GA23-0376-00

Enterprise System/9000
Models 190, 210, 260, 320, 440 and 480

Planning for Recovery

IBM®

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First Edition (September 1990)

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ESA/390
ES/9000
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MVS
MVS/ESA
MVS/XA
Processor Resource/Systems Manager
Proprinter
PR/SM
System/370
VM

Preface

About This Publication

This publication is a guide to recovery on systems that include the IBM* Enterprise System/9000* (ES/9000*) Processor Unit Models 190, 210, 260, 320, 440, and 480. Recovery is the ability to perform useful work on the system after a failure occurs.

This publication is written for operators of the IBM ES/9000 Processor Unit, customer technical support personnel, and installation management. A general knowledge of the IBM architecture and operator training on the ES/9000 Processor Unit is assumed.

Engineering Level of This Publication

This publication supports system engineering change (SEC) AN7355.

Organization of This Publication

This publication contains the following two parts:

Part 1, "Basic Modes," contains the following chapters:

- *Chapter 1* provides recovery planning procedures and information. Chapter 1 begins with a discussion of the model differences and also discusses recovery strategy.
- *Chapter 2* provides entry points to recovery actions by means of problem determination procedures and information.
- *Chapter 3* provides procedures used in this publication for recovery after problem determination.
- *Chapter 4* discusses recovery from power, logic service adapter, and logic support station failures.
- *Chapter 5* discusses recovery from processor and vector facility failures.
- *Chapter 6* discusses recovery from processor storage and system control element failures.
- *Chapter 7* discusses recovery from channel subsystem and channel path failures.
- *Chapter 8* discusses operation and recovery of the processor controller.

Part 2, "Logical Partition (LPAR) Mode," contains the following chapters:

- *Chapter 9* discusses recovery topics from Part 1 for LPAR mode and recovery topics specific to LPAR mode.
- *Chapter 10* discusses recovery actions in LPAR mode.

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This publication also contains the following appendixes:

Note: The appendixes, unlike the chapters in Part 1, note the differences in operation between basic mode and LPAR mode.

- *Appendix A* is an overview of this publication, presented as a series of topics and questions in a checklist style.
- *Appendix B* discusses service language commands that may be useful for recovery.
- *Appendix C* discusses MVS/ESA* (SCP) commands that may be useful for recovery.
- *Appendix D* provides an overview of the channel subsystem display frames.
- *Appendix E* provides an overview of the Problem Analysis Facility display frames.

Basic Mode and LPAR Mode

This publication discusses the processor unit in basic mode and in LPAR mode: Chapters 1 through 8 discuss recovery when the processor unit is operating in ESA/390* mode; Chapters 9 and 10 discuss recovery when the processor unit is operating in LPAR mode. The Processor Resource/Systems Manager* (PR/SM*) feature provides LPAR mode capability in the ES/9000 Processor Unit.

Basic mode is any CP mode that is available on the Configuration (CONFIG) frame, except for LPAR mode. When LPAR is not selected on the CONFIG frame, the processor unit is operating in basic mode.

Where this publication refers to *sides*:

- All models referred to in this publication have only one side, the A-side.
- All models referred to in this publication have a processor unit with only one side, side 0.

Terminology Used in This Publication

Some terms have restricted or special meanings when used in this publication. Some examples are:

- Console, display station
- ESA/390 mode, LPAR mode
- Error, failure
- Processor controller, processor unit
- Service console, system console

See "Glossary" on page X-1 for the use of such terms in this publication.

Note: In this manual, the terms *ES/9000 processor unit* and *processor unit* refer to the Enterprise System/9000 Models 190, 210, 260, 320, 440, and 480 only.

How to Find Information

How to Use This Publication: For a problem determination entry point, see "How to Use the Recovery Guide" on page 2-2.

In LPAR Mode: All information that is unique to the processor unit in LPAR mode is found in Part 2 and as noted in the appendixes.

Contents: The Table of Contents is at the front of the manual and is a complete outline of this publication.

Partial Table of Contents: Each chapter begins with a partial table of contents that provides an outline that is more detailed than the Table of Contents and includes only the outline for that chapter.

Directories: This publication includes the following directories to information: "Directory of Recovery Actions by Hardware Area" on page 2-19 and "Directory of Recovery Actions by Reference Code" on page 2-21.

Checklist: For a checklist of the major topics in this publication, see Appendix A.

Index: The Index is at the back of the manual. The Index includes keywords, phrases, frame names, commands, messages, and procedures used in this publication.

Conventions Used in This Publication

This publication discusses system recovery in the context of an MVS/ESA system control program (SCP). MVS/ESA is used as an *example* of an SCP with automatic recovery capabilities.

Note: Where MVS/ESA is mentioned, MVS/XA* is also implied.

If the SCP is not active, this publication applies to the Processor Unit Models 190, 210, 260, 320, 440, and 480, regardless of the system control program. If the SCP is active and is not MVS/XA, the information in this publication should be interpreted by the customer for proper application to the specific SCP, although the information may apply to other SCPs.

The following conventions are implied in the procedures included for this publication:

- See "Conventions in Part 2" on page 8-39 for conventions that are unique to LPAR mode.
- Where the operator is asked to *enter* a command or a selection, the operator should type the command or selection on the command line and press the Enter key.
- Where the operator is asked to *shut down* the SCP, the operator should stop all application programs and the SCP in such a way that a SYSRESET (for example) *could* then be executed without causing any disruption.

- The operator is often asked to enter the F command to display frames. The operator may also enter **F INDEX0** and select frames from the System Console Index (INDEX0) frame.

  The frames shown in this publication do not use the highlighting that is often seen in the actual frames. Occasionally, highlighting in frames is used to indicate fields that are discussed in the text.

- Where this publication refers to data that is written to or read from the *processor controller DASD*, it is implied that the data is a permanent part of the system until the data is erased or changed. Data written to the processor controller DASD is preserved during power sequencing, power-on reset, SYSIML, SYSRESET, or IPL.

  For more information, see the Index for entries under "*processor controller DASD*."

Related and Companion Publications

Enterprise System/9000 Models 190, 210, 260, 320, 440, and 480:

Introducing the Processor; Functional Characteristics, GA23-0380

Migration Considerations with Operation Examples, GA23-0374

Operating Guide, GA23-0375

Messages — Part 1, GA23-0377

Messages — Part 2, GA23-0378

Processor Resource/Systems Manager: Planning Guide, GA22-7123

Input/Output Configuration Program: User's Guide and Reference, SC38-0097

MVS/ESA Planning: Recovery and Reconfiguration, GC28-1837

MVS/ESA Resource Measurement Facility (RMF): Version 4, General Information Manual, GC28-1028

MVS/ESA System Management Facilities (SMF), GC28-1819

MVS/ESA Message Library: System Codes, GC28-1815

MVS/ESA Operations: System Commands, GC28-1826

MVS/ESA System Messages, GC28-1812 and GC28-1813

MVS/ESA Resource Measurement Facility Version 4 Monitor I and II Reference and User's Guide, LC28-1007

MVS/ESA Resource Measurement Facility Version 4 Monitor III Reference and User's Guide, LC28-1008

Part 1. Basic Mode

Chapter 1. Planning for Recovery

This chapter discusses the following topics:

Processor Unit Hardware Overview

The processor unit includes the processors, system control element, processor storage, and the channel subsystem.

Notes:

1. Vector facilities are optional. If installed, a vector facility is associated with a specific processor. For example, to install vector facility VE1, processor CP1 must be installed.
2. The channel subsystem (CSS) consists of a channel control element and various channel elements. I/O devices attached to the processor unit are not considered to be part of the processor unit.

Recovery Strategy

To recover the processor unit (or the system) means to maintain or regain system operation after a failure occurs. A system includes an active system control program, a processor unit, and configured I/O devices.

Errors are correctable deviations from normal operation. Error correction is an automatic function of the hardware and the Licensed Internal Code.

Failures are uncorrectable errors (see Figure 1-1). If the processor unit is operated by the MVS/ESA system control program (SCP), recovery is an automatic function of the SCP.

Recovery requires operator intervention only when the automatic facilities provided by the system cannot handle a failure. When this occurs, recovery becomes the responsibility of the operator and customer technical support personnel until the service representative can analyze the cause of the failure.

The operator should follow local procedures for reporting problems and consider the following recovery actions (ranked from least to most disruptive):

- If the SCP continues to operate satisfactorily with the problem, allow it to do so.
- If the SCP remains active but processing is interrupted, consider a program restart.
- Shut down the SCP. Perform an IPL of the SCP in an attempt to reset the problem.
- Shut down the SCP. Perform a power-on reset in an attempt to reset the problem and IPL the SCP.
- If possible, take the failed hardware offline. Do this with the SCP active, if possible. If necessary, shut down the SCP and take the hardware offline from the Configuration frame. Perform a power-on reset and IPL the SCP.

Note: Recovery may be considered successful if the most critical applications remain operational.

The success of any recovery attempt (by the SCP or by the operator) depends on the extent and location of the failure. An attempt to recover the system from a failure may:

- Result in a complete return to normal operation.
- Result in an intermediate state of degraded operation.
- Require a repair before recovery is possible.

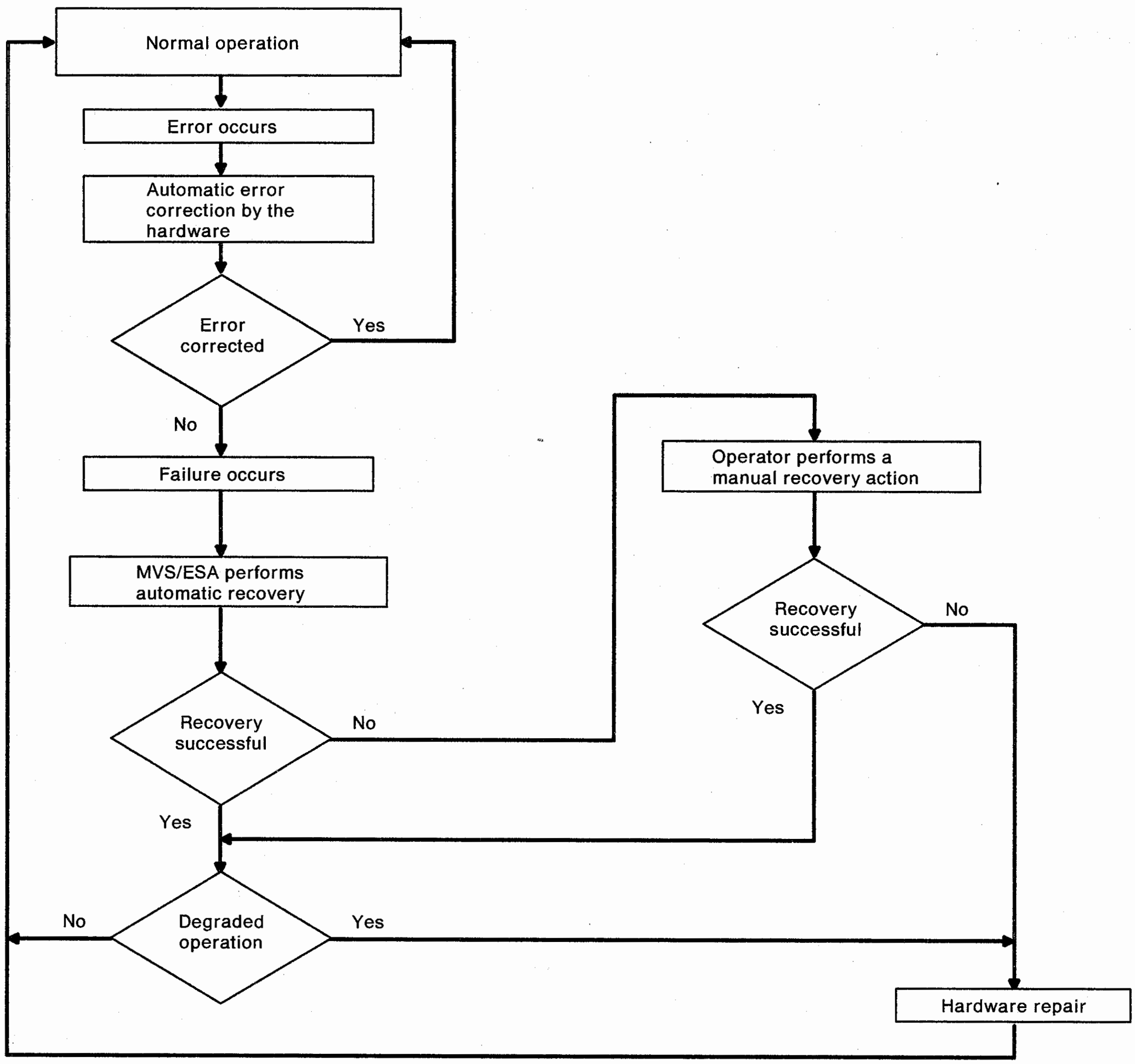


Figure 1-1. Error and Failure Flowchart

Problem Analysis Facility

The problem analysis (PA) facility is an integral function of the processor unit. The PA facility analyzes the state of the processor unit hardware. The operator should call the PA facility at any time that a problem is suspected to determine whether the Licensed Internal Code has identified a failure.

PA Facility Overview

Figure 1-2 and Figure 4-2 on page 4-3 provide an overview of the PA facility. The alphanumeric references (An or Rn, where n is a selection number) refer to the selections available from the previous frame. The frame references, for example, (PA)-23, are PA frame numbers.

For example, at the bottom of Figure 1-2, see the Operator Console frame (PA)-60. The operator selects (PA)-60 from the Status Selection frame by entering A6. Frame (PA)-60 has two selections: entering R3 selects the I/O Device Error frame (PA)-50, and entering R2 selects the IOPD entry frame. Except for the power problem frames, entering R1 returns the operator to the PA Status Selection frame (Figure 2-11 on page 2-18).

The PA facility has two basic problem categories; power and non-power. The operator is directed to handle power problems first.

- Power problems.

  Power problems are the most severe problems handled by the PA facility. If any power problems are present, they will automatically be shown by the PA facility. There are three categories of power problems (see Figure 4-2 on page 4-3).

- Nonpower problems.

  There are six categories of non-power problems. Each of these six categories (A1 through A6 in Figure 1-2) is selected from the PA Status Selection frame, which is selected from the PA Status frame.

Note: Any hardware error or interface control check (IFCC) that is more than 1 hour old is not available to the PA facility. Any hardware error or IFCC that is less than 1 hour old may still be indicated even if the problem is solved.

The PA facility has the ability to enhance the list of recovery actions.

- Installation management may add recovery actions or messages that are important to a specific installation. The additions are included by means of the recovery action tailoring (PATLR) frames. See "Tailoring the PA Facility" on page 1-7.

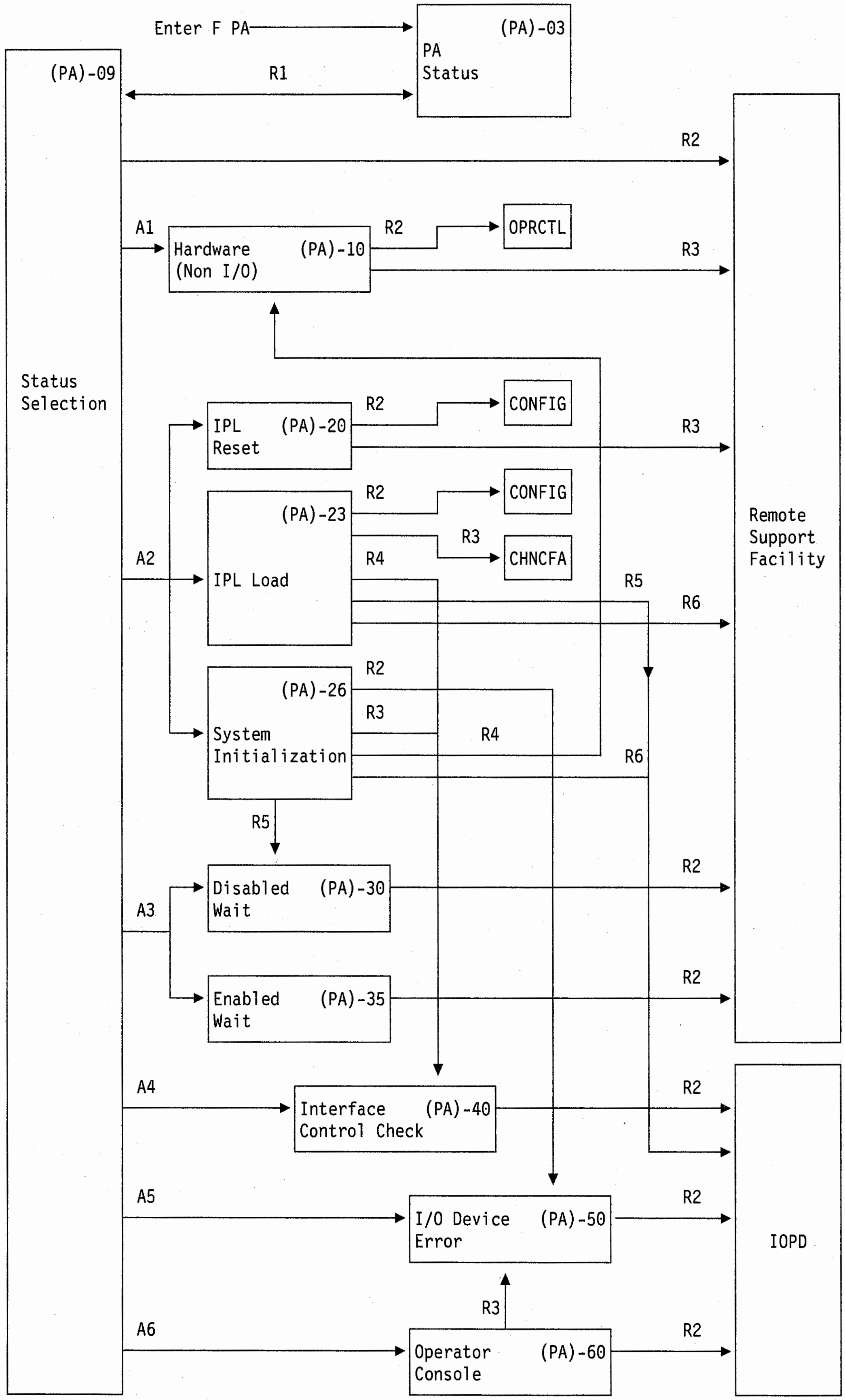


Figure 1-2. An Overview of the PA Facility (Nonpower Problems)

Tailoring the PA Facility

Installation management should use the Problem Analysis Tailoring (PATLR) frame to add unique recovery and service messages to the PA facility frames. The PA facility messages consist of integral messages and messages added by the customer. The integral messages cannot be changed.

Use the following procedure to add, change or delete customer messages:

1. Go to the system console.
2. Enter **F ACCESS** to display the Console Access Level Control frame and activate access level 1.
3. Enter **F PATLR** to display the PROBLEM ANALYSIS – Action Tailoring frame (Figure 1-3).
4. Select a **PROBLEM CONDITION** *and* a **TYPE OF ACTION** entry.

   For example, enter **A3 B1** to tailor a System Initialization During IPL recovery action.

   The PROBLEM ANALYSIS – Edit Action Messages frame, PATLR-10, is then displayed. For example, see Figure 1-4.

   Use the Fwd and Bkwd keys to scroll through the list of Action Messages.
5. Enter a new customer message or change an existing customer message.
6. Enter **A2** to compress any blank lines from the action list.
7. Enter **A1** to save the message. The message is written to the processor controller DASD.
8. Continue PA tailoring or exit the PATLR frame.

   To return to the first PATLR frame, press the End key:

   - If the most recent changes have *not* been saved, a warning is displayed. Pressing the End key once has no effect.

     To return to the first PATLR frame without saving the changes, press the End key twice. A message indicates that the changes have not been saved.
   - If the most recent changes have been saved, pressing the End key once returns the operator to the first PATLR frame.

