to change the paper (mount a new form).

You change the printer's state by entering the START or DRAIN commands, by responding to the mount or setup request, or by handling the condition for which your intervention is required.

## Assigned User

The *assigned user* shows you whose spool files the printer will print. In Figure 9, the 3800 is assigned to SYSTEM. The SYSTEM setting allows the printer to print files belonging to any user. Otherwise, the printer prints only the files belonging to the user whose logon ID is displayed. In Figure 9, the impact printer is assigned to user MAINT and so would print only MAINT's files.

You change the printer's assigned user with the START command.

## Spool File Class

The *spool file classes* field (which appears after the keyword CLASS) shows the class or classes of spool files the printer will print. The *operator form name* (after FORM) indicates the type of paper that should be mounted on the printer. The printer prints only spool files with matching class, security label, and operator form name.

Each installation classifies its printed output differently, but it is common to use a combination of class and form to separate different kinds of print files from each other. For example, a job of one print class/form differs from a job in another print class/form in at least one of the following ways:

- The type of printer (for example, impact or 3800) it is printed on
- The 3800 stacker feature (burster-trimmer-stacker or continuous forms stacker) to be used
- The kind of paper (size and number of parts) it is printed on
- The security label of the file
- The forms overlay required, if any
- The set of characters (print train image or font) used to print it
- The spacing in lines per inch (forms control buffer) used to print it.

A spool file class is an alphanumeric character (A through Z, 0 through 9). CP displays up to eight classes, or an asterisk (\*), which indicates that any class file will print. In the example, the 3800 printer prints files of four classes, classes A, B,

C, and D, in that order. The impact printer prints class E, F, G, and H files, in that order.

You change the print class with the START command to correspond to the kind of files you want to print next.

## Security Label

The SEC field contains a 1- to 8-character alphanumeric value that corresponds to the *security label* of spool files that can be printed on this printer. If a security label is not assigned to the printer, the SEC field is followed by the word NONE. No files can be printed until the printer is STARTed with a valid security label.

In Figure 9, the printers will print only files with a security label of JOBARO.

Security labels are used to control print jobs only if an external security manager (ESM) is installed and security label checking is enabled. If you are authorized by the ESM, use the START command to change the security label of the printer to correspond to the security label of the files you want to print next.

## Form Name

The operator form name corresponds to the type of paper on which a spool file should print. CP displays either an operator form name that your installation has established, or an asterisk (\*), which indicates that files with any form will print. In Figure 9, the 3800 printer will print files with the operator form name TTABT6. The impact printer, on the other hand, will print only the files that require standard paper.

You change the form name with the START command to correspond to the kind of files you want to print next.

## Form Mode

The *form mode* shows how the printer acts when no more files of the current form are left to print.

The MANUAL setting allows you to choose the next form you want to mount on the printer. The printer idles until another file of the current form joins the print queue or until you start the printer with a new form. Figure 9 shows the 3800 printer with the MANUAL setting.

When AUTO is set, CP automatically chooses the next form for you. When there are no more files in queue of the current form, CP starts the printer with the form of the next available file. CP then prompts you to mount the new form.

Both 3800 and impact printers may display MANUAL and AUTO settings. But SETUP mode applies only to impact printers; the example shows what it looks like.

In SETUP mode, the printer waits for you to align the paper based on the position of the alignment page it has printed out. The alignment page is the first page of the active file, except that the letters on the page appear as Xs and the numbers appear as 9s. Pressing the START and STOP buttons on the printer causes the printer to print out another alignment page. The printer stays in SETUP mode until you enter a START command without the SETUP option.

## Printer and Print File Status

You change the printer's form mode with the START command.

### Separator Page Mode

The *separator page mode* (in both examples in Figure 9, SEP) shows whether the printer prints separator pages between files. The SEP setting causes the printer to produce separator pages. These header and trailer pages make it easier to burst the output. When NOSEP is set, the printer prints one file after another without separation.

You change the printer's separator page mode with the START command.

**Note:** If an ESM is installed and security label checking is enabled, the NOSEP option is not valid. Files must be printed with separator pages.

### 3800 Load CCW Mode

The *3800 load CCW mode* shows you whether or not the printer will print files with 3800 load CCWs. Figure 9 shows ANY3800 mode for the 3800, and NO3800 mode for the impact printer.

A *3800 load CCW* is a special instruction imbedded in a spool file. It tells a 3800 to load data that defines the spacing, characters, or copy modification data that the printer is to use to print the file. CP keeps track of whether a spool file has any 3800 load CCWs, and if so, whether they appear only at the beginning, or throughout the file.

The ANY3800 setting allows the printer to print any kind of print file, whether it has 3800 load CCWs or not.

The NO3800 setting allows the printer to print only those files that have no 3800 load CCWs.

The BEG3800 setting allows the printer to print files with no 3800 load CCWs, or files with 3800 load CCWs that appear only at the beginning of the file.

ANY3800 is the normal setting for a 3800, while NO3800 is the normal setting for an impact printer. If you must, you can print BEG3800 and ANY3800 files on an impact printer, but doing so does not take advantage of any required 3800 features. An impact printer ignores 3800 load CCWs.

You change the printer's 3800 load CCW mode with the START command.

### DEFFCB/FILEFCB

The DEFFCB specification tells CP to use the default FCB, which has been loaded to the printer. The default FCB can be loaded to the printer using the LOADBUF command or the START command.

The FILEFCB specification tells CP to send LOAD FCB CCWs that were imbedded in the SPOOL file to the printer.

DEFFCB and FILEFCB are only valid for non-1403 impact printers. You can change the printer's LOAD FCB CCW load option with the START command.