   To return to the INDEX0 frame, enter **F INDEX0**. Again, changes and additions are *not* automatically saved.
9. When PA facility tailoring is completed, enter **F ACCESS** and return the processor unit to access level 2.

For examples of PA tailoring, see Figure 1-5 and Figure 1-6 on page 1-9, and Figure 1-7 on page 1-10.

```
                                                        dd mmm yy  19:47:07
                  PROBLEM ANALYSIS - Action Tailoring           (PATLR)

    A= PROBLEM CONDITION
      1. Power Status Incomplete
      2. Hardware Errors (Non-I/O)
    ->3. System Initialization During IPL
      4. Disabled Wait State
      5. Enabled Wait State
      6. Interface Control Check
      7. I/O (Device Error)
      8. Operator Console Lockout

    B= TYPE OF ACTION
    ->1. Recovery
      2. Service


COMMAND ==>
SYSTEM 1          1 .... 2 ....                          PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 1-3. PROBLEM ANALYSIS — Action Tailoring (PATLR) Frame

```
                                                        dd mmm yy  19:47:07
                  PROBLEM ANALYSIS - Edit Action Messages       (PATLR)-10

      PROBLEM CONDITION                         TYPE OF ACTION
  System Initialization During IPL                 Recovery

  Determine if any messages exist on the system or operator
  consoles or both.                                           (IPL3R04)

  ____________________________________________________________________
  ____________________________________________________________________
  ____________________________________________________________________
  ____________________________________________________________________
  ____________________________________________________________________
  ____________________________________________________________________

    A= ACTION
      1. Save Action Tailoring
      2. Compress Action List
  Next frame is blank: Press FWD to enter more actions.          (29423)
COMMAND ==>
SYSTEM 1          1 .... 2 ....                          PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 1-4. Example of PA Facility Tailoring

```
                                                       dd mmm yy  19:47:07
                 PROBLEM ANALYSIS - Edit Action Messages         (PATLR)-10

    PROBLEM CONDITION                            TYPE OF ACTION
  System Initialization During IPL                  Recovery

  Determine if any messages exist on the system or operator
  consoles or both.                                               (IPL3R04)

  ************  Due to system changes made over the July 4th holiday, new IPL
  * dd/mm/yy *  parameters are necessary.  Check the new IPL procedure in the
  ************  local procedures book.

  ____________________________________________________________________________
  ____________________________________________________________________________
  ____________________________________________________________________________

    A= ACTION
      1. Save Action Tailoring
      2. Compress Action List
  Next frame is blank: Press FWD to enter more actions.                 (29423)
COMMAND ==>
SYSTEM 1         1 .... 2 ....                               PSW0 Operating
_______________________________________________________________________________
        A:a MODE
```

Figure 1-5. Example of PA Facility Tailoring, IPL Problem 1 of 2

```
                                                       dd mmm yy  19:47:07
                 PROBLEM ANALYSIS - Edit Action Messages         (PATLR)-10

    PROBLEM CONDITION                            TYPE OF ACTION
  System Initialization During IPL                  Recovery

  Determine if any messages exist on the system or operator
  consoles or both.                                               (IPL3R04)

  ************  If a problem occurs during IPL of the system resident pack,
  * dd/mm/yy *  perform the following to determine if there is a system
  ************  problem, hardware problem with the control unit or pack, or
  software problem with the pack.  IPL backup sys res pack.  If you are able
  to get to "Specify System Parameters", continue and have the service
  representative check DASD and CU.  If IPL fails again, notify management.

    A= ACTION
      1. Save Action Tailoring
      2. Compress Action List
  Next frame is blank: Press FWD to enter more actions.                 (29423)
COMMAND ==>
SYSTEM 1         1 .... 2 ....                               PSW0 Operating
_______________________________________________________________________________
        A:a MODE
```

Figure 1-6. Example of PA Facility Tailoring, IPL Problem 2 of 2

```
                                                  dd mmm yy  19:47:07
                PROBLEM ANALYSIS - Edit Action Messages        (PATLR)-10

    PROBLEM CONDITION                           TYPE OF ACTION
  I/O (Device Error)                               Recovery

  For the I/O error condition see the operating system's messages
  and/or codes manual.                                          (IOERR01)
  If possible use another device or medium to retry the operation.   (IOERR02)

  ************  I/O errors can be temporary or permanent, and occur in three
  * dd/mm/yy *  types;  DATA, CONTROL, or EQUIPMENT.  They may be intermittent
  ************  or continuous.  Error type may indicate where in the subsystem
  the problem is occurring.  Generate an EREP summary report.  Follow the local
  procedures document for reporting the problem to management and/or the
  service representative.

    A= ACTION
      1. Save Action Tailoring
      2. Compress Action List
  Next frame is blank: Press FWD to enter more actions.              (29423)
COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating

        A:a MODE
```

Figure 1-7. Example of PA Facility Tailoring, I/O Device Error

Remote Support Facility

The remote support facility (RSF) is an effective and efficient means of providing service in many situations. When RSF is notified of a failure, RSF calls the remote support center and reports the error. The remote support center then collects error information and notifies service RSF often enables the service representative to arrive with any necessary parts to repair the failure.

RSF provides the following functions:

- Reports failures to the remote support center automatically.
- Enables the operator to call the remote support center.
- Enables the remote support center to call the operator for information about a problem or for failure analysis.
- Enables the service representative to update system status history and to work with a remote specialist during failure analysis.
- Provides periodic Licensed Internal Code maintenance.

Note: The operator should not change any information on the RSFCNF frames without first obtaining the approval of installation management and the service representative.

RSF Strategy

When planning local procedures for reporting problems by means of the remote support facility (RSF), installation management has the following options. When a failure occurs:

- Allow RSF to automatically call the remote support center and wait for the service representative to return the call.
- Allow RSF to automatically call the remote support center and attempt to recover from the failure while waiting for the service representative to return the call.
- Delay the RSF call, attempt to recover from the failure, and notify the service representative if recovery is not successful or to schedule service for a later time.

The preferences of installation management, the extent and location of a failure, and other variable factors in an installation may influence which option the operator chooses in a specific situation.

Any RSF call may be found in one of the following categories:

- A failure is detected by the processor controller. If outbound RSF calls are enabled, the processor controller initiates the RSF call. The remote support center records the incident and dispatches the service representative.
- A failure is detected by the processor controller. If outbound RSF calls are enabled, the processor controller initiates the RSF call. The remote support center helps the service representative with failure analysis and monitors the repair.
- The on-site service representative initiates an RSF call for data collection and testing.
- The remote support center (automatically) or the operator (manually) initiates an RSF call for a periodic service update (data collection and Licensed Internal Code maintenance).
- The remote support center initiates an RSF call.
- The operator initiates an RSF call for a problem that is suspected by the operator.
- The operator cannot initiate an RSF call and uses the telephone to call the remote support center because the modem, line, or other RSF resource does not operate or is not installed.
- A failure is detected on a Fiber-extended channel, on a 3094 Fiber I/O Extender Unit, or on the fiber optic link.

RSF Configuration

RSF is configured by means of the RSF Configuration frames. The RSF configuration is defined at the time of installation and redefined when changes are made to the installation. The two RSF configuration frames are called by entering **F RSFCNF** from the system console. The second frame is displayed by pressing the Fwd key. The Bkwd key returns the operator to the first frame. See Figure 1-8 on page 1-13, Figure 1-9 on page 1-14, and Figure 1-10 on page 1-14.

The RSF Access Controls frame is displayed by entering the proper authorization code on the first RSF Configuration frame.

The RSFCNF frames are initialized by installation management and the service representative during installation. The information is written to the processor controller DASD. When RSFCNF initialization is completed, the frames should be printed and saved as a reference for the operator and for installation management.

Remote Access Phone Numbers: Four telephone numbers are entered by the service representative. When an outbound RSF call is attempted by the processor controller, the four telephone numbers are automatically dialed in sequence. If all four attempts are not successful, the whole sequence is repeated. If the second sequence is not successful, the RSF call is automatically ended.

Installed Equipment: The service representative uses this field to specify the configuration of installed RSF equipment. With some automatic calling equipment it is possible to change the selection to manual dialing if the automatic dialing process fails. Questions about this field should be directed to the service representative. (The X21BIS selection makes RSF compatible with the Japanese NTTX.21 data network.)

Outbound and Inbound Calls: When outbound or inbound calls are enabled, the processor controller requests authorization from the operator by means of the *RSF authorization required* priority message (45001 or 45003) before attempting an RSF call. If inbound calls are disabled, the remote specialist must call and ask the operator to manually enable an inbound call. Outbound calls for a processor unit problem are placed only after some number of intermittent errors have occurred over a period of time. The outbound call is not always placed after the first intermittent error.

The *RSF authorization required* priority message (45001 or 45003) does not appear for outbound calls if operator approval is bypassed (selection field E). Operator approval may also be bypassed for inbound calls (to handle, for example, a processor controller failure).

The procedure for inbound calls is similar to that for outbound calls. The main difference is that the RSF Service Request Authorization frame (RSF) displays only the INVOKE RSF field to allow or disallow the call. The *RSF authorization required* priority message (45001 or 45003) appears as it does with outbound calls and the call is automatically ended in 30 minutes if the message is ignored.

Installation management may choose to disable automatic inbound calls or may choose to enable all inbound calls.

Service Update Schedule: When this selection is enabled, service updates are performed automatically at times and intervals that are set during manufacture of the processor unit, but may be changed by installation management and the service representative. This field can also be used to initiate a manual service update call.

Bypass Operator Approval: If installation management chooses to do so, this field allows the processor controller to initiate RSF calls (inbound or outbound) and service updates without the *RSF authorization required* priority message (45001 or 45003).

Display RSF Access Controls: When the authorization code is entered, the RSF Access Controls frame is displayed.

Customer Identification Information: This field identifies the installation to the remote support center.

Customer Phone Numbers: Main number is the telephone number of the customer voice line that is to be used for communicating with the remote support center. Console is the telephone number of a customer voice line that is available from the system console and the service console. RSF modem is the telephone number of the customer data line.

IBM Information: This field provides additional information that may be useful to the operator or the remote support center.

Frame Authorization Code: This selection enables the authorization code to be updated. The authorization code may be as many as 6 alphanumeric characters in length. The code has an initial value of ABCABC during installation. The authorization code is not displayed when it is entered in this field. The A1 selection must be made alone and no other input or selections are allowed until the authorization code update is completed or canceled.

Remote Console Initialization: This selection allows the customer to limit the conditions under which a remote console call may be initiated. Remote console initialization that is allowed when service is performed permits a remote console call to be initiated if a power-on reset is complete and SERVMODE or SERVPART is on. Remote console initiation that is not allowed when service is performed does not permit a remote console call to be initiated if a power-on reset is complete and either SERVMODE or SERVPART is active.

The Service Support Information: This selection allows the customer to change the remote system access code.

```
                                                        dd mmm yy  19:47:07
                        Remote Support Configuration (1 of 2)       (RSFCNF)
   REMOTE ACCESS PHONE NUMBERS  (Enter phone, node, line speed, half or full)

     ____________________  ____________  ____   ____
     ____________________  ____________  ____   ____
     ____________________  ____________  ____   ____
     ____________________  ____________  ____   ____

  A= INSTALLED EQUIPMENT                 D= SERVICE UPDATE SCHEDULE
    1. Manual dial     3. Auto dial        1. Day : 2    (1 = Monday)
    2. End of number   4. X21BIS           2. Local time : 21 : 30
       required                            3. Start update immediately
                                        -> 4. Disable update
  B= OUTBOUND CALLS
    1. Enable                            E= BYPASS OPERATOR APPROVAL
 -> 2. Disable                             1. Service update
                                           2. System initiated error report
  C= INBOUND CALLS                         3. Remote system initiated call
    1. Enable
 -> 2. Disable                           F= DISPLAY RSF ACCESS CONTROLS
                                           1. Auth code: ( ______ )
 COMMAND ==>
 SYSTEM 1         1 .... 2 ....                               PSW0 Operating
 ____________________________________________________________________________
         A:a MODE
```

Figure 1-8. Remote Support Configuration (RSFCNF) Frame, 1 of 2

```
                                                       dd mmm yy  19:47:07
                        RSF Configuration - Customer Info. (2 of 2)  (RSFCNF)-02

          CUSTOMER IDENTIFICATION INFORMATION
            Name: _______________________________________________
            Address: ____________________________________________
                     ____________________________________________
            System location: ____________________________________
            Account number: __________

          CUSTOMER PHONE NUMBERS
            Main number: ____________________
            Console    A: ____________________   B: ____________________
            RSF modem  A: ____________________   B: ____________________
            Modem type A: ______                 B: ______

          IBM INFORMATION
            Country: ________________
            Branch Office number: ____
            Branch Office phone: _________________________
            Prime shift dispatch phone: ____________________
            Off shift dispatch phone: ____________________

COMMAND ==>
SYSTEM 1           1 .... 2 ....                            PSW0 Operating
______________________________________________________________________________
        A:a MODE
```

Figure 1-9. RSF Configuration — Customer Info. (RSFCNF)-02 Frame, 2 of 2

```
                                                       dd mmm yy  19:47:07
                            RSF ACCESS CONTROLS                  (RSFCNF)-10

    A= FRAME AUTHORIZATION CODE
      1. Change: ( ______ ) / ( ______ )   (new/new)

    B= REMOTE CONSOLE INITIALIZATION
      1. Allowed during service
   -> 2. Not allowed during service

    C= SERVICE SUPPORT INFORMATION
   -> 1. Update access code: ( ______ )







COMMAND ==>
SYSTEM 1           1 .... 2 ....                            PSW0 Operating
___________________________________________________________________________
        A:a MODE
```

Figure 1-10. RSF Access Controls Frame

RSF Call Authorization

When an outbound call is generated, an *RSF authorization required* priority message (45003) is displayed at the system console and the alarm sounds. The priority message informs the operator that an RSF call is pending. The priority message is displayed for 15 minutes if it is not cleared. (Priority messages are cleared by pressing the the Enter key.) If the operator does not respond to the priority message within 15 minutes, a reminder (priority message 45001) is displayed for another 15 minutes. If the operator does not respond to the original priority message within 30 minutes, the RSF call is automatically ended.

Normally, the operator is aware that a failure has occurred before the *RSF authorization required* priority message (45001 or 45003) appears. See Figure 1-11. The operator should follow local procedures for handling specific call types.

To initiate an RSF call after the *RSF authorization required* priority message (45001 or 45003) appears, the operator should enter **F RSF** to display the Service Request Authorization frame (RSF). See Figure 1-12. To maintain an accurate RSF log, the operator should answer all four fields (A, B, C, and D) for each call.

A = CUSTOMER CONTACT. Enter the name of the person is to be notified when the remote support center calls.

B = CE ON SITE AND NOTIFIED? Yes or no.

C = SYSTEM AVAILABLE FOR IMMEDIATE SERVICE? Yes or no.

D = INVOKE RSF. Place, cancel, or delay the call. Delay time range in the D3 field is 00 to 99 hours. If the call is delayed, before or after the delay has elapsed, the operator may start processing the call by entering **RSF DEQUEUE**. After the delay has elapsed, a message reminds the operator to process the call.

After the operator completes the information on the authorization screen, messages inform the operator of the status of the RSF call as it progresses. Normally, the remote support center calls the customer within 15 minutes to do the following:

- Acknowledge the call
- Inform the Customer Contact (field A1) when a service representative should be dispatched
- Evaluate the problem and plan a repair action (if necessary)

Note: The RSF communications that do not generally require authorization are those initiated by the on-site service representative for remote (external) data bank access, remote (external) console, URSF (external) console, and processor controller hardware failure.

```
19:47:07                                                          (45003)

************************ PRIORITY MESSAGE **************************
*                                                                  *
*                  RSF authorization required.                     *
*                                                                  *
* Intended Console: System                                         *
*                                                                  *
* Detailed Information: A RSF service call requires authorization  *
*                       within 30 minutes. After 15 minutes,       *
*                       another priority message is displayed with *
*                       a second notice indication.                *
*                                                                  *
* Call Type: Hardware Problem Report AQEID = 000034P               *
*                                                                  *
* System Action: RSF waits for input from the RSF Authorization    *
*                frame. After 30 minutes the call is canceled.     *
*                                                                  *
* User Action: Invoke the RSF frame (key F RSF then press ENTER).  *
*              This frame contains additional call information.    *
********************************************************************

        A:a MODE
```

Figure 1-11. RSF Authorization Required Priority Message (Example)

```
                                                  dd mmm yy  19:47:25
                       Service Request Authorization            (RSF)

 CALL REASON: ... Hardware Problem Report    AQEID ......... 00000034P
 CALL TYPE: ..... Outbound                   INITIATED ..... 01 May 19:47
 DELAYED CALLS: . 1                          PENDING CALLS . 2

 A= CUSTOMER CONTACT                                D= INVOKE RSF
   1. Name: ________________________                  1. Yes
                                                      2. No
 B= CE ON-SITE AND NOTIFIED?                          3. Delay(Dec): __(Hours)
   1. Yes
   2. No

 C= SYSTEM AVAILABLE FOR IMMEDIATE SERVICE?
   1. Yes
   2. No


COMMAND ==>
SYSTEM 1          1 .... 2 ....                         PSW0 Operating

        A:a MODE
```

Figure 1-12. Service Request Authorization (Example)

When the remote support facility is active for either inbound or outbound calls, the message *Remote Support Facility Active* appears on line 24 of the system console. This message may not appear if the RSF connection is in support of a processor controller failure.

A TP indicator near the center of line 25 indicates that the RSF connection is established. An example is shown in Figure 1-13.

```
COMMAND ==>
SYSTEM 1            Remote Support Facility Active
------------------------------------------------------------
       A:a MODE                 TP
```

Figure 1-13. Remote Support Facility Active Message (Example)

When RSF communications are completed, the RSF connection is automatically ended.

RSF Security Characteristics

The security characteristics of the remote support facility include:

- Inbound and outbound calls may be separately enabled or disabled by the customer during RSF configuration.
- When the remote support center requires an RSF communication with the processor unit for fault isolation, the RSF connection can be enabled only by one of the following methods:
  - The customer authorizes the RSF call for an inbound call.
  - The on-site service representative establishes a remote console connection for the remote support center (outbound call).

  When an RSF call is authorized, RSF does not provide remote access to customer data if the system console is assigned and service mode is off during the RSF session.

  RSF communications are automatically ended when the service call or service update is completed. Enter **F RSFLOG** to display the RSFLOG frame and review the RSF log. All RSF calls are recorded in the log, except RSF calls that are initiated by the on-site service representative in support of processor controller failures.
- All RSF calls are validated before communications are permitted. The machine type and serial number are checked against the customer's profile at the remote support center. If this check is successful, the remote support center sends the customer access code to the processor controller where the customer access code is checked. If either of these checks is not successful, the RSF call is automatically ended.

  The customer access code is not checked for RSF calls initiated by the on-site service representative.
- Customer data (whether the data resides in central, expanded, or high-speed buffer storage) is *not* transmitted to the remote support center. All RSF communications are established between the remote support center and the processor controller, not the processor unit. The only access to processor unit data is by means of the alter/display frames that are available from the on-site system console.

Data sent by the processor controller to the remote support center for weekly service updates includes AQE summaries, SEC level, Licensed Internal Code service history, RSF configuration data, RSF counters, and the system status recording (SSR) log.

Licensed Internal Code maintenance files are transmitted from the remote support center and are written to the processor controller DASD during service update RSF communications. The files are *received*, but are not *applied* during the service update.

After the maintenance files are *received* (when the service update is completed), the RSF connection is automatically ended. The files are *applied* at a later time by the service representative (with customer concurrence).

- The conditions under which a remote console call is allowed can be limited by selecting **B2** on the RSF Access Controls frame. See Figure 1-10 on page 1-14.

Stall Detection

Stall detection should always be enabled if the SCP is MVS/ESA. Use the OPRCTL frame (Figure 1-14) to check the selection and, if necessary, to enable stall detection.