## LIMIT

The LIMIT specification shows whether CP has been instructed to select files for the printer based on the overall size of the spool file. If LIMIT is not displayed as NONE, CP will multiply the copy count of a spool file by its record count and if the number exceeds the number displayed after LIMIT, the file will not be selected for printing. You can change the LIMIT value by entering the START command.

## Forms Overlay Name (3800 Only)

The *forms overlay name* (which appears after the FLASH keyword) shows you whether or not a 3800 printer prints files with a forms overlay.

Some print files may require the use of a forms overlay, a feature of the 3800. When this feature is active, the 3800 flashes an image onto selected pages of a print file through a film negative mounted in a frame. In the sample 3800 status, Figure 9, the keyword FLASH is followed by blanks, which indicates that the printer prints only files that do not require a forms overlay. CP does not display forms overlay status for an impact printer.

You change a 3800's forms overlay name with the START command.

## Image Library Name

The *image library name* (which appears after the IMAGE keyword) indicates which image library a printer will use.

An *image library* is a set of modules that define the spacing, characters, and copy modification data you may select. When a spool file that is printing calls for one of these modules, the printer looks for it in the specified image library. Figure 9 shows IMAG3800 for the 3800 printer and IMAGIMP1 for the impact printer.

You change the image library name with the START command.

## Default Character Set and FCB Names

The *default character set name* (which appears after the keyword CHARS) and *default FCB name* (appearing after the keyword FCB) show the characters and spacing a printer will use for files that do not specify a character set or FCB.

If spool files do not specify their own character set(s) or FCB, the printer uses these default values. The printer also uses these defaults to print the separator pages between files, if any. The default character set and FCB usually correspond to the class or form, or both, set up on the printer.

The number of lines to be printed on the separator page is determined by the FCB loaded on the printer. The default separator page contains 58 lines of data. If the page length defined by the FCB is less than the default separator page length, the separator page data must be customized in order to fit on a single page. This may be done using CP Exit points that are provided in separator page processing. See the *IBM VM/ESA: CP Exit Customization* for details.

In Figure 9, both printers use a character set of GF10 and a vertical spacing of 8 lines per inch. (This information is not displayed for a 1403-type printer unless it is equipped with a UCS feature.)

## Printer and Print File Status

You change a printer's default character set and FCB name with the START command.

### Load Check Action (3800 Only)

The *load check action* setting shows what a 3800 printer does when it encounters a load check error while printing a file.

A *load check error* indicates a problem with a spool file's 3800 load CCW. The HOLD setting causes CP to put the file in system hold. The PURGE setting causes CP to delete the file. The HOLD setting for the 3800 printer in Figure 9 indicates that CP will put a file in system hold. CP does not display a load check action for an impact printer.

You change the load check action setting for a 3800 with the START command.

### Fold or Nofold Status (Impact Printers Only)

FOLD indicates that lowercase characters are being translated into uppercase for printing and NOFOLD indicates they are not.

### Spool File Destination Value

The *dest field* (which appears after the keyword DEST) indicates those destinations the printer will print. The *dest* variable has a 1- to 8-character value and there can be up to four destination values. In Figure 9, both printers will print those spool files with a destination of BLDG1.

The first printer's DEST value is always shown as OFF unless it has been specifically set by the START command. If the remaining DEST values have not been set (by the START command), they are shown as - NONE -.

### Advanced Function Printer Status

Although a CP printer can select spool files having AFP characteristics, it is best to enter the START command with the NOAFP option. This avoids any erroneous output.

### Active File Printing Response Line

If the printer is not in a drained state, there may be a file that is either actually printing or ready to print. This is the *active file*.

If there is an active file on the printer, CP displays information about it after the other printer status, which will look something like the PRINTING response lines at the bottom of Figure 9 on page 331. In addition to the device type and real device number, the PRINTING response line shows, for the active file:

- The *file owner*—the logon ID of the user who owns or created the file
- The *spool file identification number*—a number CP assigns to the file when it is created
- The *file record count*—the number of logical records in the spool file, expressed in units, thousands (K), or millions (M)
- The *file copy number*—the number of the copy now printing, which is useful for files that have more than one copy

- The *file sequence number*—a number that appears on the separator pages (if any), marking the start and end of the printed file. CP maintains a separate list of sequence numbers for each spooled printer.

In Figure 9, the active file on the 3800 is file 1603. This file belongs to user MAINT and contains 4436 logical records. Copy 001 is about to print, and sequence number 001 will appear on the file's separator pages.

The active file on the impact printer in Figure 9 is file 1610. It also belongs to user MAINT, but it contains 5328 logical records. The printer is about to print copy 003. The separator pages will also show sequence number 001.

---

## Understanding Print File Status

To display information about all of the spool files in the print queue, enter one or all of the following commands:

```
query printer
query printer exp
query printer all
query printer psf
query printer seclabel
```

In response, CP displays information about all the files that are waiting to be printed. To display information about only a particular spool file in the print queue, enter:

```
query printer userid nnn
```

where *nnn* is the spool file identification number for the file.

Figure 10 on page 338 is an example of a CP response to these commands. The sections that follow Figure 10 describe the responses in detail. However, because the information CP displays for one file is the same as the information CP displays for all files, the discussion covers only the responses to the QUERY PRINTER, QUERY PRINTER EXP, QUERY PRINTER ALL, QUERY PRINTER PSF, and QUERY PRINTER SECLABEL commands, rather than the information about each file.