Stall detection notifies the SCP, by means of a service processor damage (SP) machine check, when automatic recovery for the processor controller has failed. The SCP is notified when the processor controller is found to be not usable.

MVS/ESA performs the following when an SP machine check is received:

- Displays message IEA470W (Figure 1-15) at the master console.
- Broadcasts an *event notification* to all MVS/ESA subsystems, including IMS/VS. IMS/VS, if installed, shuts itself down.

An occurrence of MVS/ESA message IEA470W does not necessarily mean that the system has failed or is going to fail. However, the occurrence of another event that requires the processor controller can cause the system to fail. For example, because the processor controller supports many recovery processes, a failure that requires automatic system recovery may result in system failure (no recovery). In addition, because the processor controller supports the service support and system displays, any console functions assigned to these displays cannot be used after MVS/ESA message IEA470W is issued.

If MVS/ESA message IEA470W is displayed, go to “Stall Detected” on page 8-29. The operator should plan to shut down the SCP or assume the risk of continued operation. Use the telephone to call the service representative, because the processor controller may not generate an automatic RSF call.

```
D= PCE STALL DETECT
-> 1. Enable
   2. Disable

                              --- SYSTEM INDICATOR ---
                                  Mode:

COMMAND ==>
SYSTEM 1           1 .... 2 ....                            PSW0 Operating

        A:a MODE
```

Figure 1-14. PCE Stall Detection, OPRCTL Frame, System Console

```
IEA470W THE PROCESSOR CONTROLLER HAS FAILED.  SOME CRITICAL SYSTEM
        FUNCTIONS HAVE FAILED.  AN ORDERLY SHUTDOWN OF THE SYSTEM
        SHOULD BE IMMEDIATELY ATTEMPTED IN ORDER TO MINIMIZE THE
        IMPACT OF THIS FAILURE.
```

Figure 1-15. MVS/ESA Message IEA470W, Master Console

Single Points of Failure

A single point of failure is a failure that causes an immediate outage of the SCP. Single points of failure are generally hardware failures.

Single points of failure include the following:

- Most power/thermal failures
- Logic support adapter (LSA) failure
- Uncorrectable errors (UEs) in processor storage when the UE is in a critical area (such as the hardware system area)
- Central storage controller (PMC) failure
- System control element (SCE) failure
- Channel control element (CCE) failure
- Processor (CP) failure in the uniprocessor models
- Failure in a critical I/O device or its paths
- A software failure in critical code or data (for example, a control block)

Channel Paths and I/O Devices

I/O devices should be configured with multiple paths whenever possible. Each path should minimize common hardware. In an optimal configuration, two paths to each I/O device share little or no common hardware. For example, it may not help to provide two paths to an I/O device if both paths use different storage directors on the same IBM 3880 Storage Controller. Although the 3880 provides different physical control units, a 3880 power failure would eliminate both paths to the device. Also, it may not help to provide two paths to an I/O device if both include channel paths in the same channel element. Although the channel element provides different physical channel paths, a channel adapter failure would eliminate both paths to the device.

The following guidelines should help installation management keep to a minimum the effect of I/O device, channel path (CHP), channel element (CHE), and (on the multiprocessor models) channel control element failures.

Distribute paths to multiple-path I/O devices across separate paths that minimize common hardware, including:

- Channel elements
- Secondary data stagers, when more than one is installed

See Figure 7-1 on page 7-3 for an overview of the channel subsystem hardware and the channel path IDs (CHPIDs) that correspond to the above hardware.

Distribute the paths to single-path (asymmetrical) I/O devices through a channel switch (for example, an IBM 3814 Switching Management System) to provide maximum availability of the devices.

Master Console Configuration

The master console is the console that the operator uses to control and monitor the system when the SCP is active. When configuring the master console and its alternate console, installation management should use the following guidelines. To provide maximum access to the master console and maximum availability of the system:

- Configure the master console and its alternate so that they share the least amount of common hardware (see "Channel Paths and I/O Devices" on page 1-20).
- Dedicate a control unit to the master console and a different control unit to the alternate console.
- Install the control unit for the master console (or its alternate) as the first physical control unit on the path (closest to the channel path). Also, instruct the service representative to set this control unit for high priority at the time of installation.

Also see "SCP Message Facility" on page 2-12.

Figure 1-16 shows the recommended configuration for master and alternate consoles. CHP(x) and CHP(y) represent different channel paths that run from different control units.

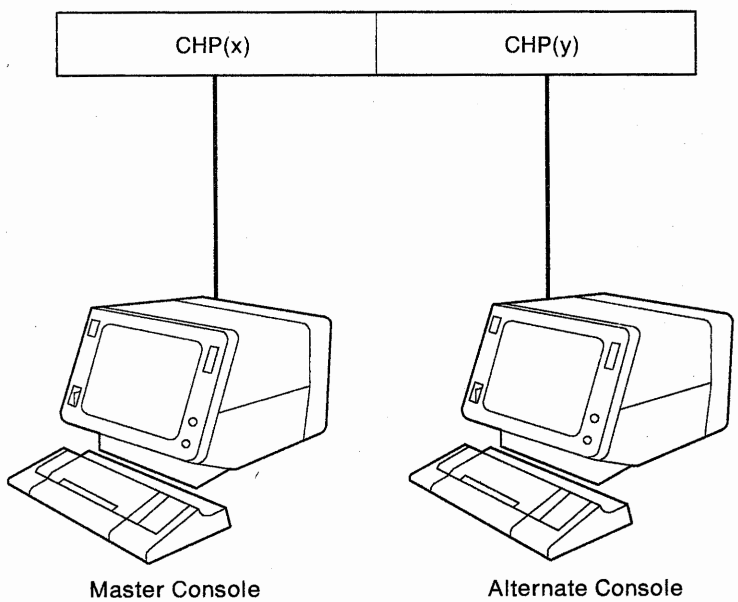


Figure 1-16. Recommended Configuration for Master and Alternate Consoles

IOCP Reports

Installation management should provide a current copy of the IOCP reports for each IOCDS to the operators. The IOCP report enables the operator to perform I/O problem determination. See *Input/Output Configuration Program User's Guide and Reference* for information on producing and reading the IOCP configuration reports. The IOCP reports provide the information that the operator needs to correlate the unit address (UA) of an I/O device to a device number and a subchannel number, and to determine the channel paths and control units for a device.

The system programmer should create the following reports whenever an IOCDS is written to the processor controller DASD:

Channel Path Identifier Report (CHPID): This report lists the channel path identifiers (CHPIDs) defined in the IOCDS and the control units and I/O devices assigned to each channel path.

I/O Device Report (DEVICE): This report shows the channel paths and logical control units to which each device is assigned.

Logical Control Unit Report (LOGICAL CONTROL UNIT): This report shows the device number, attached control units, and preferred channel paths.

Resource Measurement Facility

The availability of some measurement data from the Resource Measurement Facility (RMF) may be affected by:

- Reconfiguration changes which result in the interruption of channel measurement data from the channel subsystem (CSS).
- Modification of the active IOCDS.

Interruption of Channel Measurement Data

Causes of Interruption

Channel measurement data as reported by the channel subsystem may be interrupted when any of the following events occur:

- When the TOD clock is set for any processor. This occurs when the operator performs an IPL of the SCP or when the operator configures a processor online by using SCP configuration commands.
- When the operator configures the processor that provides timing for the channel subsystem offline by using SCP configuration commands. The lowest-numbered configured processor at the time of the power-on reset provides timing for the channel subsystem. If this processor is taken offline, control of the channel subsystem timing is again assigned to the lowest-numbered configured processor.

RMF Data Affected

When a channel measurement data interruption occurs, data that is normally contained in the RMF I/O device activity report is not available for the entire RMF reporting interval in which the interruption occurs. Data reporting for the I/O device activity report resumes during the next RMF reporting interval. The system is not otherwise affected.

Modification of the Active IOCDS

The Active IOCDS

When the operator performs a power-on reset, the hardware system area (HSA) is created from the I/O configuration data residing in an IOCDS. An IOCDS is selected by the operator when the power-on reset is performed and is thereafter known as the *active* IOCDS. During initialization, RMF tries to read the active IOCDS to get I/O configuration information.

The ACTIVE IOCDS field on the Configuration frame (Figure 1-17) specifies the number of the active IOCDS and the customer-specified name for the active IOCDS.

If the active IOCDS is changed or another IOCDS is selected, the changed IOCDS or the new IOCDS does not become active until the new IOCDS is loaded into the hardware system area (HSA) during a power-on reset (or SYSIML).

If the active IOCDS is changed and RMF is restarted before the next power-on reset, the system prevents RMF from reading the active IOCDS because the contents of the IOCDS may not reflect the configuration defined in the hardware system area (HSA). If RMF is not restarted before the next power-on reset, the availability of RMF data is not affected.

RMF Data Affected

If the active IOCDS is changed and RMF is restarted before another power-on reset is performed, the following RMF data is not available until the operator performs a power-on reset and an IPL:

- The logical control unit (LCU) number assigned to I/O devices as shown in the I/O device activity report.
- The I/O queuing report is not produced in its entirety.
- The CHPID TYPE field (block or byte) in the channel path activity report is left blank.

The system is not otherwise affected. If RMF is not initialized until after the operator performs another power-on reset, all RMF data is available.

```
                                                      dd mmm yy 19:47:07
                              Configuration                   (CONFIG)

 POWER ON RESET             CURRENT CONFIGURATION     ACTIVE IOCDS
    Complete                                            A4/IMSPROD

 A= ACTION                       D= PROCESSORS       F= STORAGE (TOTAL=1024MB)
   1. Release                 -> 1. CP1                  CENTRAL    EXPANDED
   2. Power on reset             2. CP2                1.  32MB        992MB
   3. Maximum Installed                                2.  48MB        976MB
   4. Select IOCDS Mgmt.                               3.  64MB        960MB
 B= CP MODE                                         -> 4.  96MB        928MB
-> 1. ESA/390 tm                                      5. 128MB        896MB
   2. Not Used                   E= VECTORS            6. 192MB        832MB
   3. Not Used                -> 1. VE1                7. 256MB        768MB
   4. LPAR                       2. VE2

 C= I/O TRACE
   1. Type(hex): ________                            @@@@ CHPID STATUS @@@@
      Units: __                                      Online: 32 Offline: 16
ESA/390 is a trademark (tm) of the IBM Corporation.

COMMAND ==>
SYSTEM 1         1 .... 2 ....                              PSW0 Operating

________________________________________________________________________________
        A:a MODE
```

Figure 1-17. Configuration (CONFIG) Frame (ESA/390 Mode, 1GB Storage)

```
                                                      dd mmm yy 19:47:07
                             IOCDS Management                 (IOCDSM)

POWER ON RESET             CURRENT CONFIGURATION     ACTIVE IOCDS
   Complete                                              A4

                                         ---- I/O CONFIGURATION DATA SETS ----
A= ACTION                     I= IOCDS   Name     Status         Timestamp
  1. Select                     1.  A0   IMSPROD  Write Protect 90.128 15:31:58
  2. Write Protect              2.  A1   V2.1 90                90.012 13:40:56
  3. Release Write Protect      3.  A2   5-07 HPO               90.117 14:42:30
  4. Select Config Frame        4.  A3   PR518 TM Write Protect 90.226 23:59:56
                             -> 5.  A4   IMSPROD  Write Protect 90.113 15:31:58
                                6.  A5   V2.1 90                90.098 00:10:02




COMMAND ==>
SYSTEM 1         1 .... 2 ....                              PSW0  Operating
________________________________________________________________________________
        A:a MODE
```

Figure 1-18. IOCDS Management (IOCDSM) Frame

Chapter 2. Problem Determination

This chapter discusses the following topics:

How to Use the Recovery Guide

The operator should always *follow local procedures.* Local procedures define the constraints and responsibilities of the operator in any situation. The operator should perform as much problem determination as time and local procedures permit, and as little as necessary to isolate the failure to a system component (for example, a power boundary or an application program). The operator should call the next level of support or the service representative for help with a known or suspected problem.

When the Cause of Failure Is Known

The flowchart on the facing page, Figure 2-1 on page 2-3, provides an overview of how to use this publication. Figure 2-1 is an extension of the the recovery strategy flowchart, Figure 1-1 on page 1-4. Figure 2-1 emphasizes manual recovery.

If the cause of a failure is known, the operator may go directly to "Directory of Recovery Actions by Hardware Area" on page 2-19 and from there go to a recovery action topic and perform the appropriate recovery action. The operator may also go directly to a recovery action topic by using the Contents, Index, or Index Tabs.

Figure 2-1 on page 2-3 includes the following off-page connectors:

X If the cause of a problem is not known, off-page connector X takes the operator to Figure 2-2 on page 2-5 to attempt problem determination.

Y If problem determination is successful, the cause of failure is identified. Off-page connector Y returns the operator to Figure 2-1 on page 2-3.

Z If problem determination is not successful, the cause of failure is still not known. Off-page connector Z returns the operator to Figure 2-1 on page 2-3.

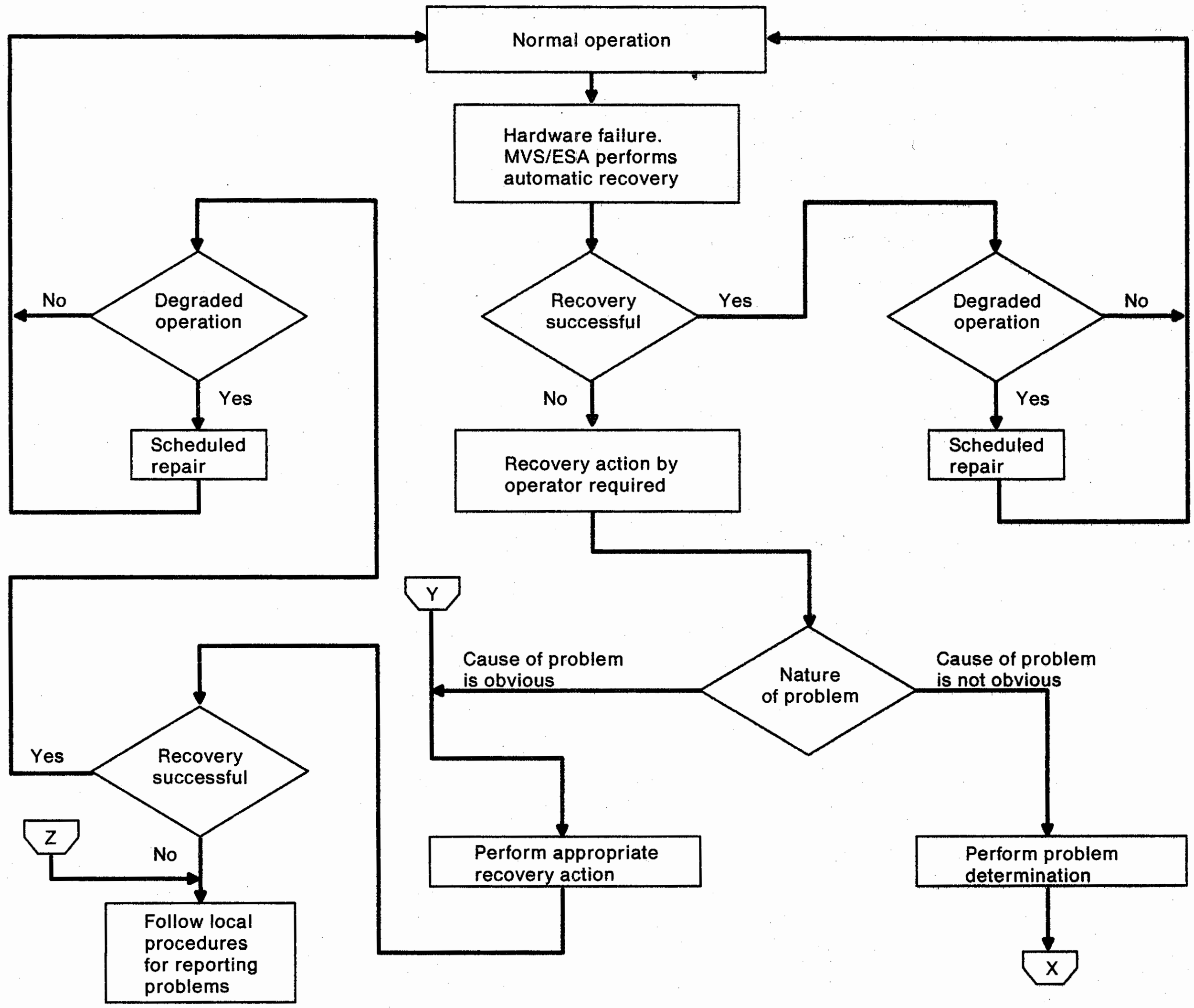


Figure 2-1. How to Use the Recovery Guide, 1 of 2

When the Cause of Failure Is Not Known

The operator should use the following list and the corresponding flowchart, Figure 2-2 on page 2-5, to look for the cause of a failure. The order of the following list is one approach to problem determination; the list and the flowchart are arbitrary. Perhaps some of the items do not apply to a specific problem; perhaps another order would help an operator with a specific problem.

Figure 2-2 includes the following off-page connectors:

X If the cause of a problem is not known, off-page connector X directs the operator to Figure 2-2 on page 2-5 to attempt problem determination.

Y If problem determination is successful, the cause of failure is identified. Off-page connector Y returns the operator to Figure 2-1 on page 2-3.

Z If problem determination is not successful, the cause of failure is still not known. Off-page connector Z returns the operator to Figure 2-1 on page 2-3.

The operator should consider each of the following topics which are reflected in the decision blocks of the flowchart:

A Does a message appear at the system console or in the system console log? See "System Console Messages" on page 2-6.

B Does a message appear at the master console or in the master console log? See "Master Console Messages" on page 2-7.

C Can the system console and master console communicate with the system? See "System Console Problem Determination" on page 2-8 or "Master Console Problem Determination" on page 2-10.

D Does the system appear to be (for example, by examining the SAD frames) in a loop or wait state? See "Wait States and Loops" on page 2-14.

E Has the problem analysis (PA) facility found a hardware failure? See "Using the Problem Analysis Facility" on page 2-16.

F Does a reference code (REFCODE) appear in the AQE summary that corresponds to the time of the failure? See "Finding a Reference Code" on page 2-20.

G Could the system problem be caused by an I/O device failure? Perform I/O problem determination according to local procedures.

H Is the processor controller available and operational? See "Determining the Cause of Suspected Problems" on page 8-28.

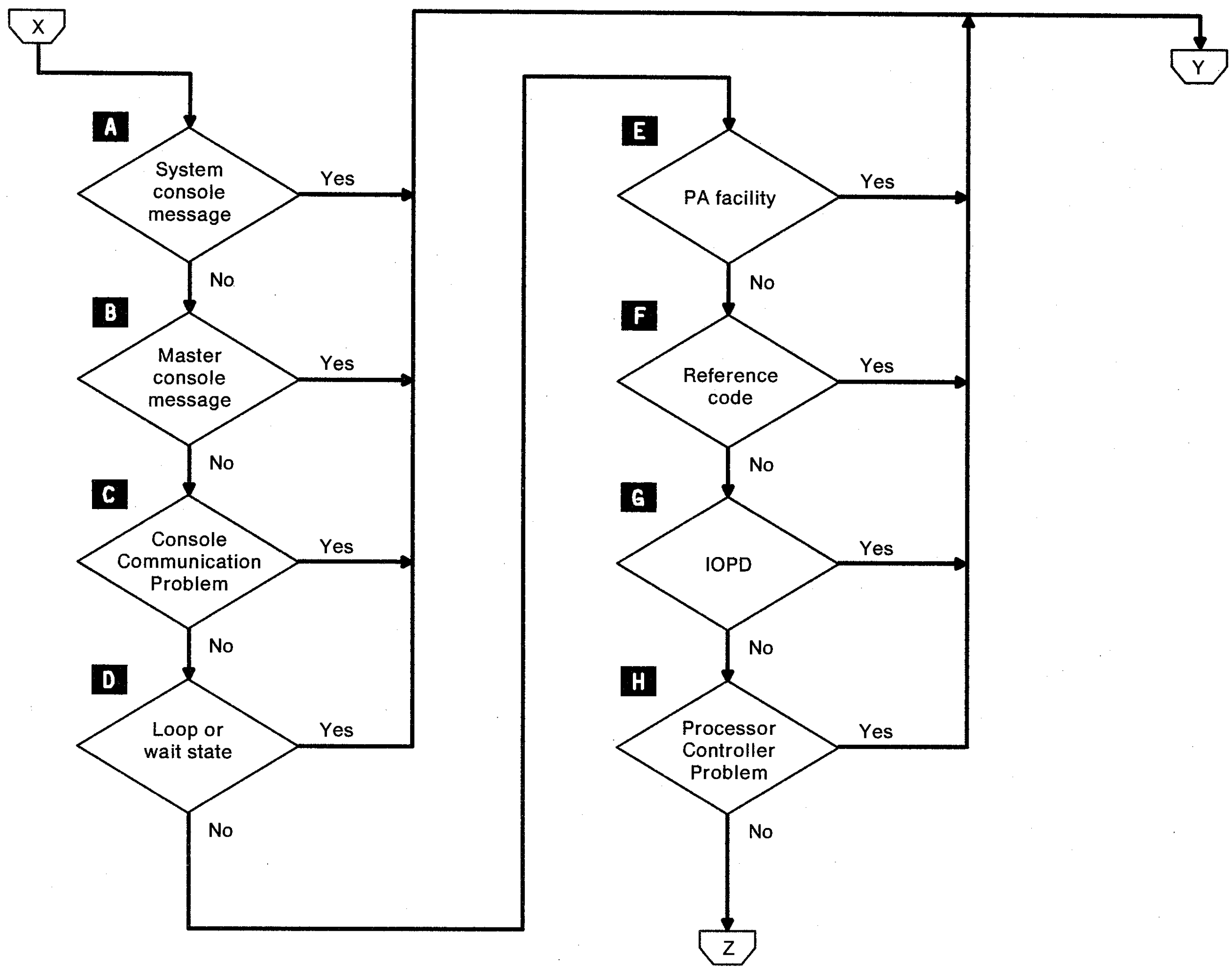


Figure 2-2. How to Use the Recovery Guide, 2 of 2

Error Messages

The following topics describe how system console and master console error messages relate to recovery from failures.

System Console Messages

Error messages are displayed at the system console as:

- Priority messages (full-screen messages) with an associated message number.
- One-line messages on line 22 with an associated message number.

Priority Messages

Priority messages are displayed at the system console and warn the operator of an important system condition (for example, a power/thermal failure). The processor controller alarm is activated only by some priority messages.

If the alarm sounds, note the contents of the priority message and reset the alarm by pressing the Enter key of the display on which the priority message appears. The alarm stops and the priority message is cleared from the screen. If priority messages are stacked, the next priority message then appears.

If a priority message is sent to a display that already has a priority message on it, the priority messages are stacked. Note the message that is displayed, and then press the Enter key to display the next priority message in the stack. (This is the only way to determine whether priority messages are stacked.)

If the priority message indicates one of the following:

Power/Thermal Problem: See "Power Problem Analysis Using the PA Facility" on page 4-2.

Processor Controller Problem: See "Determining the Cause of Suspected Problems" on page 8-28.

RSF Authorization Required: See "Remote Support Facility" on page 1-10.

Line 22 Messages

One-line error messages are displayed at the system console on line 22. If more information is available, the operator is asked to look at the console log (conlog). If the message is cleared and the operator needs to refer to it, the operator should look at the system console log. (The service console also has a console log.)

Master Console Messages

Error messages displayed at the master console indicate that a hardware or software problem has occurred. Look up the error message in the appropriate SCP manual. If the SCP is MVS/ESA, see *MVS/ESA Message Library: System Messages*.

If the error message indicates a problem with the processor unit hardware, the operator should use the problem determination facilities (PA facility, system console message, wait state, reference code, and so on) to identify the failure. See "When the Cause of Failure Is Not Known" on page 2-4.

Note: If the error message indicates a problem with an I/O device, perform I/O problem determination according to local procedures.

If the error message does not indicate a processor unit hardware failure or an I/O device problem, determine whether the SCP is active. If the SCP is MVS/ESA, enter a simple command like **D T** and look for an appropriate response. Do not use the MVS/ESA commands that require a response from the processor controller (CF or D M).

If MVS/ESA responds to a simple command and the processor controller is available (see "Availability of the Processor Controller" on page 8-28), enter a *Display Matrix* (D M) command to check the logical status of system resources.

Console Communication Problems

The following topics describe how to recover the system console or master console when communication with the system by means of either console is not possible.

System Console Problem Determination

The operator should use the following list and the corresponding flowchart, Figure 2-3 on page 2-9, as a general approach for handling system console problems.

A If the operator cannot use the system console to communicate with the system, either the keyboard of the system console is locked or is *input inhibited*. If the keyboard is locked, nothing happens when the Enter key or any other action key is pressed.

When the Enter key is pressed, if an **X** is displayed on the left side of line 25, the display is *input inhibited*. This condition may be reset when the Reset key is pressed, but when the Enter key is again pressed, the result is another input-inhibited condition.

B If the Setup, Play, or Record key is accidentally pressed on any display attached to the processor controller, the keyboard locks and the appropriate symbol (flashing diamond, P, or R) is displayed on line 25. To unlock the keyboard, press again the key that was accidentally pressed.

C Check the availability and operation of the processor controller. See "Availability of the Processor Controller" on page 8-28 and "Determining the Cause of Suspected Problems" on page 8-28.

D If SvPCE is displayed on line 25 of the service support display, press the Chg Dply key to restore normal display mode.

E Press the Reset key and then press the Assgn Cons key. Check the assignment of the system console (Figure 8-5 on page 8-24). The system console *monitor* must not be assigned to the display intended for the system console. Press the End key.

F Press the Index key to display the System Console Index (INDEX0) frame. If SERVMODE ON is indicated, go to "When SERVMODE ON Is Indicated" on page 3-9.

G Press the Reset key. If pressing the Reset key does not recover the display for the system console, reset it by powering the display off. Wait 30 seconds and power on the display.

H If powering the display for the system console off and on does not reset it, use the TAKECONS command to move the system console to another display. See "TAKECONS" on page B-11.

If none of the above actions is successful, follow local procedures for reporting problems.

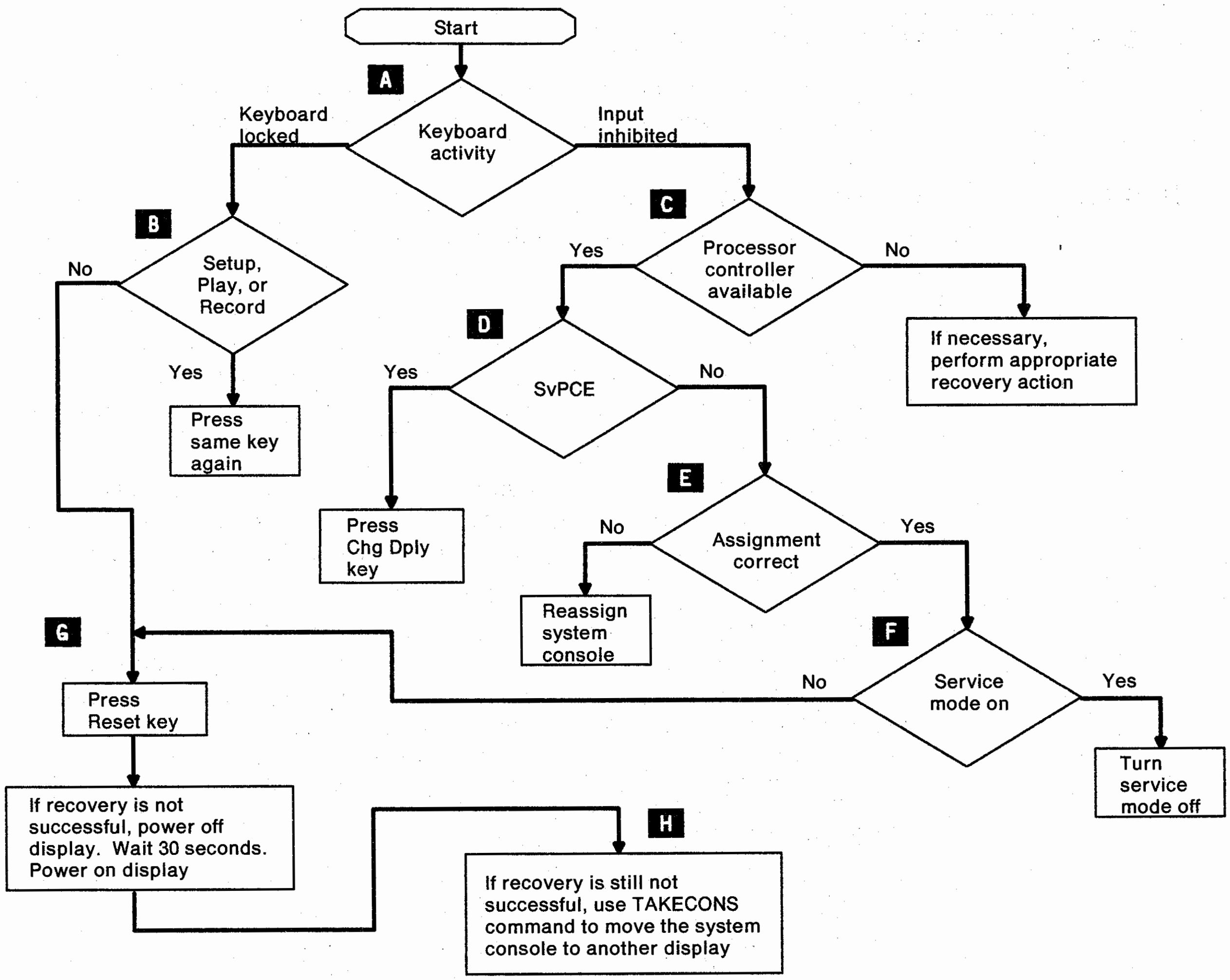


Figure 2-3. System Console Problem Determination

Master Console Problem Determination

The operator should use the following list and the corresponding flowchart, Figure 2-4 on page 2-11, as a general approach for handling master console problems.

A When the Enter key is pressed, if the input inhibited symbol is displayed, the display is *input inhibited*. This condition may be reset when the Reset key is pressed, but when the Enter key is again pressed, the result is another input-inhibited condition.

B Enter a simple MVS/ESA command, like **D T**. If the command is accepted by the system, the SCP is active. Do not use the MVS/ESA commands that require a response from the processor controller for successful execution (CF or D M).

C Check for system problems, like abnormal ends (abends) or wait states.

D If the SCP is active, check the alternate console to see if the master console automatically switched to the alternate console. If the consoles switched, automatic system recovery has performed normally. Check the display, control unit, channel path, and cables (the hardware) associated with the problem display.

E Is message 64400 displayed at the system console? If yes, a priority message is pending. Press the Enter key to clear it. If no, see key **H**.

F If the consoles did not automatically switch (the alternate console failed to take over for the master console), is message 35201 displayed? If yes, a *DCCF condition* has occurred. Go to "SCP Message Facility" on page 2-12. If no, assume a *no console condition*.

G *No console condition*. If MVS* fails to automatically switch from a failed master console to an alternate console, the result is a *no console condition*.

Find an unallocated, channel-attached display that may be used as a master console and press the Enter, Request, or End key on this display. Then press the Irpt key on the *system* console. The master console should then be assigned to the channel-attached display (MVS/ESA message IEE143I is displayed).

H Is the processor controller available? If the processor controller is not available, the SCP may be waiting for a response, making it appear that the master console has failed. For example, MVS/ESA commands CF or D M require a response from the processor controller for successful execution.

See "Availability of the Processor Controller" on page 8-28. Wait for the processor controller to become available or, if necessary, follow local procedures for reporting problems.

If recovery is not successful, see "Wait States and Loops" on page 2-14.

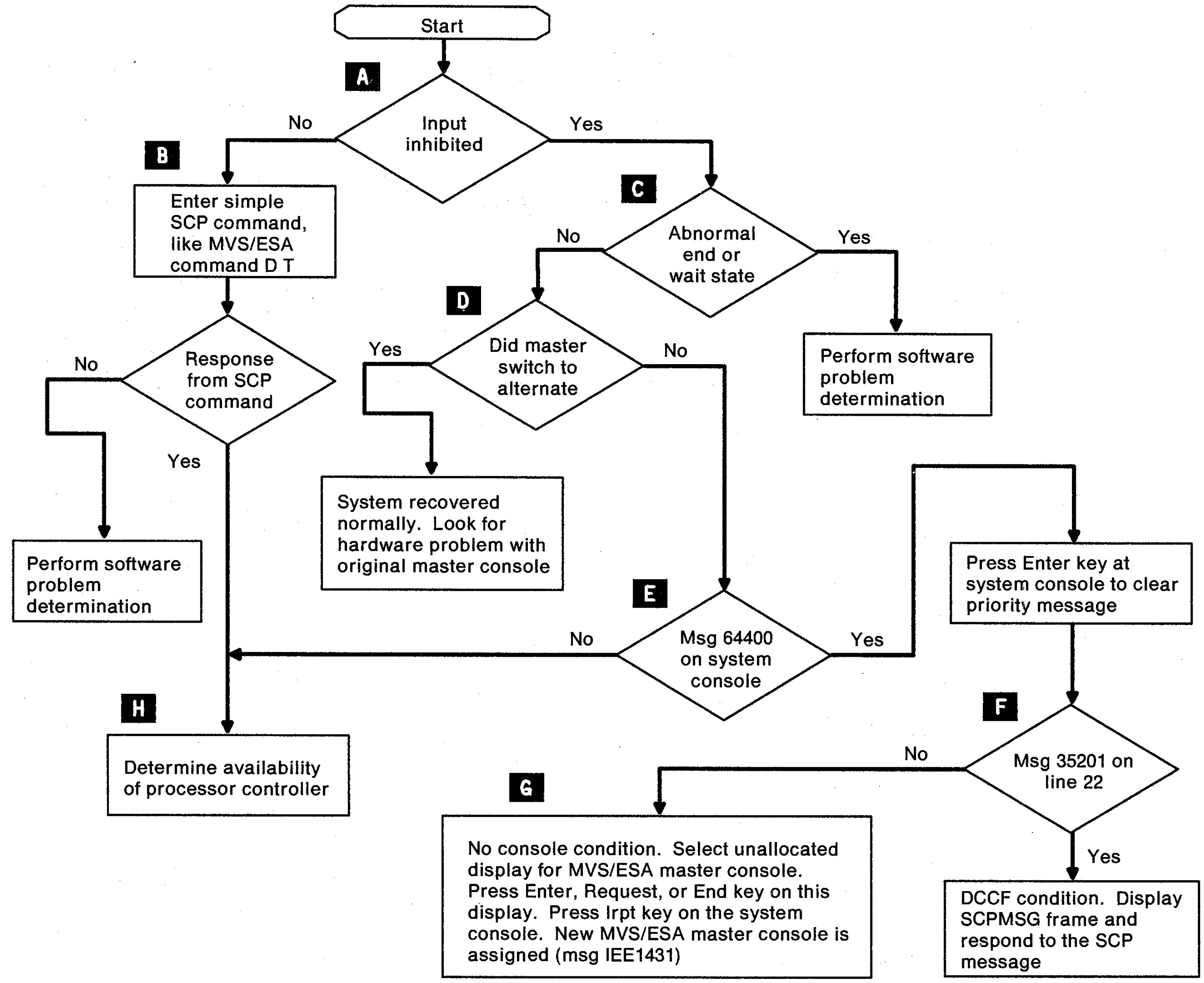


Figure 2-4. Master Console Problem Determination

SCP Message Facility

The SCP message facility allows the SCP to issue messages and process responses through the system console. The disabled console communications facility (DCCF), for example, sends a message to the system console by using the SCP message facility when a message cannot be processed through the MVS master console or its alternate. The system console continues to operate as before, but the SCP message facility cannot process any more messages until the operator replies to the current message.

A DCCF message is sent to the system console (1) if the SCP cannot access either the master console or its first alternate, or (2) if the SCP does not receive a response to an SCP message displayed on the master console or its alternate within approximately 2 minutes. DCCF sends only those messages to the system console that require an operator reply.

The SCP may not receive a response to an SCP message because (1) the operator did not send a response or (2) the operator sent a response, but the path for that response was blocked (for example: if the master console is not dedicated to a 3274 Control Unit, a response to an SCP message may never reach the channel subsystem).

The SCP message facility gives the SCP an additional way to communicate with the operator. Formerly, DCCF loaded a restartable wait state to communicate with the operator when a message or its reply could not be processed through the master console or its alternate (see "Master Console Configuration" on page 1-21). DCCF still loads the restartable wait state if the SCP message facility is not active.

When DCCF sends a message to the system console, the system console receives a priority message (Figure 2-5) and the processor controller alarm sounds to indicate that an SCP message is pending. The operator should use the following procedure:

1. Press the Enter key to clear the priority message.
2. Look at line 22 (the line above the command line):
   - If system message 35201 is displayed on line 22 (*SCP messages are pending. Invoke or refresh the SCPMSG frame.*), a *DCCF condition* has occurred. Go to step 3.
   - If line 22 is blank, assume a *no console condition* (see "Master Console Problem Determination" on page 2-10).
3. Enter **F SCPMSG** at the system console to display the SCP Message Facility frame (for example, Figure 2-6). The SCP message remains on the screen until the operator responds to it.
4. Place the cursor at the beginning of the RESPONSE: field on line 22 and enter a response (for example, enter **U** or **ACR**). Do not begin the response with 'R O,' as would be correct if the message were sent to the master console or its alternate.

   If the system activity display (SAD) is active when F SCPMSG is entered, SAD stops. To restart SAD after a response to the SCPMSG message, enter **F SAD LAST**.

```
19:47:07                                                    (64400)

************************ PRIORITY MESSAGE *************************
*                                                                 *
*            Operator console not operational.                    *
*                                                                 *
* Intended Console: System                                        *
*                                                                 *
* Detailed Information: The SCP is unable to send messages to any *
*                       I/O device specified as an operator       *
*                       console.                                  *
*                                                                 *
* System Action: The audible alarm is sounded and the system waits *
*                for operator intervention.                       *
*                                                                 *
* User Action: Identify the cause of trouble with the SCP.        *
*                                                                 *
*                                                                 *
*                                                                 *
*******************************************************************

        A:a MODE
```

Figure 2-5. Priority Message for SCP Message Facility

```
                                               dd mmm yy 19:47:07
                            SCP MESSAGE FACILITY             (SCPMSG)

 IEE127I THE FOLLOWING MESSAGE IS ISSUED THROUGH DISABLED CONSOLE FACILITY
 IEE331A PROCESSOR (1) IS IN AN EXCESSIVE DISABLED SPIN LOOP
 WAITING FOR RISGNL RESPONSE
 REPLY  U  TO CONTINUE SPIN,
 OR STOP PROCESSOR(1) AND REPLY  ACR
 (AFTER STOPPING THE PROCESSOR, DO NOT START IT)









 RESPONSE: ________________________________________

COMMAND ==>
SYSTEM 1         1 .... 2 ....                   PSW0 Operating

        A:a MODE
```

Figure 2-6. Response Frame for SCP Message Facility

Wait States and Loops

Wait states and program loops are two reasons why a system may appear unable to perform useful work. The *type* of loop or wait state determines how the operator can respond. Enabled loops or wait states allow the operator to communicate with the SCP by means of the master console. Disabled loops or wait states prevent the operator from communicating with the SCP.

Wait States

The SCP may load a wait state on one processor or on every online processor. This causes a message to be displayed on the system console and may cause the processor controller alarm to sound.