## Printer and Print File Status

### Sample Response to the QUERY PRINTER Command:

System:	OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	USERFORM	OPERFORM	DEST	KEEP	MSG
	OPERATOR	1598	T	CON	00006789	001	NONE	LISTING	STANDARD	OFF	OFF
	OPERATOR	1602	T	CON	00000171	001	USER	LISTING	STANDARD	OFF	OFF
	MAINT	1603	B	PRT	00004436	001	NONE	LISTING	STANDARD	ANY	ON
	MAINT	1608	B	PRT	00045373	003	NONE	LISTING	STANDARD	ANY	ON
	FINANCE1	1612	S	PRT	00004833	001	NONE	BILLING1	BILLFORM	BLDG1	ON
	FINANCE1	1615	R	PRT	00000524*020		NONE	MEMO	TTABT6	BLDG1	OFF
	MAINT	1629	B	PRT	00047682	001	NONE	LISTING	STANDARD	ANY	ON

### Sample Response to the QUERY PRINTER EXP Command:

System:	OWNERID	FILE	CLASS	RECORDS	FLASH	FCB	MDFY	FLSHC	LOAD	CHARS	SIZE
	OPERATOR	1598	T	CON	00006789				NO		0004
	OPERATOR	1602	T	CON	00000171				NO		0004
	MAINT	1603	B	PRT	00004436				BEG		0004
	MAINT	1608	B	PRT	00045373				ANY		0004
	FINANCE1	1612	S	PRT	00004833	BILL	BFCB	BMOD	1	001	ANY
	FINANCE1	1615	R	PRT	00000524		CONF	1			BEG
	MAINT	1629	B	PRT	00047682				ANY		0004

### Sample Response to the QUERY PRINTER ALL Command:

System:	OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	DATE	TIME	NAME	TYPE	DIST
	OPERATOR	1598	T	CON	00006789	001	NONE	OPEN-	0009		OPER
	OPERATOR	1602	T	CON	00000171	001	USER	08/03	09:08:55		OPER
	MAINT	1603	B	PRT	00004436	001	NONE	08/03	10:59:34	TESTIM1	LISTING
	MAINT	1608	B	PRT	00045373	003	NONE	08/03	11:02:27	TESTIM2	LISTING
	FINANCE1	1612	S	PRT	00004833	001	NONE	08/03	11:03:43	AUGBILL	REPORT
	FINANCE1	1615	R	PRT	00000524*020		NONE	08/03	11:10:28	AUGRPT	MEMO
	MAINT	1629	B	PRT	00047682	001	NONE	08/03	11:22:59	TESTIM3	LISTING

Figure 10 (Part 1 of 2). Sample QUERY Responses for Files in the Print Queue

**Sample Response to the QUERY PRINTER PSF Command:**

System:	OWNERID	FILE	CLASS	RECORDS	USERFORM	OPERFORM	DEST	CONVERSION	SPECIAL	PURGE
	OPERATOR	1598	T CON	00006789	LISTING	STANDARD	OFF	NOTCONV	NO	NO
	OPERATOR	1602	T CON	00000171	LISTING	STANDARD	OFF	NOTCONV	NO	NO
	MAINT	1603	B PRT	00004436	LISTING	STANDARD	ANY	COMPLETE	YES	NO
	MAINT	1608	B PRT	00045373	LISTING	STANDARD	ANY	COMPLETE	YES	YES
	FINANCE1	1612	S PRT	00004833	BILLING1	BILLFORM	BLDG1	NOTCONV	NO	NO
	FINANCE1	1615	R PRT	00000524	MEMO	TTABT6	BLDG1	NOTCONV	NO	NO
	MAINT	1629	B PRT	00047682	LISTING	STANDARD	ANY	ACTIVE	YES	NO

**Sample Response to the QUERY PRINTER SECLABEL Command for a Class D User:**

System:	OWNERID	FILE	CLASS	RECORDS	CPY	HOLD	USERFORM	OPERFORM	DEST	SECLABEL
	MAINT	1593	A PRT	00000173	001	NONE	PLAIN	PLAIN	BLDG2	009BDF
	MAINT	1603	A PRT	00000084	001	NONE	PLAIN	PLAIN	BLDG1	12345678
	MAINT	1632	A PRT	00000032	001	USER	PLAIN	PLAIN	BLDG2	543219E
	MAINT	1645	A PRT	00000576	001	SYS	PLAIN	PLAIN	BLDG1	89FED7
	MAINT	1668	A PRT	00000893	001	USYS	PLAIN	PLAIN	BLDG3	7EF9C1

**Sample Response to the QUERY PRINTER SECLABEL Command for a Class G User:**

System:	ORIGINID	FILE	CLASS	RECORDS	CPY	HOLD	FORM	DEST	KEEP	MSG	SECLABEL
	MAINT	1593	A PRT	00000273	001	NONE	PLAIN	BLDG3	ON	ON	019BCF
	MAINT	1603	A PRT	00000096	001	NONE	PLAIN	BLDG2	OFF	OFF	87654321
	MAINT	1632	A PRT	00000032	001	USER	PLAIN	BLDG1	ON	OFF	54319E
	MAINT	1645	A PRT	00000276	001	SYS	PLAIN	BLDG1	ON	ON	82FED9

Figure 10 (Part 2 of 2). Sample QUERY Responses for Files in the Print Queue

**QUERY PRINTER Response**

In the response to the QUERY PRINTER command, the information is as follows:

- **ORIGINID|OWNERID** is the logon ID of the file owner. The file owner is the user who either created the file or put it in the print queue.
- **FILE** is the spool file identification number, a number CP assigned to the file when it was created.
- **CLASS** tells you the class of the spool file and how the spool file was created. The class can be a letter (A through Z) or a number (0 through 9). The origin may be one of the following:
  - **PRT** (virtual printer)
  - **RDR** (real reader)
  - **PUN** (virtual punch)
  - **CON** (virtual console)
- **RECORDS** is the number of logical records in the file.
- **CPY** is the number of copies CP will print.