Wait states are loaded by an SCP for several reasons:

- Procedural problems (enabled wait state). For example, a processor is waiting for work.
- Communication problems (disabled, restartable wait state). For example, the SCP cannot communicate with the operator by means of the operator console. Disabled wait states are reported to the operator by a priority message at the system console (for example, see Figure 2-5).
- Hardware problems (disabled, nonrestartable wait state). For example, a hardware failure occurs in a location or to an extent that results in a system check-stop state. Disabled wait states are reported to the operator by a priority message at the system console (for example, see Figure 2-7).

To determine the appropriate response to the wait state, the operator should refer to the appropriate publications for the specific SCP. If the SCP is MVS/ESA, see *MVS/ESA Message Library: System Codes*.

```
19:47:07                                                        (62103)

************************ PRIORITY MESSAGE **************************
*                                                                  *
*               CP1 has entered disabled wait.                     *
*                    PSW = 000A0000 0000000E                       *
*                                                                  *
*  Intended Console: System                                        *
*                                                                  *
*  Detailed Information: The processor has loaded a wait PSW       *
*                        which is enabled for all interrupts.      *
*                                                                  *
*  System Action: None.  The processor remains in the operating    *
*                 state but is not executing instructions.         *
*                                                                  *
*  User Action: Refer to operating system message and wait codes   *
*               publication for recommended action.                *
*                                                                  *
********************************************************************
```

Figure 2-7. Wait State Priority Message (Example)

If the SCP is MVS/ESA and an enabled wait state is indicated, check the following:

- Are SCP requests outstanding?
  - Try the command D R or D U.
  - Display, if available, the RMF Monitor II ENQ and ENQR online report.
- Is work available?
  - Display queues, initiators, and (for example) TSO users.
  - Display, if available, the RMF Monitor II DOMAIN online report.
- If an I/O device problem is suspected, perform I/O problem determination.

Loops

Loops are often first recognized by unusual SAD activity (one or more processors at 100% utilization or one or more at 0% utilization), or as jobs that do not start (or do not end) when expected to do so.

If a disabled loop is suspected, try to determine which program is looping. Consider interrupting the loop by performing a program restart or by canceling the job. Follow local procedures.

If the same apparent loop occurs again (it may be difficult to identify another loop as the same loop), attempt to document the problem by performing an instruction trace and a standalone dump. Follow local procedures.

If the SCP is MVS/ESA and an enabled loop is suspected, check the following:

- Display, if available, the RMF Monitor II ASD online report (Delta Option, CPU field) from the RMF monitor console.
- Reset the Performance Group if possible.
- Cancel or force the looping program if possible.

Using the Problem Analysis Facility

The operator should use the following procedure to call the problem analysis (PA) facility:

1. Go to the system console.
2. Enter **F INDEX0** to display the System Console Index (INDEX0) frame. If SERVMODE ON is indicated, see "When SERVMODE ON Is Indicated" on page 3-9.
3. Enter **F PA** to call the PA facility.

   Note: Any hardware error or interface control check (IFCC) that is more than 1 hour old is not available to the PA facility. Any hardware error or IFCC that is less than 1 hour old may still be indicated even if the problem is solved.

   The PA facility automatically displays one of the following:

   - The PROBLEM ANALYSIS – Processor Unit Conditions frame, (PA)-00 (Figure 4-2 on page 4-3), if the system has a power problem. Go to "Power Problem Analysis Using the PA Facility" on page 4-2.
   - The PROBLEM ANALYSIS – Status frame, (PA)-03 (Figure 2-10 on page 2-18), if the system *does not* have a power problem. Go to "PA Status and Status Selection" on page 2-17.

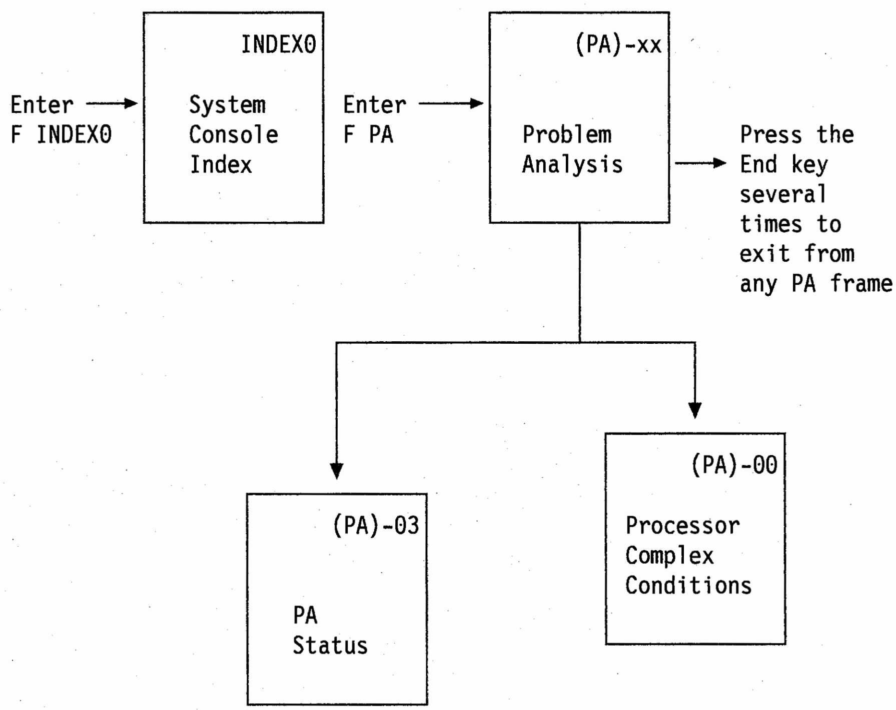


Figure 2-8. Calling the Problem Analysis Facility

PA Status and Status Selection

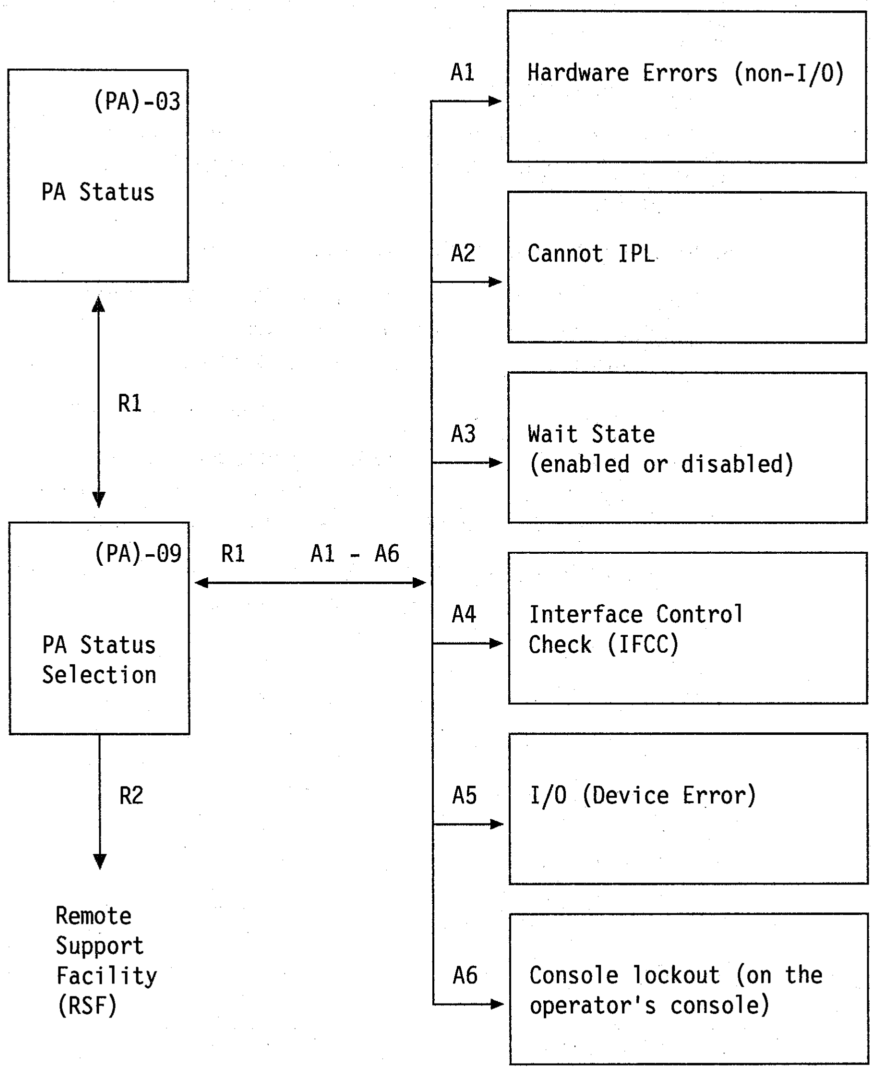


Figure 2-9. PA Status and Status Selection

When the operator calls the PA facility and the system *does not* have a power problem, the PA Status frame, (PA)-03 (Figure 2-10 on page 2-18), is automatically displayed. The operator should use the following procedure:

1. Enter **R1** from the PROBLEM ANALYSIS — Status frame, (PA)-03. The PROBLEM ANALYSIS — Status Selection frame, (PA)-09 (Figure 2-11 on page 2-18), is then displayed.
2. Enter **An**, where n is the number of the first category listed that can be applied to the problem and does not have an X next to it.
3. Consider the recovery actions. If the recovery actions listed in the PA facility are not successful or do not apply: return to this publication, perform I/O problem determination, call the remote support facility, or follow local procedures for reporting problems.

```
                                                        dd mmm yy 19:47:07
                         PROBLEM ANALYSIS - Status              (PA)-03

 CP1: Running                         CP2: Running












 R= CALL OR RETURN TO
   1. PA Status Selection

COMMAND ==>
SYSTEM 1          1 .... 2 ....                            PSW0 Operating
__________________________________________________________________________
        A:a MODE
```

Figure 2-10. PROBLEM ANALYSIS — Status Frame

```
                                                        dd mmm yy 19:47:07
                    PROBLEM ANALYSIS - Status Selection         (PA)-09

    A= PROBLEM CONDITION
      1. Hardware Errors (non-I/O)
      2. Can not IPL
     X3. Wait State (enabled or disabled)
     X4. Interface Control Check (IFCC)
      5. I/O (Device Error)
      6. Console lockout (on the operator's console)







    R= CALL OR RETURN TO
      1. PA Status
      2. Service Request (RSF: Exit PA)

COMMAND ==>
SYSTEM 1          1 .... 2 ....                            PSW0 Operating
__________________________________________________________________________
        A:a MODE
```

Figure 2-11. PROBLEM ANALYSIS — Status Selection Frame

Directory of Recovery Actions by Hardware Area

If the failed hardware area is known, the following list can direct the operator to specific recovery actions.

Failed hardware:	Go to:
Central storage	"Central and Expanded Storage Recovery Actions" on page 6-3.
Channel subsystem	"Channel Subsystem Recovery Actions" on page 7-6.
Expanded storage	"Central and Expanded Storage Recovery Actions" on page 6-3.
Logic service adapter	"Logic Service Adapter Recovery Actions" on page 4-10.
Logic support station	"Logic Support Station Recovery Actions" on page 4-11.
Power	"Power Recovery Actions" on page 4-6.
Processor	"Processor Recovery Actions" on page 5-4.
Processor controller	"Recovering from Processor Controller Problems" on page 8-32.
System control element	"System Control Element Recovery Actions" on page 6-4.
Vector facility	"Vector Facility Recovery Actions" on page 5-6.

Using a Reference Code

Using a reference code (REFCODE) to recover the processor unit includes finding the reference code and finding the recovery actions that apply to the reference code.

Finding a Reference Code

The reference code is part of the action queue entry (AQE) for a system event. Something has occurred, such as a failure or persistent error, that must be tracked by means of a log. The action queue is the log and the AQE is an entry to that log.

An error message or the PA facility may identify failed hardware in the processor unit. Sometimes the reference code that corresponds to the failure may be more meaningful. If a failure occurs and the RSF call cannot complete, the reference code (REFCODE) may be indicated in the priority message for the failure. If this happens, the reference code may be found in the system console log.

If a reference code is not indicated in the priority message, the operator should use the following procedure to find the reference code that corresponds to a failure:

1. Go to the service console.
2. Enter **F MPINDX** to select the Maintenance Procedures Index frame.
3. Enter **A1** to select the Action Queue frame.
4. Enter **A1** to select the AQE Summary frame.
5. Enter **ALL** to display all AQE summaries.
6. Scroll forward to find a reference code with a time stamp (last occurrence) that corresponds to the time of the failure.

   If an applicable reference code is found, note the first four digits.
7. Go to "Directory of Recovery Actions by Reference Code" on page 2-21.

Directory of Recovery Actions by Reference Code

The first two digits of a reference code (REFCODE) identify the appropriate recovery actions topic.

Example

An ES/9000 fails and RSF cannot complete the call. The operator may have canceled the RSF request (priority message 45001, *RSF authorization required*) according to local procedures.

The operator finds the first two digits of the reference code in the console log (priority message 45013, *RSF service call cannot complete*) or in the AQE summary (see "Finding a Reference Code" on page 2-20) and goes to the list of recovery action topics on page 2-21.

If the reference code begins with 03, the operator goes to "System Control Element Recovery Actions" on page 6-4. The operator uses the first four digits of the reference code to identify the failed hardware (for example, a reference code of 0300 would identify system control element SCE0 as the most likely site of failure).

In this example, the operator would turn to "System Control Element Recovery Actions" on page 6-4.

ID	Go to:
01	"Processor Recovery Actions" on page 5-4.
03	"System Control Element Recovery Actions" on page 6-4.
04	"Central and Expanded Storage Recovery Actions" on page 6-3.
06	"Channel Subsystem Recovery Actions" on page 7-6.
07	"Channel Subsystem Recovery Actions" on page 7-6.
08	"Channel Subsystem Recovery Actions" on page 7-6.
0B	"Channel Subsystem Recovery Actions" on page 7-6.
0D	"Channel Subsystem Recovery Actions" on page 7-6.
0E	"Channel Subsystem Recovery Actions" on page 7-6.
0F	"Vector Facility Recovery Actions" on page 5-6.
10	"Vector Facility Recovery Actions" on page 5-6.
12	"Channel Subsystem Recovery Actions" on page 7-6.
18	"Vector Facility Recovery Actions" on page 5-6.
1A	"Logic Service Adapter Recovery Actions" on page 4-10.
1C	"Processor Recovery Actions" on page 5-4.
1D	"Channel Subsystem Recovery Actions" on page 7-6.
1E	"System Control Element Recovery Actions" on page 6-4.
1F	"Channel Subsystem Recovery Actions" on page 7-6.
24	"Channel Subsystem Recovery Actions" on page 7-6.
25	"Channel Subsystem Recovery Actions" on page 7-6.
2A	"Channel Subsystem Recovery Actions" on page 7-6.
2C	"Channel Subsystem Recovery Actions" on page 7-6.

Note: If the operator finds a reference code that corresponds with a current system problem but the reference code is not listed above (for example, a reference code that begins with 00 or 20), the operator should follow local procedures for reporting problems.

System Activity Display Frame

The System Activity Display frame provides a graphic indication of processor and channel path activity. The SAD facility consists of one frame that allows the operator to define up to 24 activity displays. Each activity display may contain processor and channel path information in any order or combination desired.

List of System Activity Displays Frame

The List of System Activity Displays frame lists all defined activity displays by number and name.

The SAD list consists of one frame for a total of 24 possible activity displays.

1. Enter **F SAD** to display the List of System Activity Displays frame (Figure 2-12).

   Note: To directly call a specific display, enter **F SAD nn**, where nn is the number of desired system activity display.

2. Perform one of the following:

   - Enter **Ann**, where nn is the number of the desired system activity display.

     Press the End key from any system activity display to return to the list of SAD frames.

   - Enter **B1** to define a system activity display frame.

```
                                                            dd mmm yy  19:47:07
                         List of System Activity Displays  (1 of 2)   (SAD)

      A= EXECUTE SAD
        1. PRODUCTION  SYSTEM CP                    13. Not Defined
        2. CUSTOMER B PAYROLL                       14. Not Defined
        3. INTERACTIVE/BATCH                        15. Not Defined
        4. NIGHT SHIFT CHANNELS                     16. Not Defined
        5. DAY SHIFT SCIENTIFIC                     17. Not Defined
        6. DAY SHIFT  SYSTEM A                      18. Not Defined
        7. Not Defined                              19. Not Defined
        8. OFF SHIFT TIMESHARE                      20. Not Defined
        9. Not Defined                              21. Not Defined
       10. 3RD SHIFT - HI USAGE                     22. Not Defined
       11. Not Defined                              23. Not Defined
       12. Not Defined                              24. Not Defined

      B= SELECT
        1. SAD Definition Frame

COMMAND ==>
SYSTEM 1          1 .... 2 ....                                 PSW0 Operating
--------------------------------------------------------------------------------
        A:a MODE
```

Figure 2-12. List of System Activity Displays Frame (1 of 2)

Define System Activity Display Frame

The Define System Activity Display frame (Figure 2-13) is used to select the type of information shown on each of the listed activity displays. This frame may be displayed directly by entering **F SAD DEFINE**, or by selecting option B1 from the List of System Activity Displays frame (Figure 2-12).

When the SAD Define frame is first displayed, the cursor moves to the upper left corner of line 1 (*SAD:* __ field). A valid activity display number must be entered. The activity display is then defined one line at a time by entering the desired information for each of the function fields. See *ES/9000 Operating Guide* for more information on defining activity displays.

```
SAD: __                                               dd mmm yy  19:47:07
                          Define System Activity Display          (SAD)-00
 A= LINE NO.                       B= LINE ELEMENT
   1.                           1. CP(Hex): _
   2.                           2. CP(Hex): _ Key(Hex): _
   3.                           3. CP(Hex): _ Ex Key(Hex): _ State: _ (S/P/B)
   4.                           4. CH(Hex):ESA CHPID: __   370 Set: _ No. __
   5.                           5. CH List: __ (HI/LO) ; Thru line(Dec): __
   6.                           6. Blank Line
   7.                           7. Grid
   8.                                                 E= REFRESH RATE:
   9.                                                   1. Seconds(Dec): __
  10.                         C= PROCESSOR STATE:
  11.                           1. Supervisor         F= SAD ID INFORMATION:
  12.                           2. Problem              1. SAD Name(A/N):
  13.                           3. Both
  14.                                                     ____________________
  15.                         D= THRESHOLD:             2. Save as No.(Dec): __
  16.                           1. >(Dec): __           3. Review SAD List
  17.                           2. <(Dec): __         G= EXECUTE SAD:
  18.                           3. None                 1. Number(Dec): __
 A SAD must be specified.
COMMAND ==>
SYSTEM 1         1 .... 2 ....                              PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 2-13. Define System Activity Display Frame

Examples of System Activity Display Frames

Figures 2-14 and 2-15 are examples of defined system activity displays. Up to 16 defined system activity displays may be displayed sequentially with a specified time interval between display changes.

Enter **F SAD aa bb ... Rnn**, where:

aa First display number

bb Second display number, and so on ...

nn Display time interval in seconds (default = 10)

Figure 2-14 shows channel path activity as it appears when running in ESA/390 mode. Figure 2-15 shows the dynamically-selected high-usage and low-usage channel path activity as it appears when running S/370 in LPAR mode.

High-usage and low-usage channel paths are displayed in ascending order, with the lowest numbered channel path at the top usage line. Channel path usage is sampled every 30 seconds.

Generally, a normal system activity display indicates constantly changing processor activity between 0% and 100%. A display that is constantly at 0% or 100% supervisor state is usually an indication of a problem. Loops are often first recognized by unusual SAD activity (one or more processors at 100% utilization and one or more at 0% utilization). A display showing one processor at 0% utilization and all other processors at 100% utilization may indicate a disabled wait state.