If there is no asterisk in front of the number, CP prints the entire file the specified number of times. But if an asterisk precedes the number, and you print the file on a 3800, CP prints each page of the file the specified number of

## Printer and Print File Status

times. On a 3800, printing many copies of each page is faster than printing many copies of the whole file.

- **HOLD** is the status of the file, where:
  - **USER** means the file is in user hold.
  - **SYS** means the file is in system hold.
  - **USYS** means the file is in both user and system hold.
  - **NONE** means the file is not in hold status.

If the file is in system hold or user hold status, you cannot print it.

- **FORM** is the name of the paper type as understood by the user.
- **USERFORM** is the name of the form associated with the file as understood by the user.
- **OPERFORM** is the name of the form associated with the file as understood by the operator. The form names under *OPERFORM* are the ones you use when you enter a *START* command for a printer.
- **DEST** is the destination value of the file, where:
  - *ddddddd* means that the file will be printed by a specific printer or group of printers indicated by the 1- to 8-character destination value.
  - **OFF** means that the file will be processed only by a printer that is specifically started or defaulted to **OFF**.
  - **ANY** means that the file can be selected on any CP-owned printer, regardless of the printer's **DEST** setting, as long as the other selection criteria match.
- **KEEP** is the keep status of the file, where:
  - **ON** means the file is in keep status.
  - **OFF** means the file is not in keep status.

If the file is in keep status, you may print the file, but the system also keeps a copy in user hold.

- **MSG** is the message status of the file, where:
  - **ON** means the file is in message status.
  - **OFF** means the file is not in message status.

If the file is in message status, CP sends a message to the file's owner when you print the file.

## QUERY PRINTER EXP Response

In the response to the *QUERY PRINTER EXP* command, the information is as follows:

- **OWNERID** is the logon ID of the file owner.
- **FILE** is the spool file identification number.
- **CLASS** tells you the class of the spool file and how the spool file was created.
- **RECORDS** is the number of logical records in the file.
- **FLASH** is the name of the forms overlay to load in a 3800 when you print the file.

When the forms overlay feature is active, the 3800 flashes an image onto selected pages of a print file through a film negative mounted in a frame. The number under **FLSHC** gives the number of copies the 3800 prints while the forms overlay is in place.

- **FCB** is the name of the FCB module to be used to control the vertical spacing on a 3800 printer. The module must be present in the image library for which the 3800 is set up.
- **MDFY** is the name of the copy modification module a 3800 should use when it prints the file.

The copy modification feature allows a user to specify that the 3800 is to add or delete text from selected copies of an output file. The number after the name gives the copy modification character arrangement table number, which helps the 3800 locate the correct data. The module must be present in the image library for which the 3800 is set up.

- **FLSHC** is the number of copies the 3800 prints while a forms overlay is in place.
- **LOAD** is the position of 3800 load CCWs in the file, if any.

A **3800 load CCW** is a special instruction imbedded in a spool file. It tells a 3800 to load data that defines the spacing, characters, or copy modification data needed to print the file. CP keeps track of whether a spool file has any 3800 load CCWs, and if so, whether they appear only at the beginning or throughout the file. Accordingly, the keyword under *LOAD* may be:

- **NO** (no 3800 load CCWs in the file)
- **BEG** (3800 load CCWs at the beginning of the file only)
- **ANY** (3800 load CCWs throughout the file).
- **CHARS** is the name of the character set a 3800 should use to print the file. A file may request up to four character sets, which must be present in the 3800 image library for which the printer is set up.
- **SIZE** is the number of 4KB DASD blocks allocated for data for the file.

## QUERY PRINTER ALL Response

In the response to the QUERY PRINTER ALL command, the information is as follows:

- **OWNERID** is the logon ID of the file owner.
- **FILE** is the spool file identification number.
- **CLASS** tells you the class of the spool file and how the spool file was created.
- **RECORDS** is the number of logical records in the file.
- **CPY** is the number of copies CP will print.
- **HOLD** is the hold status of the file.
- **DATE** and **TIME** are one of the following:
  - The date and time the file was created
  - **PRT- (recs)** if a file is being printed, where *recs* indicates the number of logical records left to print
  - **OPEN- vdev** if a file is still open, where *vdev* is the virtual device number of the virtual device at which the file is queued

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- **OPEN- SYS** if a file is open but not associated with a virtual device (for example, if the file is being processed by the SPTAPE command).
- **NAME** is the file name of the file, if any.
- **TYPE** is the file type of the file, if any.
- **DIST** is a code your installation may use to distribute output.

## QUERY PRINTER PSF Response

In the response to the QUERY PRINTER PSF command, the information is as follows:

- **OWNERID** is the logon ID of the file owner.
- **FILE** is the spool file identification number.
- **CLASS** tells you the class of the spool file and how the spool file was created.
- **RECORDS** is the number of logical records in the file.
- **USERFORM** is the name of the form associated with the file as understood by the user.
- **OPERFORM** is the name of the form associated with the file as understood by the operator.
- **DEST** is the 1- to 8-character destination value of the file.
- **CONVERSION** is the conversion status of the file, where:
  - **COMPLETE** means that the print server has read the spool file, has marked it as being converted and has created a corresponding CMS file containing the actual data and print controls used to print the file.
  - **ACTIVE** means that the file is currently being converted to a corresponding CMS file.
  - **NOTCONV** means that the file has not yet been converted to a corresponding CMS file.
- **SPECIAL** indicates whether the file contains CCWs for advanced function printer data streams, where:
  - **YES** means that the file does contain CCWs.
  - **NO** means that the file does not contain CCWs.
- **PURGE** indicates whether the file has been purged from CP and is waiting for the print server to recognize this status, where:
  - **YES** means that the file has been purged.
  - **NO** means that the file has not been purged.

## QUERY PRINTER SECLABEL Response

The following information is returned in response to the QUERY PRINTER SECLABEL command:

- **OWNERID** is the logon ID of the file owner. The file owner is the user who either created the file or put it in the print queue.
- **FILE** is the spool file identification number, a number CP assigned to the file when it was created.

- **CLASS** tells you the class of the spool file and how the spool file was created. The class can be a letter (A through Z) or a number (0 through 9). The origin may be one of the following:
  - **PRT** (virtual printer)
  - **RDR** (real reader)
  - **PUN** (virtual punch)
  - **CON** (virtual console).

- **RECORDS** is the number of logical records in the file.

- **CPY** is the number of copies CP will print.

If there is no asterisk in front of the number, CP prints the entire file the specified number of times. But if an asterisk precedes the number, and you print the file on a 3800, CP prints each page of the file the specified number of times. On a 3800, printing many copies of each page is faster than printing many copies of the whole file.

- **HOLD** is the status of the file, where:
  - **USER** means the file is in user hold.
  - **SYS** means the file is in system hold.
  - **USYS** means the file is in both user and system hold.
  - **NONE** means the file is not in hold status.

If the file is in system hold or user hold status, you cannot print it.

- **USERFORM** is the name of the form associated with the file as understood by the user.
- **OPERFORM** is the name of the form associated with the file as understood by the operator. The form names under *OPERFORM* are the ones you use when you enter a START command for a printer.
- **DEST** is the destination value of the file, where:
  - *ddddddd* means that the file will be printed by a specific printer or group of printers indicated by the 1- to 8-character destination value.
  - **OFF** means that the file will be processed only by a printer that is specifically started or defaulted to OFF.
  - **ANY** means that the file can be selected on any CP-owned printer, regardless of the printer's DEST setting, as long as the other selection criteria match.
- **SECLABEL** specifies the security label of the print file. If a security label is not assigned to the file, the SECLABEL field contains the word NONE.

## Printer and Print File Status

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## Appendix C. Dealing with Cross System Extension (CSE) Outages

This appendix explains how to deal with CSE outages. It is a step-by-step approach to handling system outages on a CSE system.

---

### Withdrawing a System from the CSE Complex for a Scheduled Outage

You can shut down a properly operating system within the CSE complex in a way that can minimize the effects of that action on users. There will be an interruption in service to some users, since those who are logged on to the system that is going down must log off, then log on to one of the other associated systems. Because the user directory is common across all systems, and all systems have the same access to the real volumes that contain the minidisks, these users will have full access to their minidisk data once they have logged on to the other system. Access to applications and to spool files that were created on the down system require you to perform certain tasks. Depending on installation preference, there are two ways to maintain full service. The choices are:

- Migrate the spool files to the remaining systems using the SPTAPE function.
- Bring up the CSE system that is going down in a virtual machine on one of the associated systems.

If there are applications that run exclusively on this member of the CSE complex, they will no longer be available to users when this system is withdrawn from service. Furthermore, if any user's spool files were created on this system, they will not be available until service is resumed, either in normal mode, in backup mode, or through migration to another member of the CSE complex by the SPTAPE command. These tasks are described in "Migrating Spool Files with SPTAPE" on page 346 and in "Maintaining Service by Operating a Virtual CSE System" on page 347.

Regardless of how the system is withdrawn, you should:

- Determine whether the outage is going to be long enough to make backup arrangements necessary or short enough that service will resume within a reasonably brief period of time.
- Issue a warning to users if the outage will be brief. Then use normal procedures to shutdown any applications on this system and enter the SHUTDOWN command. When the outage is over, IPL the system with a warm start and reenter into the CSE complex normally. CSE automatically synchronizes the spool files within the CSE complex.
- Choose between maintaining service by operating a virtual CSE system or by migrating files to another system, using the SPTAPE command, if the outage is going to be long enough to require backup operation.

---

### Migrating Spool Files with SPTAPE

Before a system in the CSE complex is voluntarily withdrawn, its spool files need to be made available to other systems in the complex. You should be familiar with the SPTAPE, XSPPOOL REMOVE, and XSPPOOL UNLOCK commands. The XLINK RESET command should *not* be used in this situation.

Perform the following steps on the system that is to be removed from service:

1. Send a message to all users telling them to log off.
2. Disable all terminals to prevent inadvertent new logons.
3. Shut down all applications requiring service virtual machines using, the procedures appropriate for each particular application. Examples of such applications are:
  - RSCS
  - DIRMAINT
  - Office Vision.

These applications may be restarted elsewhere in the CSE complex, provided they do not conflict with applications already running on the other systems.

4. Stop the cross-system spool on the system that is going down. You can do this by forcing the communication virtual machine (CVM) or by using the VM/Pass-Through Facility DROP USER for Release 1.3 or DROP CSE for Release 1.4.
5. Use the XSPPOOL REMOVE ALL *sysname* command on this system to destroy all information about spool files that exist on other systems in the complex. You must enter this command from this system for each of the other *sysnames* in the CSE complex.
6. Use the XSPPOOL UNLOCK ALL command on each of the remaining systems to unlock any of the spool files that had been locked by the system that is down.
7. Use the SPTAPE command on the system that is going down to dump all of its original spool files to tape.
8. Use the SHUTDOWN command on the system going down to remove it from service. When this system is restored to service, it should be cold started, because it no longer contains any spool files.

**Note:** Do *not* use the XLINK RESET command. Normal shutdown has cleared all cross-system link flags belonging to the down system.