```
                                                        dd mmm yy  19:47:07
                   System Activity Display - INTERACTIVE/BATCH       (SAD 6)
   Prob=* Supv=@     0----1----2----3----4----5----6----7----8----9----10
 CP1                  ***************************@@@@@@@@@@@@@@@@@@       >90
 CP2                  *********************@@@@@@@@@@@@@@               >90
 CP1  S       KEY0    @@@@@@@@@@@@
 CP1  P       KEY7    ***************                                   >90
 CP2  S       KEY0    @@@@@@
 CP2  P       KEY7    ************
                     0----1----2----3----4----5----6----7----8----9----10
 CHPID 0A             @                                                 <2
 CHPID 0B             @@@@@@@@
 CHPID 0F             @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
 CHPID 03             @@@@@@@@@@@@@@@@@@@@@
 CHPID 25             @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@              >99
 CHPID 23             @                                                 <2
 CHPID 24             @@@@@@@                                           >99
 CHPID 26             @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@          >99
 CHPID 27
 CHPID 28             @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
 CHPID 29             @@@@@@@@@@@@@@

COMMAND ==>
SYSTEM 1          1 .... 2 ....                          PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 2-14. System Activity Display Frame, ESA/390 Mode

```
                                                                   dd mmm yy  19:47:07
                 System Activity Display - CUSTOMER B PAYROLL       (SAD 9)
   Prob=* Supv=@    0----1----2----3----4----5----6----7----8----9----10
 CP1                 ****************************@@@@@@@@@@@@@@@@@@       >90
 CP1         KEYA    ******@@@@                                            <60
 CP1         KEYB    **@@@
 CP1  S      KEYC    @@@@
 CP1  P      KEYD    ***********
 CP2                 ***************@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@    >90
 CP2         KEY0    @@@@@@@@@@@@
 CP2         KEY1    ***@@@@@@@
 CP2         KEY2
 High Usage         0----1----2----3----4----5----6----7----8----9----10
 CH 0-01 CHPID 11    @@@@
 CH 1-08 CHPID 29    @@@@@@@@@@@@@@@@
 CH 1-09 CHPID 2A    @@@@@
 CH 1-0A CHPID 2F    @@@@@@@@@@@@@@@@@@@@@@@
 Low Usage          0----1----2----3----4----5----6----7----8----9----10
 CH 0-00 CHPID 10    @
 CH 1-07 CHPID 28    @@@

COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 2-15. System Activity Display Frame, S/370 in LPAR Mode

Chapter 3. Procedures for Recovery

This chapter discusses the following topics:

Changing the Hardware Configuration

The MVS/ESA system control program (SCP) provides two methods of reconfiguration: automatic reconfiguration and manual reconfiguration. Automatic reconfiguration is handled by MVS/ESA and the processor controller without operator intervention. The operator performs manual reconfiguration from the master console when the SCP is active and from the system console when the SCP is not active. Manual reconfiguration for recovery is rarely necessary when MVS/ESA is active.

Warning: An active SCP does not prevent hardware configuration changes from the system console. To keep the logical configuration (maintained by MVS/ESA) identical to the physical configuration (maintained by the processor controller), do not change the hardware configuration from the system console when the SCP is active.

If the SCP is active, the operator enters configuration commands at the master console to logically change the hardware configuration. When applicable, the SCP also notifies the processor controller and the processor controller changes the physical hardware configuration.

If the SCP is not active, the operator enters service language commands or Configuration (CONFIG) frame selections at the system console to change the hardware configuration. The processor controller immediately changes the physical configuration.

Figure 3-1 shows how the methods of reconfiguration are related to the recovery approach used in this publication. When a hardware failure occurs, MVS/ESA either remains active or fails with the hardware. If MVS/ESA remains active, MVS/ESA automatically tries to take the failed hardware offline and recover the system.

When recovery (automatic or manual) is successful, the system either returns to normal operation or suffers a loss of performance, depending on the extent and location of the failure. The ability of the system to run in this (less than normal) state enables processing to continue while the service representative is notified of the failure and responds to it.

The operator performs manual reconfiguration from the master console by using MVS/ESA commands. The operator performs manual reconfiguration from the system console by using the Configuration (CONFIG) frame. See Figure 3-2 on page 3-5. If MVS/ESA is not active after a hardware failure, the operator should take the failed hardware offline from the system console. If reconfiguration from the system console is not successful, the failed hardware must be repaired before system recovery is possible.

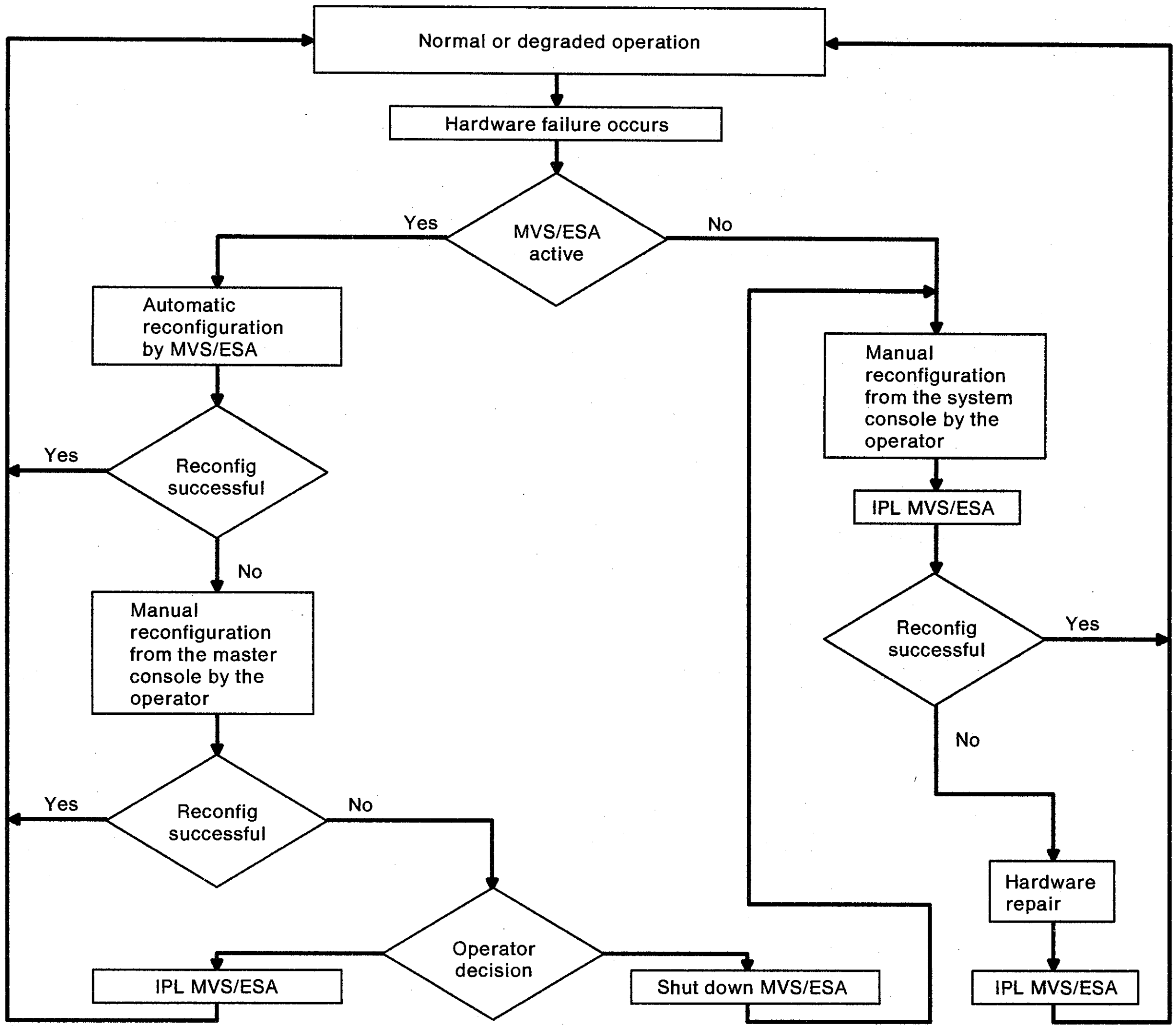


Figure 3-1. Methods of Reconfiguration

Automatic Reconfiguration

MVS/ESA provides most of the automatic reconfiguration capability for the processor unit. Whenever possible, MVS/ESA automatically takes the failed hardware offline and allows processing to continue. If the failure occurs in a resource that is critical to system operation, the system is down until the failure is repaired. Error information is written to the processor controller DASD.

MVS/ESA can automatically take processors offline by means of a function called alternate processor recovery (ACR) (see "Alternate Processor Recovery" on page 5-2). MVS/ESA can also take vector facilities offline.

MVS/ESA can automatically take processor storage offline by means of *frame deallocation*. When some storage errors are detected, the processor controller isolates the storage, marks it as offline, and records the error on the processor controller DASD. Generally, MVS/ESA deallocates any 4K-byte frame found to be in error.

MVS/ESA can automatically take channel paths and I/O devices offline. When MVS/ESA is informed of an I/O device failure, MVS/ESA boxes (pending offline) the failed device (if possible). Any subsequent I/O operation to the device is an I/O error. MVS/ESA may box an I/O device as a result of one or more of the following conditions:

- Hot I/O (device failure).
- The only channel path to an I/O device fails or is manually forced offline.
- RESERVE fails when the last channel path to an I/O device fails or unconditional reserve (U/R) recovery fails to move the reserve to an alternate channel path.

Manual Reconfiguration (MVS/ESA Active)

During normal operation with MVS/ESA active, the system should be reconfigured from the master console (Figure 3-2 on page 3-5). The reconfiguration request is sent to MVS/ESA where a logical reconfiguration is performed so that the failed resource is no longer available. When the logical reconfiguration is complete, MVS/ESA requests a physical reconfiguration from the processor controller. The processor controller informs MVS/ESA when the physical reconfiguration is complete.

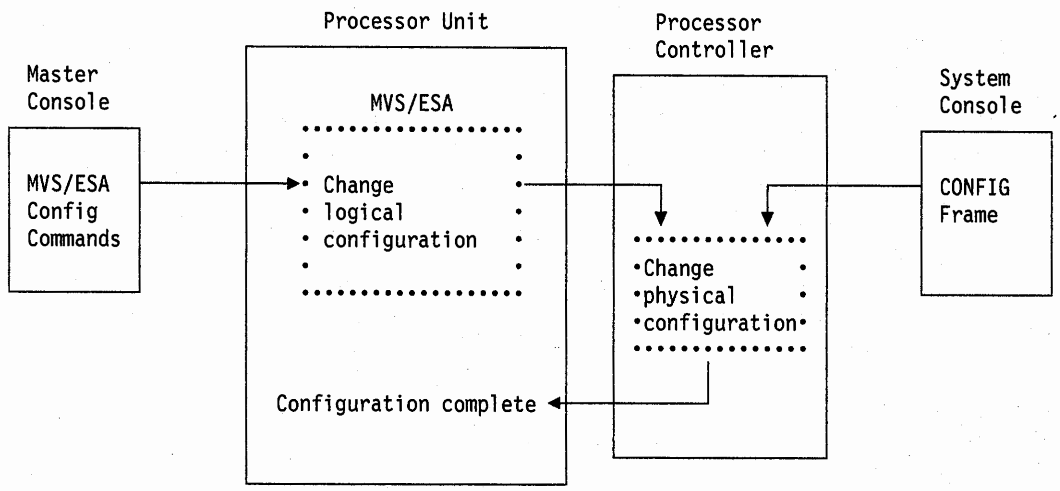


Figure 3-2. Overview of Manual Reconfiguration

Manual Reconfiguration (SCP Not Active)

When the SCP is not active, the operator must perform any reconfiguration from the system console. See Figure 3-2. Use the system console to reconfigure the system only when the SCP is not active.

Before reconfiguring the system:

1. Go to the system console.
2. Enter **F INDEX0** to display the System Console Index (INDEX0) frame. If SERVMODE ON is indicated, see "When SERVMODE ON Is Indicated" on page 3-9.
3. Enter **F CONFIG** to display the Configuration frame and note the configuration status (POWER ON RESET Required or POWER ON RESET Complete is indicated).
4. Enter **F PA** to call the problem analysis facility (see "Using the Problem Analysis Facility" on page 2-16). Attempt to identify a failure.
5. Attempt to recover the processor unit. If service is required, follow local procedures for reporting problems.

Note: The system console supports reconfiguration of the processor unit hardware (including channel paths), but does not support I/O device reconfiguration.

Recovery Actions

Indications

The following problem indications appear at the system console unless otherwise noted. A hardware failure is indicated by one or more of the following:

- *Check* indicator lighted on System Power panel
- Problem indicated by the PA facility
- Priority message
- Threshold exceeded message
- Reference code (REFCODE)
- SCP messages at the master console

Overview of Major Recovery Actions

If the operator must recover the system from a failure, the operator should attempt to do so with the least possible disruption to the installation's operations. The most *appropriate* recovery action is the most effective *and* the least disruptive. The following is a list of the major recovery actions, ranked from the least to the most disruptive:

- Program restart
- SCP configuration commands
- Interface reset (IFRST)
- System reset (SYSRESET)
- IPL of the SCP
- System IML (SYSIML)
- Power-on reset
- Switch off and switch on power to the processor unit

Other major recovery actions (not ranked above) include the following:

- Warm start of the processor controller

Program Restart

A program restart provides recovery for loops and some wait states. The area affected includes the program that is running and the processor that is executing the program. The operator resumes or cancels the unit of work on the restarted processor. See "Procedure for Program Restart" on page 3-10.

SCP Configuration Commands

MVS/ESA provides commands that allow the operator to reconfigure system resources, but these commands are rarely necessary for recovery because MVS/ESA provides automatic recovery facilities. Other SCPs may provide less automatic recovery capability.

Interface Reset (IFRST)

The IFRST command resets individual channel paths or all channel paths. Any outstanding reserves are lost on reset channel paths. See "IFRST" on page B-4.

System Reset (SYSRESET)

The SYSRESET command performs the following:

- Clears all pending interruptions
- Resets the channel subsystem
- Resets all configured processors

This publication often recommends that the operator perform an IPL of the SCP instead of a SYSRESET because an IPL first performs a SYSRESET.

IPL of the SCP

If the operator decides that an IPL is the most appropriate recovery action, the operator should consider performing an instruction trace (if a loop is suspected) or a stand-alone dump (if the cause of the problem is unknown) before performing the IPL. See "Procedure for Instruction Trace" on page 3-11, "Procedure for Stand-Alone Dump" on page 3-12, and "Procedure for IPL of the SCP" on page 3-13.

An IPL of the SCP performs all system reset (SYSRESET) functions.

System IML (SYSIML)

The SYSIML command performs a basic reset and initialization of the processor unit that is similar to a power-on reset. SYSIML does not reset the processor controller.

A SYSIML performs the following:

- Initializes all configured processors
- Initializes the channel subsystem
- Validates and clears central storage
- Initializes the hardware system area

This publication recommends that the operator perform a power-on reset instead of a SYSIML. When a SYSIML (or power-on reset) is completed, an IPL of the SCP is necessary.

Power-On Reset

A power-on reset performs a basic reset and initialization of the processor unit and allows manual reconfiguration of the processor unit hardware. Power-on reset does not reset the processor controller.

A power-on reset performs all SYSIML functions and the following:

- Switches on the processor unit during the power-on sequence
- Performs additional processor unit resets
- Clears expanded storage
- Resets the TOD clocks

  If Enable Automatic TOD Setting is selected on the SYSDEF frame, the TOD clocks are automatically set from the battery-operated clock (BOC) in the processor controller. See "System Definition (SYSDEF) Frame" on page 3-15.

If the power-on reset is performed after the power-on sequence is complete, the power-on reset does the processor unit resets only and does not power on any processor unit hardware. See "Procedure for Power-On Reset or Deselecting Hardware" on page 3-14.

Power-Off and Power-On of the Processor Unit

In rare situations, a power-off and power-on sequence of the processor unit is the only appropriate recovery action. Such a recovery action is the only way to completely reset the processor unit. See Figure 8-19 on page 8-37.

Warm Start of the Processor Controller

A warm start (IPL) of the processor controller is an automatic function and rarely requires a manual procedure by the operator.

When the processor controller senses a failure which does not cause the machine to enter IOSP Concurrent Maintenance Mode (See "IOSP Concurrent Maintenance Mode" on page 8-30), a warm start is initiated. If, for some reason, warm start fails, the operator may attempt recovery by forcing a warm start. See "Forced Warm Start of the Processor Controller" on page 8-32.

When SERVMODE ON Is Indicated

When SERVMODE ON is indicated, the configuration is controlled from the service console. SERVMODE OFF must be indicated for the operator to control the configuration from the system console. The console that owns the configuration displays processor unit status on line 24.

SERVMODE OFF should be indicated when the processor unit is in normal operation. If the operator has any difficulty with manual operation of the system, or before the operator attempts to change the configuration of the system from the system console, the operator should check the status of SERVMODE (service mode).

Use the following procedure to check the status of service mode and to turn off service mode if SERVMODE ON is indicated:

1. Go to the system console.
2. Enter **F INDEX0** to display the the System Console Index frame.
3. If SERVMODE OFF is indicated, no further action is necessary. If the operator was directed to this procedure from another procedure in this publication, return to that procedure.

   If SERVMODE ON is indicated, go to step 4.
4. Go to the service console.
5. Enter **F INDEX0** to display the the Service Console Index frame.
6. Enter **SERVMODE OFF**.
7. A message may appear that requests service information (*Direct File Create Application*). If the message appears, press the End key to clear the message.
8. Go to the system console.
9. Priority message 39104 may appear at the system console, indicating SERVICE CONFIGURATION IS INACTIVE. If this priority message appears, press the Enter key at the system console to clear the priority message.
10. Enter **F INDEX0** to display the the System Console Index frame.
11. Press the Refresh key.
12. The INDEX0 frame should indicate SERVMODE OFF. If the operator was directed to this procedure from another procedure in this publication, return to that procedure.

Procedures from the SYSCTL Frame

The following topics provide procedures to be performed from the SYSCTL frame.

Procedure for Program Restart

A program restart is a recovery procedure for restartable wait states or program loops in a processor (CP). Use the following procedure to perform a program restart from the SYSCTL frame:

1. Go to the system console.
2. Enter **F SYSCTL** to display the SCP Manual Control frame (Figure 3-3).
3. Enter **Tn**, where n is the ID of the processor that is to be the target.

   The current target processor is highlighted on line 24.
4. Enter **C1** to initiate a restart.
5. If MVS/ESA is active, a prompt asks the operator to enter a restart reason (0 or 1).

   Restart reason **0** causes MVS/ESA to display message IEA500A at the master console. Go to the master console and reply **RESUME** to continue the interrupted unit of work, or **ABEND** to cancel the current unit of work.

   Restart reason 0 may be used:

   - When MVS/ESA is in a restartable disabled wait state.
   - When a unit of work is suspected of causing a loop. The repeated use of the restart function using reason 0 (and a response of RESUME to master console message IEA500A) may be useful in identifying the cause of an enabled loop.

   Reason 0 is the default restart reason when the RESTART service language command is used.

   Restart reason **1** causes MVS/ESA to interrupt the current unit of work on the restarted processor, perform software diagnostic tests to provide data concerning the state of the system, and, if possible, resume the interrupted unit of work.

   Warning: Restart reason 1 should be used only under the direction of a system programmer and only if a system problem is not related to the current unit of work. MVS/ESA attempts to diagnose and repair the system problem.

The message *CPn RESTARTED* is displayed on line 22 of the system console (where n is the ID of the affected processor).