Perform the following steps on *each* of the other systems in the CSE complex:

1. Use the DROP USER command for Release 1.3, and DROP CSE for Release 1.4 of the VM/Pass-Through Facility, to drop the link to the system that is down.
2. Enter the XSPPOOL REMOVE ALL *sysname* command once from each remaining system indicating as *sysname* the system that is down. This will delete all information about spool files that had been on the down system.
3. Use the SPTAPE command on *one* of the remaining systems to restore the spool files from the system that has been shut down.

4. Those applications that were stopped on the outgoing system may be restarted elsewhere in the CSE complex, provided that they do not conflict with applications already running on the other systems.

The users from the system that was removed from service may resume processing on the other systems in the CSE complex.

---

## Maintaining Service by Operating a Virtual CSE System

In order to operate a virtual CSE system, a properly configured virtual machine must have been defined in the user directory to support virtual operation of the hardware system that is going down.

The following commands *should not* be used while operating the down system in a virtual machine:

1. XSPOOL REMOVE or UNLOCK commands. The existing information on shared spool files should remain as is.
2. XLINK RESET command. Improper use of this command causes the destruction of minidisk data, not directly, but through the disruption of the cross-system link operation. Although the down system may not have cleared all of its cross-system link flags, and some minidisks may temporarily be unavailable because of the former links those flags represent, the danger of potential data loss far exceeds this momentary inconvenience. The flags are cleared automatically as CSE comes up.

Once a virtual machine is defined, perform the following steps on the system that is to be removed from service:

1. Send a message to all users telling them to log off.
2. Disable all terminals to prevent inadvertent new logons.
3. Shut down all applications requiring service virtual machines should be using the appropriate procedures for each particular application. Examples of such applications are:
  - RSCS
  - DIRMAINT
  - Office Vision.

These applications, provided they do not conflict with applications already running on the other systems, may be restarted elsewhere in the CSE complex or may be restarted on this same system once it is running virtually.

4. Stop the cross-system spool on the system that is going down. This can be accomplished by forcing the CVM or by using the VM/Pass-Through Facility DROP USER for Release 1.3 or DROP CSE for Release 1.4.
5. Use the SHUTDOWN command on the system that is going down to remove it from service. When this system is restored to service, either virtually on real hardware, it will still contain spool files and should be warm started.

Perform the following steps on the other system in the CSE complex that is chosen to support the virtual associated system.

1. Log on the virtual machine that has been configured to support the virtual associated system.

## Dealing with CSE Outages

2. If the real hardware that was used for interconnecting the down system within the CSE complex is available, vary it online to the new host and attach it to the backup virtual machine.
3. If the real hardware is not available:
  - a. Detach from the CVM the real CTCA connection to the down hardware, using the DETACH command
  - b. Define, on the CVM, a virtual CTCA at the same address as the real CTCA just detached, using the DEFINE command
  - c. Couple this virtual machine's virtual CTCA to the one defined on the CVM, using the COUPLE command
  - d. If necessary, stop one or more of the CMSs and restart it using a different PVM CONFIG file if there are more than two systems in the CSE complex.
4. IPL the system residence volume from the hardware that is down, and perform a warm start of CP.
5. The CVM must be logged on automatically (XAUTOLOG command) at system IPL. Following initialization, it sends a message to the operator's console.
6. Use the SMSG command to inform the CVM to start the CSECOM task. CSECOM is the task that joins the systems together. Your installation may have an exec you can invoke to enter this command with fewer keystrokes.

Following is an example of a four-system complex:

From the first system, enter the following commands to join the appropriate systems to the CSE complex:

```
smsg cvm start csecom sysname2
smsg cvm start csecom sysname3
smsg cvm start csecom sysname4
```

From the second system, enter the following commands to join the appropriate systems to the CSE complex:

```
smsg cvm start csecom sysname1
smsg cvm start csecom sysname3
smsg cvm start csecom sysname4
```

From the third system, enter the following commands to join the appropriate systems to the CSE complex:

```
smsg cvm start csecom sysname1
smsg cvm start csecom sysname2
smsg cvm start csecom sysname4
```

From the fourth system, enter the following commands to join the appropriate systems to the CSE complex:

```
smsg cvm start csecom sysname1
smsg cvm start csecom sysname2
smsg cvm start csecom sysname3
```

where:

*cvm*

specifies the user ID of the communication virtual machine as defined on the XSPPOOL\_SYSTEM statement in the system configuration file or in the HCPSYS ASSEMBLE file.

*sysname1, sysname2, sysname3, sysname4*

specifies the name of the other system in the CSE complex as defined on the XSPPOOL\_SYSTEM statements in the system configuration file or in the HCPSYS ASSEMBLE file.

7. Enable lines and terminals and start the output spooling devices, if any.
8. Restart elsewhere in the CSE complex those applications that were stopped on the outgoing system if they do not conflict with applications already running on the other systems. If necessary, applications may be restarted on the virtual system, but performance suffers if many users log on to the system.

The users from the system that is down may resume processing on the other systems in the CSE complex. They may also log on to the virtual system using the VM/Pass-Through Facility, but for performance reasons this should be kept to a minimum.

---

## Maintaining Service During Unscheduled Outages

If the outage is going to be brief, the best procedure is to take no recovery action, because when the failed system comes back up, it reestablishes synchronization with the CSE complex automatically. However, if the outage is going to be long enough to require backup operation, the software of the system that is down must be operated as a virtual CSE system on another member of the CSE complex. To do this:

- Determine whether the outage is going to be long enough to make backup arrangements necessary or short enough that service will resume within a reasonably brief period of time.
- If the outage will be brief, no action should be taken. When the outage is over, the system should be warm started and reentered into the CSE complex normally. CSE automatically synchronizes the spool files within the CSE complex.
- If the outage will be long enough to require backup operation, perform the task described in “Restoring Service by Operating a Virtual CSE System.”