```
                                                             dd mmm yy  19:47:07
                           SCP Manual Control (ESA/390 Mode)         (SYSCTL)

    A= INITIALIZE SYSTEM CONTROL PROGRAM              T= TARGET CP
   -> 1. Load Unit Addr : 0150                       -> 0. CP1
      2. Load Parm(a/n) : ________                      1. CP2
      3. Initiate SCP Initialization

    B= INITIALIZE STANDALONE DUMP                     R= RATE CONTROL
      Auto Store Status =  Off                       -> 1. Process
   -> 1. Load Unit Addr : 0840                          2. I-Step
      2. Initiate Standalone Dump  ------------ RESTART REASONS --------------
                                   0 - ABEND CURRENT PROGRAM
    C= RESTART                     1 - PERFORM MVS SYSTEM DIAGNOSTICS
   -> 1. Initiate Restart
         Reason(A/N) : _

    D= INSTRUCTION ADDRESS TRACE
      1. Start Address Tracing

 COMMAND ==>
 SYSTEM 1         1 .... 2 ....                            PSW0 Operating
 ________________________________________________________________________________
         A:a MODE
```

Figure 3-3. Program Restart from the SYSCTL Frame

Procedure for Instruction Trace

The instruction trace facility can be useful in tracing disabled loops before performing a stand-alone dump. Use the following procedure to perform an instruction trace from the SCP Manual Control frame:

1. Go to the system console.
2. Enter **F SYSCTL** to display the SCP Manual Control frame (Figure 3-4).
3. Enter **Tn**, where n is the ID of the processor that is to be the target.

   The current target processor is highlighted on line 24.
4. Enter **D1** to begin the instruction trace.

   Each processor is instruction traced in turn, beginning with the target processor. To stop the trace at any time, press the Reset key and then the Cncl key.
5. When the instruction trace is stopped or completed, perform one of the following steps:
   - If the SCP is MVS/ESA, go to the master console and use the MVS/ESA *DUMP* command to send the instruction trace to a DASD.

     For example, if a problem is encountered with a specific job and the operator only wants to perform an instruction trace and then cancel the job, the operator should use the *DUMP* command because it allows MVS/ESA to remain active.

     Note: The instruction address trace data is stored at the beginning of the dump after the heading, "Console Initiated Loop."
   - Perform a stand-alone dump. Go to "Procedure for Stand-Alone Dump" on page 3-12.

```
                                                    dd mmm yy  19:47:07
                          SCP Manual Control (ESA/390 Mode)        (SYSCTL)

     A= INITIALIZE SYSTEM CONTROL PROGRAM              T= TARGET CP
    -> 1. Load Unit Addr : 0150                       -> 0. CP1
       2. Load Parm(a/n) : ________                      1. CP2
       3. Initiate SCP Initialization

     B= INITIALIZE STANDALONE DUMP                     R= RATE CONTROL
       Auto Store Status =  Off                       -> 1. Process
    -> 1. Load Unit Addr : 0840                          2. I-Step
       2. Initiate Standalone Dump

     C= RESTART
       1. Initiate Restart

     D= INSTRUCTION ADDRESS TRACE
    -> 1. Start Address Tracing


 COMMAND ==>
 SYSTEM 1          1 .... 2 ....                          PSW0 Operating
 ________________________________________________________________________
         A:a MODE
```

Figure 3-4. Instruction Trace from the SYSCTL Frame

Procedure for Stand-Alone Dump

Use the following procedure to perform a stand-alone dump from the SCP Manual Control frame:

1. Go to the system console.
2. Enter **F SYSCTL** to display the SCP Manual Control frame (Figure 3-5).
3. Check the B1 field (Load Unit Addr). To change the load address: enter **B1**, wait for the cursor, and enter the new load address.
4. Enter **Tn**, where n is the ID of the processor that is to be the target.

   The current target processor is highlighted on line 24.

   If the desired target processor is in the check-stop state (see "Processor Unit Status (Line 24)" on page 8-25), select a different target processor. If only one processor is available and it is in the check-stop state, enter **SYSRESET** (*do not enter SYSRESET Clear*). If only one processor is available, it is in the check-stop state, and it does not reset as a result of SYSRESET, the stand-alone dump program cannot be loaded.
5. If Auto Store Status = Off is displayed, enter **STORSTAT CPn**, where n is the ID of the target processor.

   If Auto Store Status = On is displayed and the target processor is in the manual or running state, store status is automatically performed when the stand-alone dump is initiated.
6. Enter **B2** to initiate the stand-alone dump.
7. When the dump is completed, IPL the SCP. Use the "Procedure for IPL of the SCP" on page 3-13.

```
                                                      dd mmm yy  19:47:07
                       SCP Manual Control (ESA/390 Mode)        (SYSCTL)

   A= INITIALIZE SYSTEM CONTROL PROGRAM               T= TARGET CP
  -> 1. Load Unit Addr : 0150                        -> 0. CP1
     2. Load Parm(a/n) : ________                       1. CP2
     3. Initiate SCP Initialization

   B= INITIALIZE STANDALONE DUMP                      R= RATE CONTROL
     Auto Store Status =   On                        -> 1. Process
     1. Load Unit Addr : 0840                           2. I-Step
  -> 2. Initiate Standalone Dump

   C= RESTART
     1. Initiate Restart

   D= INSTRUCTION ADDRESS TRACE
     1. Start Address Tracing


COMMAND ==>
SYSTEM 1         1 .... 2 ....                            PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 3-5. Stand-Alone Dump from the SYSCTL Frame

Procedure for IPL of the SCP

Use the following procedure to perform an initial program load (IPL) from the SCP Manual Control frame:

1. Go to the system console.
2. Enter **F SYSCTL** to display the SCP Manual Control frame (Figure 3-6).
3. Check the A1 (Load Unit Addr) and A2 (Load Parm) fields.

   To change the load unit address: enter **A1**, wait for the cursor, and enter the new address.

   To change the load parameter: enter **A2**, wait for the cursor, and enter the new parameter.

   Note: If the SCP is MVS/ESA, the load parameter consists of 3 hexadecimal digits in the form xyy, where x is the NUCLEUS ID and yy is the IOCONFIG ID (the default is 100). The IOCONFIG ID=yy is specified during the execution of MVSCP which defines the I/O configuration to MVS/ESA.
4. Enter **Tn**, where n is the ID of the processor that is to be the target.

   The current target processor is highlighted on line 24.
5. Enter **A3** to IPL the SCP from the target processor.

```
                                                              dd mmm yy  19:47:07
                          SCP Manual Control (ESA/390 Mode)         (SYSCTL)

    A= INITIALIZE SYSTEM CONTROL PROGRAM              T= TARGET CP
   -> 1. Load Unit Addr : 0150                       -> 0. CP1
      2. Load Parm(a/n) : ________                      1. CP2
      3. Initiate SCP Initialization

    B= INITIALIZE STANDALONE DUMP                     R= RATE CONTROL
      Auto Store Status =  Off                       -> 1. Process
   -> 1. Load Unit Addr : 0840                          2. I-Step
      2. Initiate Standalone Dump

    C= RESTART
      1. Initiate Restart

    D= INSTRUCTION ADDRESS TRACE
      1. Start Address Tracing


COMMAND ==>
SYSTEM 1          1 ..W. 2 .MW.                      PSW0 000A0000 00000CCC
________________________________________________________________________________
        A:a MODE
```

Figure 3-6. IPL Procedure from the SYSCTL Frame

Procedure for Power-On Reset or Deselecting Hardware

If the SCP is not active, the operator should deselect processor unit hardware by using the following procedure:

1. Go to the system console.
2. Enter **F SYSDEF** to display the System Definition frame. Make sure that the battery-operated clock (BOC) in the processor controller has the correct local time and that B2 is selected. The TODs are then set from the BOC during power-on reset.

   See "System Definition (SYSDEF) Frame" on page 3-15.

   To check the BOC time, go to the system console, press the Refresh key, and look in the upper right corner of any frame.
3. Enter **F CONFIG** to display the Configuration frame (Figure 3-7).
4. If POWER ON RESET Complete is indicated, enter **A1** to release the configuration. When prompted, enter **X1** to confirm the request.

   When POWER ON RESET Required is indicated:

   - Go to step 5 to deselect failed hardware. Or,
   - Go to step 7 to perform only a power-on reset (POR).
5. Enter the selection number (ID) of the failed hardware.

   For example, enter D1 to deselect processor CP1.
6. Verify the configuration.
7. Enter **A2** to perform a power-on reset.
8. IPL the SCP. See "Procedure for IPL of the SCP" on page 3-13.

```
                                                      dd mmm yy 19:47:07
                         Configuration                          (CONFIG)

 POWER ON RESET             CURRENT CONFIGURATION        ACTIVE IOCDS
    Complete                                              A4/IMSPROD

 A= ACTION                       D= PROCESSORS        F= STORAGE (TOTAL=1024MB)
   1. Release                 -> 1. CP1                   CENTRAL    EXPANDED
   2. Power on reset             2. CP2                1.  32MB        992MB
   3. Maximum Installed                                2.  48MB        976MB
   4. Select IOCDS Mgmt.                               3.  64MB        960MB
 B= CP MODE                                         -> 4.  96MB        928MB
-> 1. ESA/390 tm                                       5. 128MB        896MB
   2. Not Used                   E= VECTORS            6. 192MB        832MB
   3. Not Used                -> 1. VE1                7. 256MB        768MB
   4. LPAR                       2. VE2

 C= I/O TRACE
   1. Type(hex): ________                             @@@@ CHPID STATUS @@@@
      Units: __                                       Online: 32 Offline: 16
ESA/390 is a trademark (tm) of the IBM Corporation.

COMMAND ==>
SYSTEM 1          1 .... 2 ....                             PSW0 Operating

        A:a MODE
```

Figure 3-7. Configuration (CONFIG) Frame (ESA/390 Mode, 1GB Storage)

System Definition (SYSDEF) Frame

The System Definition (SYSDEF) frame provides system identification information and five function fields that enable the operator to:

- Select the maximum installed configuration.
- Set the battery-operated clock in the processor controller.
- Allow the processor controller to automatically set the time-of-day (TOD) clocks from the battery-operated clock during power-on reset.
- Select the name of the frame to be displayed when power-on reset is complete.
- Assign or change the system name.
- Set the load information required for an automatic IPL.
- Set the problem-report (RSF call) initiation method.

A = CONFIGURATION

This field allows the operator to select the maximum configuration. Selecting A1 on the SYSDEF frame is the same as selecting A3 on the CONFIG frame (Figure 3-7).

B = CLOCKS

To check the BOC time, press the Refresh key and look in the upper right corner of the SYSDEF frame.

Select one of the following:

- Enter **B1** to set the battery-operated clock (BOC). Enter the local date and time, and then enter **X1** to confirm or **B1** to cancel. Setting the BOC results in a warm start of the processor controller. The warm start begins immediately after a value is confirmed.

  Note: The warm start is not disruptive; setting the BOC may be performed concurrently with normal system operation, but the processor controller is not available until the warm start is completed (for example, the system console cannot be used).

- Enter **B2** (Enable Automatic TOD Setting) to enable automatic setting of the time-of-day (TOD) clocks from the BOC during power-on reset. The BOC is set to local time. If desired, an offset value and a direction are also entered to automatically set the TOD clocks to GMT.

  Notes:

  1. B2 must be selected before a power-on reset is performed; the TODs are set from the BOC only during power-on reset.
  2. If the SCP also uses a local or GMT+offset value, the system programmer may need to update the SCP when SYSDEF values are changed to generate correct time stamps on system output and logs.

C = SYSTEM NAME

Selecting C1 on the SYSDEF frame allows the operator to assign or change a system name (up to 8 alphanumeric characters).

D = ACTION FOLLOWING POWER ON RESET

Select one of the following:

- Enter **D1** (New Frame Name) to specify the frame to be displayed following a power-on reset. If the specified frame is OPRCTL or SYSCTL, the load information from the D2 fields may be used to perform an automatic IPL. If any other frame is specified, an automatic IPL is not performed.
- Enter **D2** (Load Information) to add or modify load information for the automatic IPL following a successful power-on reset (when the D1 field is OPRCTL or SYSCTL).

E = PROBLEM REPORT METHOD

Select one of the following:

- Enter **E1** (Initiate by PA Only) to initiate manual RSF calls from the PA facility only.
- Enter **E2** (Initiate by PA or RSF) to initiate manual RSF calls from the PA facility or from the command line (by entering F RSF).

F= ACTION DURING SYSTEM CHECKSTOP

Enter **F1** (I/O Interface Reset) to initiate I/O Interface Reset, which allows I/O shared between systems to be freed if a system checkstops.

```
                                                          dd mmm yy hh:mm:ss
                              System Definition                     (SYSDEF)

MACHINE TYPE: nnnn      MODEL: nnn       D= ACTION FOLLOWING POWER ON RESET
SERIAL NUMBER: nnnnn                        1. New Frame Name(A/N) :________
SYSTEM EC LEVEL: nnnnnnnn                   2. Load Information(Hex) :
VERSION ID: xnnn                               MODE        ESA/390 tm
                                               Load Addr: ____
 A= CONFIGURATION (Forces POR Required)        Parameter: ________
   1. Maximum Installed                        Target CP: _         _
                                            (Above not used with LPAR POR)
 B= CLOCKS (B1 forces PC Warm Start)           I/O Pwr Seq Delay: __:__
   1. Set Date : __ ___ ____      day
          Time : __ : __                    Automatic Load: Not Active
   2. Enable Automatic TOD Setting        E= PROBLEM REPORT METHOD
      Zone offset:     __ : __ (hh:mm)  -> 1. Initiate by PA Only
      Zone direction: ____ (East/West)      2. Initiate by PA or RSF
                                          F=RECOVERY ACTIONS
 C= SYSTEM NAME                             1. I/O Interface Reset
   1. Set Name : ________                   2. Set Recovery Time: ___
ESA/390 is a trademark (tm) of the IBM Corporation.

COMMAND ==>
```

Figure 3-8. System Definition (SYSDEF) Frame

Chapter 4. Power and Logic

This chapter discusses the following topics:

Power Problem Analysis Using the PA Facility

If the operator calls the PA facility and the system has a power problem, the PROBLEM ANALYSIS — Processor Complex Conditions frame, (PA)-00, is automatically displayed (Figure 4-1).

Processor Complex Conditions

```
                                                               dd mmm yy 19:47:07
            PROBLEM ANALYSIS - Processor Complex Condition(s)        (PA)-00

*******************************************************************************
*                                                                             *
*                         <POWER-STATUS-MESSAGE>                              *
*Use the R1 selection below to resolve condition(s) before proceeding with PA.*
*                                                                             *
*******************************************************************************






  R= CALL OR RETURN TO
    1. Power Problem Resolution
    2. Service Request (RSF; Exit PA)


COMMAND ==>
SYSTEM 1                                                     PSW
________________________________________________________________________________
        A:a MODE
```

Figure 4-1. PROBLEM ANALYSIS — Processor Complex Conditions

See Figure 4-1 and Figure 4-2 on page 4-3. Note the following:

- If Power Status Incomplete is indicated in the <POWER-STATUS-MESSAGE> field, the **R2** selection (in the above figure) will not be displayed. The operator enters R1 to display the Recovery Actions frame, (PA)-01 (Figure 4-3 on page 4-4). Recovery Actions has a companion frame, also numbered (PA)-01, called Service Actions.
- If POWER ON RESET Required is indicated in the <POWER-STATUS-MESSAGE> field, the operator enters R1. The CONFIG frame is displayed and the operator then performs a power-on reset.
- If a processor unit reset is required and POWER ON RESET Complete is indicated, the operator enters R1. The OPRCTL frame is displayed and the operator then performs a SYSIML (or goes to the CONFIG frame, releases the configuration, and performs a power-on reset).

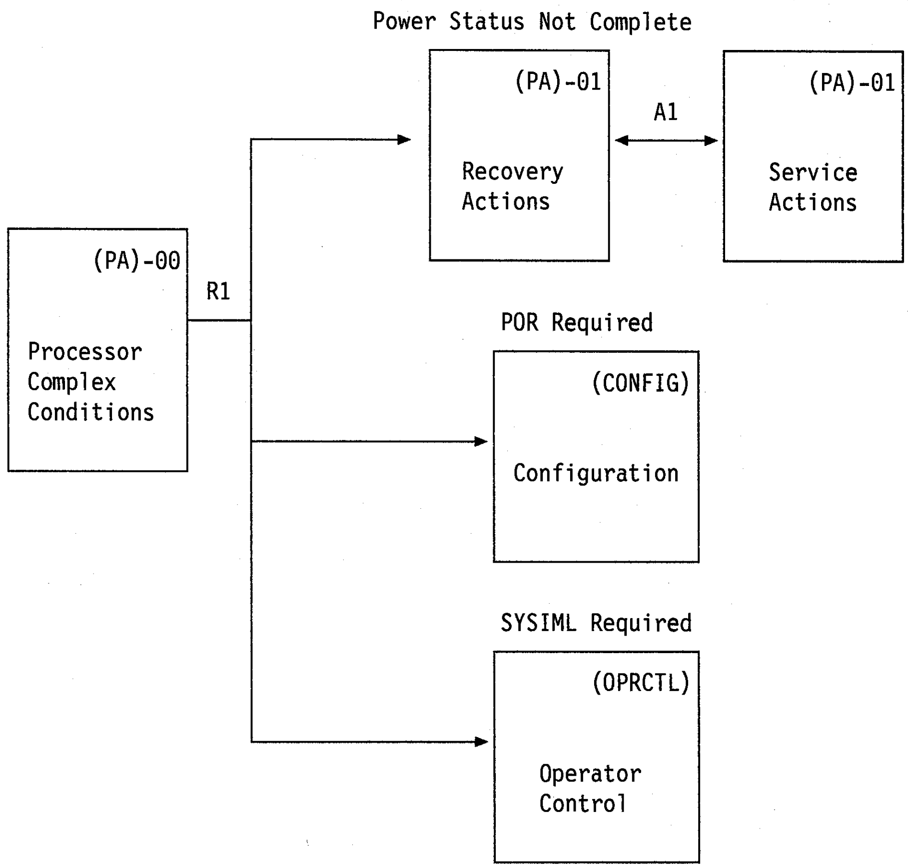


Figure 4-2. Power Problem Analysis

Power Status Not Complete

The PROBLEM ANALYSIS — Power Status Not Complete frame (Figure 4-3) identifies any incomplete power boundaries. The list on page 4-5 shows the corresponding processor unit hardware for each of the power boundary identifiers.

Go to "Power Recovery Actions" on page 4-6 and perform the appropriate recovery action.

Notes:

1. A power failure in one of the boundaries will cause all of the power boundaries to get powered off.
2. If the power boundaries are powered off (for example, by a failure) a power-on reset does not power the boundaries on. Power-on the power boundaries before attempting a power-on reset.
3. Identify the failing power boundary. If the failing power boundary is not associated with CP2, a vector, or a channel group, you will not be able to recover the processor unit. If the failing boundary is associated with one of these boundaries, power-on all the other power boundaries and then deselect the affected hardware from the CONFIG frame (see "Power Recovery Actions" on page 4-6).

   Note: If the failed power boundary is associated with CP1, call your IBM service representative to repair the problem.

   - You will not be able to recover from a CP1 power boundary failure without repairing the problem. Included in the CP1 power boundary is processor 1 (CP1), the System Control Element (SCE), and the Channel Control Element (CCE)).

```
                                                        dd mmm yy 19:47:07
                 PROBLEM ANALYSIS - Power Status Not Complete        (PA)-01

  PROBLEM: Power Status Not Complete

  STATUS:  The following Power Boundaries are incomplete:
  <POWER-BDY-LIST>

  RECOVERY ACTIONS:
  <PAPOWR-RECOVERY-ACTIONS>


   A= ACTION
     1. Display Service Actions

   R= CALL OR RETURN TO
     1. Service Request (RSF; Exit PA)
     2. INDEX0 (Exit PA)


COMMAND ==>
SYSTEM 1                                               PSW
________________________________________________________________________________
        A:a MODE
```

Figure 4-3. PROBLEM ANALYSIS — Power Status Not Complete

The following list shows the correspondence between the boundary name as displayed by the PA facility, the hardware in the processor unit to which the boundary belongs, and the facility name by which the boundary was called in previous engineering levels (in parentheses). The processor unit has one side (side 0).