Following this, the spool files from the failed system are available throughout the CSE complex. Applications unique to that system, if any, are also available subject to the limitations of virtual operation.

---

## Restoring Service by Operating a Virtual CSE System

A properly configured virtual machine needs to be defined in the user directory to support virtual operation of the system that is going down. This is a subset of the task described in “Maintaining Service by Operating a Virtual CSE System” on page 347. Once this is done, that virtual machine may be used to restore service as well. The spool files that were created on a system that has failed will be available; they do not have to be withdrawn from the complex by operating the system in a virtual machine on an associated system.

Perform the following steps on the system in the CSE complex that is chosen to support the associated systems:

1. Use the XLINK RESET command to clear all cross-system link flags belonging to the system that is down. Though this occurs automatically as the CSE

## Dealing with CSE Outages

system comes up, the delay involved may inconvenience other users of the CSE complex.

2. At this point, begin at Step 1 on page 347.

Following this, the software from the system that is down is in service in backup mode, and the spool files that were created there are available throughout the CSE complex.

---

## Glossary

The list is also available in the online VM/ESA HELP Facility. For example, to display the definition of "cms", enter:

```
help glossary cms
```

You will enter the HELP Facility's online glossary file and the definition of "cms" will be displayed as the current line. Once you are in the glossary file, you can simply search for the other terms.

If you are unfamiliar with the HELP Facility, you can enter:

```
help
```

to display the main HELP Menu, or enter:

```
help cms help
```

for information about the HELP command.

For more information about the HELP Facility, see the *VM/ESA: CMS User's Guide*; for more about the HELP command, see the *VM/ESA: CMS Command Reference*.

You can find additional information on IBM terminology in the *Dictionary of Computing*, SC20-1699.



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## Bibliography

This bibliography lists the publications that provide information about your VM/ESA system. The VM/ESA library includes VM/ESA base publications, publications for additional facilities included with VM/ESA, and publications for VM/ESA optional features.

VM/ESA publications may be available as Adobe Portable Document Format (PDF) files, IBM BookManager® files, or printed books. For abstracts of VM/ESA publications and other library-related information, including current editions and available publication formats, see *VM/ESA: General Information*.

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### VM/ESA Base Publications

#### Evaluation

*VM/ESA: Licensed Program Specifications*, GC24-5744

*VM/ESA: General Information*, GC24-5745

#### Installation and Service

*VM/ESA: Installation Guide*, GC24-5836

*VM/ESA: Service Guide*, GC24-5838

*VM/ESA: VMSES/E Introduction and Reference*, GC24-5837

#### Planning and Administration

*VM/ESA: Planning and Administration*, SC24-5750

*VM/ESA: CMS File Pool Planning, Administration, and Operation*, SC24-5751

*VM/ESA: Conversion Guide and Notebook*, GC24-5839

*VM/ESA: REXX/EXEC Migration Tool for VM/ESA*, GC24-5752

*VM/ESA: Running Guest Operating Systems*, SC24-5755

*VM/ESA: Connectivity Planning, Administration, and Operation*, SC24-5756

*VM/ESA: Group Control System*, SC24-5757

*VM/ESA: Performance*, SC24-5782

#### Customization

*IBM VM/ESA: CP Exit Customization*, SC24-5672

#### Operation

*VM/ESA: System Operation*, SC24-5758

*VM/ESA: Virtual Machine Operation*, SC24-5759

#### Application Programming

*VM/ESA: CP Programming Services*, SC24-5760

*VM/ESA: CMS Application Development Guide*, SC24-5761

*VM/ESA: CMS Application Development Reference*, SC24-5762

*VM/ESA: CMS Application Development Guide for Assembler*, SC24-5763

*VM/ESA: CMS Application Development Reference for Assembler*, SC24-5764

*VM/ESA: CMS Application Multitasking*, SC24-5766

*VM/ESA: REXX/VM Primer*, SC24-5598

*VM/ESA: REXX/VM User's Guide*, SC24-5465

*VM/ESA: REXX/VM Reference*, SC24-5770

*IBM VM/ESA: Distributed Graphical User Interface Toolkit*, SC24-5724

*IBM VM/ESA: Reusable Server Kernel Programmer's Guide and Reference*, SC24-5852

*VM/ESA: Enterprise Systems Architecture/Extended Configuration Principles of Operation*, SC24-5594

*VM/ESA: Programmer's Guide to the Server-Requester Programming Interface for VM*, SC24-5455

*VM/ESA: CPI Communications User's Guide*, SC24-5595

*Common Programming Interface Communications Reference*, SC26-4399

*Common Programming Interface Resource Recovery Reference*, SC31-6821

*External Security Interface (RACROUTE) Macro Reference for MVS and VM*, GC28-1366

#### End Use

*VM/ESA: CP Command and Utility Reference*, SC24-5773

*VM/ESA: CMS Primer*, SC24-5458

*VM/ESA: CMS User's Guide*, SC24-5775

*VM/ESA: CMS Command Reference*, SC24-5776

IBM VM/ESA: *Graphical User Interface Facility*, SC24-5789

VM/ESA: *CMS Pipelines User's Guide*, SC24-5777

VM/ESA: *CMS Pipelines Reference*, SC24-5778

CMS/TSO Pipelines: *Author's Edition*, SL26-0018

VM/ESA: *XEDIT User's Guide*, SC24-5779

VM/ESA: *XEDIT Command and Macro Reference*, SC24-5780

VM/ESA: *Quick Reference*, SX24-5290

## Diagnosis

VM/ESA: *System Messages and Codes*, GC24-5841

VM/ESA: *Dump Viewing Facility*, GC24-5853

VM/ESA: *Diagnosis Guide*, GC24-5854

VM/ESA: *CP Diagnosis Reference*, SC24-5855

VM/ESA: *CP Diagnosis Reference Summary*, SX24-5292

VM/ESA: *CMS Diagnosis Reference*, SC24-5857

**Note:** CP and CMS control block information is not provided in book form. This information is available on the IBM VM/ESA operating system home page (<http://www.ibm.com/s390/vm>).

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## Publications for Additional Facilities

### OpenEdition® for VM/ESA

IBM OpenEdition for VM/ESA: *POSIX Conformance Document*, GC24-5842

IBM OpenEdition for VM/ESA: *User's Guide*, SC24-5727

IBM OpenEdition for VM/ESA: *Command Reference*, SC24-5728

IBM OpenEdition for VM/ESA: *Advanced Application Programming Tools*, SC24-5729

IBM OpenEdition for VM/ESA: *Callable Services Reference*, SC24-5726

IBM OpenEdition for VM/ESA: *Sockets Reference*, SC24-5741

IBM C for VM/ESA: *Library Reference*, SC23-3908

*Debug Tool User's Guide and Reference*, SC09-2137

### DFSMS/VM®

VM/ESA: *DFSMS/VM Function Level 221 Planning Guide*, GC35-0121

VM/ESA: *DFSMS/VM Function Level 221 Installation and Customization*, SC26-4704

VM/ESA: *DFSMS/VM Function Level 221 Storage Administration Guide and Reference*, SH35-0111

VM/ESA: *DFSMS/VM Function Level 221 Removable Media Services User's Guide and Reference*, SC35-0141

VM/ESA: *DFSMS/VM Function Level 221 Messages and Codes*, SC26-4707

VM/ESA: *DFSMS/VM Function Level 221 Diagnosis Guide*, LY27-9589

## S/390® Open Systems Adapter Support Facility for VM/ESA

*Planning for the System/390 Open Systems Adapter Feature*, GC23-3870

IBM VM/ESA: *Open Systems Adapter Support Facility User's Guide*, SC28-1992

## Language Environment®

*Language Environment for OS/390 & VM: Concepts Guide*, GC28-1945

*Language Environment for OS/390 & VM: Migration Guide*, SC28-1944

*Language Environment for OS/390 & VM: Programming Guide*, SC28-1939

*Language Environment for OS/390 & VM: Programming Reference*, SC28-1940

*Language Environment for OS/390 & VM: Writing Interlanguage Communication Applications*, SC28-1943

*Language Environment for OS/390 & VM: Debugging Guide and Run-Time Messages*, SC28-1942

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## Publications for Optional Features

### CMS Utilities Feature

VM/ESA: *CMS Utilities Feature*, SC24-5535

### TCP/IP Feature for VM/ESA

VM/ESA: *TCP/IP Function Level 320 Planning and Customization*, SC24-5847

*VM/ESA: TCP/IP Function Level 320 User's Guide*, SC24-5848

*VM/ESA: TCP/IP Function Level 320 Programmer's Reference*, SC24-5849

*VM/ESA: TCP/IP Function Level 320 Messages and Codes*, GC24-5850

*VM/ESA: TCP/IP Function Level 320 Diagnosis Guide*, GC24-5851

## **OpenEdition Distributed Computing Environment Feature for VM/ESA**

*IBM OpenEdition DCE for VM/ESA: Introducing the OpenEdition Distributed Computing Environment*, SC24-5735

*IBM OpenEdition DCE for VM/ESA: Planning*, SC24-5737

*IBM OpenEdition DCE for VM/ESA: Configuring and Getting Started*, SC24-5734

*IBM OpenEdition DCE for VM/ESA: Administration Guide*, SC24-5730

*IBM OpenEdition DCE for VM/ESA: Administration Reference*, SC24-5731

*IBM OpenEdition DCE for VM/ESA: Application Development Guide*, SC24-5732

*IBM OpenEdition DCE for VM/ESA: Application Development Reference*, SC24-5733

*IBM OpenEdition DCE for VM/ESA: User's Guide*, SC24-5738

*IBM OpenEdition DCE for VM/ESA: Messages and Codes*, SC24-5736

## **LAN File Services/ESA**

*Discovering LAN File Services/ESA*, GK2T-5762

*Introducing LAN File Services/ESA*, GH24-5259

*LAN File Services/ESA: Licensed Program Specifications*, GH24-5260

*LAN File Services/ESA: VM Guide and Reference*, SH24-5264

## **LAN Resource Extension and Services/VM**

*LAN Resource Extension and Services/VM: Licensed Program Specifications*, GC24-5617

*LAN Resource Extension and Services/VM: General Information*, GC24-5618

*LAN Resource Extension and Services/VM: Guide and Reference*, SC24-5622

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## **CD-ROM**

The following CD-ROM contains PDF versions of many VM/ESA publications and publications for some related IBM licensed programs. It also contains all the IBM libraries that are available in IBM BookManager format for current VM system products and current IBM licensed programs that run on VM/ESA.

*IBM Online Library Omnibus Edition: VM Collection*, SK2T-2067

**Note:** Only unlicensed publications are included.



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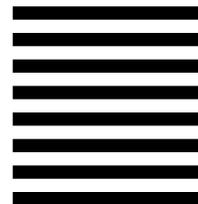
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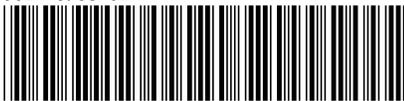


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