Boundary	Associated Hardware
PWRCOMn	ac Power Compartment PWRCOMn, where n is: • 1 or 2; side 0 (A_PPCn)
CHNGRPn	Channel group n, where n is: • 1 or 2; side 0 (ACHNLGn or ACHNIFn)
CPn	Processor CPn, where n is: • 1 or 2; side 0 (A_CPn)
IOPSn	I/O power sequencer IOPSn, where n is: • 0, side 0 (A_IOPS)
STORLGn	Storage Logic, where n is: • 0, side 0 (A_STORL)
STORARn	Storage Array, where n is: • 0, side 0 (A_STORA)
VEGRPn	Vector group, where n is: • 0, side 0 (AVECTOR)

Power Recovery Actions

A power failure is indicated, at the system console unless otherwise noted, by one or more of the following:

- *Check* indicator is lighted on the System Power panel
- Power problem indicated by the PA facility.

  See "Power Status Not Complete" on page 4-4.
- Power priority message

The following chart provides recovery actions for power failures:

SCP Active	It is not possible to continue processing. Perform the following recovery action (SCP not active).
SCP Not Active	Allow the service representative to repair the processor complex, or perform the following steps: 1. Switch off and switch on power to the processor controller. • If the power-on sequence succeeds, perform a power-on reset. • If the power-on sequence does not succeed, identify the failing boundary. a. Go to the Power Control frame and sequentially power-on all boundaries except the failing boundary until all possible boundaries are powered-on. **Note:** If the failing power boundary is not associated with CP2, a vector, or a channel group, you will not be able to recover the processor controller (Call your IBM service representative). b. If all the power boundaries power-on except CP2, a vector, or a channel group, deselect the affected hardware from the CONFIG frame and perform a power-on reset. 2. If the power-on reset completes, IPL the SCP. Schedule service for the failed power boundary. 3. If the power-on reset does not complete, call your IBM service representative for necessary repairs.

Power Control Frame

Powering on or off a boundary through the Power Control frame can only be done from the local service console. This is limited to the Port A console.

The Power Control (PWRCON) frame is used to display the power boundaries in the CEC and to enable service personnel to:

1. Switch on power to a single power boundary.
2. Switch off power to a single power boundary.
3. Switch off all power boundaries installed in the processor unit except the I/O power sequencer (IOPS).
4. Recycle the channel interface (6 volt supplies).
5. Switch on the I/O Power Sequencer (if present).
6. Switch off the I/O Power Sequencer (if present).
7. Switch off all power boundaries installed in the processor unit including the I/O Power Sequencer.

Any functional element or feature that is not installed will not be displayed on the PWRCON frame. The remaining functional elements and features will compress and be renumbered.

Frame Invocation

To invoke this frame, enter: **F PWRCON** or select it from the Manual Service Control and Display Index (MANSVC) frame.

```
                                                   dd mmm yy  hh:mm:ss
                             Power Control               <PWRCON>

  A= POWER BOUNDARIES (- = OFF, AC = AC Volt Pres, + = ON)
+   1. AC Pwr Compartment 1        AC 11. Channel Interface 2
+   2. AC Pwr Compartment 2
+   3. CP1/SCE/CCE
+   4. CP2
+   5. Vector
AC  6. Storage Logic
AC  7. Storage Array
AC  8. Channel Logic 1
AC  9. Channel Logic 2
AC 10. Channel Interface 1

  B= POWER COMMANDS
    1. Power ON one boundary           5. Power ON I/O Power Sequencer
    2. Power OFF one boundary          6. Power OFF I/O Power Sequencer
    3. Power OFF all boundaries        7. Power OFF all boundaries & I/O
    4. Recycle channel interface


COMMAND ==>
```

Figure 4-4. PWRCON Frame with I/O Power Sequencer Installed

Displayed Data

Power Status Indicator Definitions

For the Normal Case

+	dc voltage is present on the boundary.
AC	ac voltage is present on the boundary. dc voltage is not provided or is not in steady state (all supplies available) dependent on the status of the Power Thermal Controller (PTC) and commands in progress.
-	Neither dc voltage or ac voltage is present.

For the Abnormal Case

- Disabled Access

  When the PWRCON frame is invoked from a console that is either remote or not in Service Mode, some commands are disabled. An x appears next to the selections in this case.

- I/O Power Sequencer Not Present

  B selection commands relating to I/O Power Sequencer are blanked out, when the I/O Power Sequencer is not present.

Function Fields

PWRCON Frames and Command Options

The following section describes the PWRCON displays including the valid user command selections,

A = POWER BOUNDARIES

This is a list of the Power Boundaries installed in the CEC. It allows the user to select a boundary to power on or off. When a boundary is selected, an arrow will appear next to that boundary. If a selected boundary is selected again, the result is to de-select it and to turn off the arrow.

Only one selection is permitted at a time. A boundary must be selected before or at the same time as selecting the "Power ON one boundary" or "Power OFF one boundary" command.

After any operation, the column left of the boundary will show the power state of each boundary. The possible power states are "+", "AC", and "-". If a power boundary is not installed, it will not be displayed in the selection group.

B= POWER COMMANDS

Note: The Power Control frame must be displayed on port A or Alternate port A for the B-selection items to be enabled. Note that a locally attached console is not necessarily attached to port A or Alternate port A.

B1 The Power On One Boundary command will cause the PTC to power the boundary in the selected power boundary, with the appropriate logic resets being applied. The power boundary must be selected before or at the same time this command is issued.

B2 The Power Off One Boundary command will cause the PTC to remove power from the selected boundary. The power boundary must be selected before or at the same time this command is issued.

B3 The Power OFF All Boundaries command will cause the PTC to switch off any boundaries that are currently on. This does not include the I/O Power Sequencer (if present). This command does not require or allow any other selections.

B4 The Recycle Channel Interface command will toggle the 6 Volt channel interface supplies, powering them off, then on. This command does not require or allow any other selections.

B5 The Power On I/O Power Sequencer command will cause PTC to power on the I/O Power Sequencers. This command does not require or allow any other selections.

B6 The Power Off I/O Power Sequencer command will cause PTC to power off the I/O Power Sequencers. This command does not require or allow any other selections.

B7 The Power Off All boundaries & I/O command will cause the PTC to power off any boundaries which are currently powered and the I/O power sequencers. This command does not require or allow any other selections.

Note: At the completion of any of the operations, the power state of all installed boundaries will be checked and displayed next to each boundary selection.

Related Function Keys

End Selects the Manual Service Control and Display Index (MANSVC) frame.

Refresh Redisplays the frame with current data.

Logic Service Adapter Recovery Actions

A logic service adapter failure is indicated, at the system console unless otherwise noted, by one or more of the following:

- Logic service adapter threshold exceeded message
- Logic service adapter problem indicated by the PA facility
- Reference code:

ID	**Location**
1A00xxxxxxxx	LSA0, side 0

The following chart provides recovery actions for logic service adapter (LSA) failures on the processor controller.

SCP Active	It is not possible to continue processing. Perform the following recovery action (SCP not active).
SCP Not Active	Allow the service representative to repair the processor unit or perform a power-on reset: • If the power-on reset completes, IPL the SCP. Service may be deferred, but processing involves risk because the logic service adapter may fail again. **Note:** If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again. • If the power-on reset does not complete, allow the service representative to repair the processor unit.

Logic Support Station Recovery Actions

The operator should handle a logic support station (LSS) failure as a failure of the hardware with which the failed logic support station is associated. The operator can use the reference code for the failure to enter the list below (see "Using a Reference Code" on page 2-20) and go to the appropriate recovery action topic. Or, the operator can use the ID of the failed LSS to enter the list shown at the bottom of this page and identify the affected hardware.

The following indications appear at the system console unless otherwise noted. A logic support station failure is indicated by one or more of the following:

- Logic support station threshold exceeded message
- Logic support station problem indicated by the PA facility
- Reference code:

ID	Go to:
18xxxxxxxxxx	"Vector Facility Recovery Actions" on page 5-6
1Cxxxxxxxxxx	"Processor Recovery Actions" on page 5-4
1Dxxxxxxxxxx	"Channel Subsystem Recovery Actions" on page 7-6
1Exxxxxxxxxx	"System Control Element Recovery Actions" on page 6-4
1Fxxxxxxxxxx	"Channel Subsystem Recovery Actions" on page 7-6

The following list indicates the hardware that is associated with each LSS:

LSS	Associated Hardware
00	Processor CP1, side 0
01	Processor CP2, side 0
02	System control element SCE0, side 0
03	Channel control element CCE0, side 0
04	All channel paths, side 0
05	All vector facilities, side 0
07	System activity display (SAD), side 0

Note: If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again.

Chapter 5. Processors and Vector Facilities

This chapter discusses the following topics:

Processor Recovery When MVS/ESA Is Active

When active, MVS/ESA automatically handles the recovery from processor and related failures.

Alternate Processor Recovery

When a processor fails, it sends a malfunction-alert (MFA) signal to the other online processors and enters the check-stop state. MVS/ESA begins alternate processor recovery (ACR) on the first processor that receives the MFA. ACR takes the processor in the check-stop state offline and frees any system resources that were held by the processor that failed. ACR allows the SCP to continue operating on the other processors. When ACR is completed, the operator is notified at the master console.

MVS/ESA may also use ACR to recover when a failure causes a processor to send enough machine checks to exceed a predefined threshold. The operator may also initiate ACR in response to an MVS/ESA excessive spin loop message.

Spin Loops

If a processor needs a system resource held by another processor, the processor that needs the resource may enter a *spin loop*. Spin loops of short duration are normal. If the system resource is held beyond the threshold established for spin loops, an *excessive spin loop* (spin loop time-out) occurs. In an excessive spin loop, the processor that needs the held system resource is called the *detecting* processor and the processor that holds the system resource is called the *failing* processor (although excessive spin loops are rarely caused by processor hardware failures).

Recovery from an Excessive Spin Loop

See *MVS/ESA Planning: Recovery and Reconfiguration* for a detailed discussion of spin loop handling.

MVS/ESA: MVS/ESA provides the capability of automatically recovering from excessive spin loop conditions. This reduces operator intervention and the amount of time required to recover. If the system programmer chooses to handle excessive spin loops by means of manual recovery, MVS/ESA handles operator notification as in MVS/XA (described in the following topic).

MVS/XA: An excessive spin loop requires operator action to maintain an active SCP. MVS/XA notifies the operator of an excessive spin loop by sending message IEE331A to the master console or its alternate.

If MVS/XA is not able to communicate with the operator by means of the master console or its alternate, and the SCPMSG facility is available, MVS/XA sends the message to the system console and sounds the alarm (see "SCP Message Facility" on page 2-12).

If MVS/XA is not able to communicate with the operator by means of the master console or its alternate, and the SCPMSG facility is not available, MVS/XA loads a 09x restartable wait state (see "Recovery from a 09x Wait State" on page 5-3).

Recovery from a 09x Wait State

The first symptoms of a 09x wait state may include one or more of the following:

- Disabled wait priority message is displayed at the system console (and alarm sounds).
- Message display activity stops on master console and JES3 console.
- SAD indicates one processor at 0% utilization and all other processors at 100% utilization.

MVS/ESA loads the 09x wait state into the *detecting* processor. To recover from a 09x wait state, the operator may continue the spin loop by restarting (enter **RESTART CPn**) the detecting processor. If the restart is not successful or the 09x wait state occurs again, the operator should initiate ACR from the system console by using the following procedure:

1. Go to the system console.
2. Enter **F INDEX0** to display the Index frame.
3. Enter **STOP** to stop all processors (manual state).
4. Press the View Log key and look at the priority message indicating that the detecting processor is in a disabled wait state.
5. Identify the failing processor by looking at the logical ID (4n, where n is the ID of the failing processor) in byte 5 (the sixth byte) of the 09x wait state PSW. For example, if CP1 (the detecting processor) is in a 091 wait state because of a resource held by CP2 (the failing processor), the wait state PSW for CP1 is 000A0000 00**420091**.
6. Press the End key to return to the INDEX0 frame.
7. Enter **F ALTCP** to display the Alter / Display CP frame. The cursor is automatically positioned at the CP field (upper right corner).
8. Enter the ID of the failing processor in the CP field.
9. Enter **A1 B2** to alter real storage.
10. Enter **30C** in front of the prompt, Address (Hex) = >.
11. Move the cursor to location 30E and enter **AA**.
12. Enter **START CPn**, where n is the ID of a processor, for each configured processor except for the failing processor and the detecting processor.
13. Enter **RESTART CPn**, where n is the ID of the detecting processor.
14. Go to the master console.
15. After ACR processing is complete, enter **CF CPU(n),ONLINE**, where n is the ID of the failing processor.

If the 09x wait state occurs again, repeat this procedure and leave the failing processor offline. Follow local procedures for reporting problems.

Processor Recovery Actions

Depending on the model and operating configuration, the following topics provide recovery actions for processor (CP) failures.

The following indications appear at the system console unless otherwise noted. A processor failure is indicated by one or more of the following:

- Processor threshold exceeded message
- Processor check-stop message
- Processor problem indicated by the PA facility
- Reference code:

ID	Location
0101xxxxxxxx	Processor CP1, side 0
0102xxxxxxxx	Processor CP2, side 0
1C00xxxxxxxx	LSS00, processor CP1, side 0
1C01xxxxxxxx	LSS01, processor CP2, side 0

- MVS/ESA message IGF973W at the master console

Notes:

1. If a check-stopped processor is necessary for continued operation, the operator may attempt to reset the processor with an SCP configuration command (by configuring it online from the master console) or a power-on reset. If the processor is returned to the configuration and online status, some risk is involved because the processor may fail again.
2. If a vector facility is installed and online for a processor that is taken offline, the vector facility is automatically taken offline.
3. MVS/ESA may take a processor offline for reasons other than a hardware failure in the processor.

The following chart provides recovery actions for processor failures:

SCP Active	• If the SCP remains active, continue operating on the remaining processors. If the SCP does not take the failed processor offline, attempt to do so with an SCP configuration command. • If it is not possible to continue operating, shut down the SCP and perform the following recovery action (SCP not active).
SCP Not Active	Perform the following steps: 1. Deselect the failed processor from the CONFIG frame. 2. Perform a power-on reset: • If the power-on reset completes, IPL the SCP. Schedule service for the failed processor. • If the power-on reset does not complete, allow the service representative to repair the processor unit. **Note:** If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again.

Vector Facility Recovery Actions

Depending on the model and operating configuration, the following topics provide recovery actions for vector facility (VE) failures.

The following indications appear at the system console unless otherwise noted. A vector facility failure is indicated by one or more of the following:

- Vector facility threshold exceeded message
- Vector facility check-stop message
- Vector facility problem indicated by the PA facility
- Reference code:

ID	Location
0F01xxxxxxxx	Vector VE1, side 0
1002xxxxxxxx	Vector VE2, side 0
1805xxxxxxxx	LSS05: all vectors, side 0

- MVS/ESA message IGF970E at the master console

Notes:

1. If a check-stopped vector facility is necessary for continued operation, the operator may attempt to reset the vector facility with an SCP configuration command (by configuring it online from the master console) or a power-on reset. If the vector facility is returned to the configuration and online status, some risk is involved because the vector facility may fail again.
2. MVS/ESA may take a processor offline for reasons other than a hardware failure in the processor. An associated vector facility is automatically taken offline at the same time.

The following chart provides recovery actions for vector facility failures:

SCP Active	• If the SCP remains active, continue operating on the remaining vector facility. If the SCP does not take the failed vector facility offline, attempt to do so with an SCP configuration command. • If it is not possible to continue processing, shut down the SCP and perform the following recovery action (SCP not active).
SCP Not Active	Perform the following steps: 1. Deselect the failed vector facility from the CONFIG frame. 2. Perform a power-on reset: • If the power-on reset completes, IPL the SCP. Schedule service for the failed vector facility. • If the power-on reset does not complete, allow the service representative to repair the processor unit. **Note:** If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again.

Chapter 6. Processor Storage and System Control Element

This chapter discusses the following topics:

Processor Storage Increment Size

A storage increment is the smallest amount of storage that the operator can take offline by using SCP configuration commands. For all model machines, this increment size is 4M-bytes.

Central and Expanded Storage

For the ES/9000 Models 190, 210, 260, 320, 440, and 480, expanded storage is really an extension of central storage. It does not exist by itself. A problem in expanded storage will show up as a problem in central storage.

Expanded storage improves system performance by reducing the paging activity between I/O devices and central storage.

The processor unit provides the following facilities for central and expanded storage errors:

- Single-bit error detection and correction
- Double-bit error detection

Single-bit errors are detected and corrected by the hardware as they occur; MVS/ESA is not notified. Double-bit errors are detected and recorded as uncorrectable errors (UEs). (UEs) cause the SCP to check-stop.

If the SCP fails as a result of a storage failure, the recovery alternatives are:

- An IPL (without a power-on reset)
- A power-on reset and an IPL

Central and Expanded Storage Recovery Actions

The following provides recovery actions for an uncorrectable error (UE) in central or expanded storage.

If the SCP is not active because of (or coincident with) a storage error, perform a power-on reset and IPL the SCP.

Note: A power-on reset validates all storage. The location of the storage frame with a UE is recorded on the processor controller DASD and the affected storage remains offline until it is repaired.

Storage failures are also indicated by one or more of the following at the system console:

- Storage problem indicated by the PA facility
- Reference code:

ID	Location
0400xxxxxxxx	PMC0 (PMA0 and PMA1), side 0

The following chart provides recovery actions for (UEs) in storage:

SCP Active	It is not possible to continue processing. Perform the following recovery action (SCP not active).
SCP Not Active	Allow the service representative to repair the processor unit or perform a power-on reset: • If the power-on reset completes, IPL the SCP. Service may be deferred, but processing involves risk because the storage controller may fail again. **Note:** If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again. • If the power-on reset does not complete, allow the service representative to repair the processor unit.

System Control Element Recovery Actions

Depending on the model and operating configuration, the following topics provide recovery actions for system control element (SCE) failures.

The following indications appear at the system console unless otherwise noted. A system control element failure is indicated by one or more of the following:

- System control element threshold exceeded message
- System control element problem indicated by the PA facility
- Reference code:

ID	**Location**
0300xxxxxxxx	SCE0, side 0
1E02xxxxxxxx	LSS02, SCE0, side 0

The following chart provides recovery actions for system control element (SCE) failures:

SCP Active	It is not possible to continue processing. Perform the following recovery action (SCP not active).
SCP Not Active	Allow the service representative to repair the processor unit or perform a power-on reset: • If the power-on reset completes, IPL the SCP. Service may be deferred, but processing involves risk because the system control element may fail again. **Note:** If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again. • If the power-on reset does not complete, allow the service representative to repair the processor unit.

Chapter 7. Channel Subsystem

This chapter discusses the following topics:

A recovery strategy for channel subsystem and I/O problems may require complex considerations of the SCP and other software, the I/O devices, the extent and location of the failure, and the system configuration. This topic suggests approaches and includes procedures that, when combined with proper planning and the operator's knowledge of a specific system, may help to limit the effect of channel subsystem or I/O device failures.

Channel Subsystem Overview

Channel Subsystem Hardware

The channel subsystem has one channel control element (CCE). The channel control element consists of an I/O processor (IOP), a primary data stager (PDS), and two secondary data stagers (SDSs).

See Figure 7-1 for an overview of the extent to which a hardware failure can affect the channel path configuration. An IOP or PDS failure is a failure of the channel control element and therefore all channel paths communicating with the channel control element. An SDS failure is a failure of only the channel paths communicating with that part of the channel control element.

The channel paths communicate with the channel control element by means of the channel elements. Each channel element houses four channel paths and includes a common channel adapter (CHAD). See Figure 7-1 and note how the channel paths are grouped on the CHNCFA frame (Figure 7-2). If a channel adapter fails, the failure affects all four paths in the channel element.

Note: Channel subsystem failures do not require a recovery action unless the failure blocks the only access to a critical system resource.

I/O failures occur in a channel path, an I/O device, or the path to an I/O device. A failure in a channel path is generally a channel control check (CCC) or a machine-check (MCK) interruption; a failure in a I/O device or its path is generally an interface control check (IFCC).

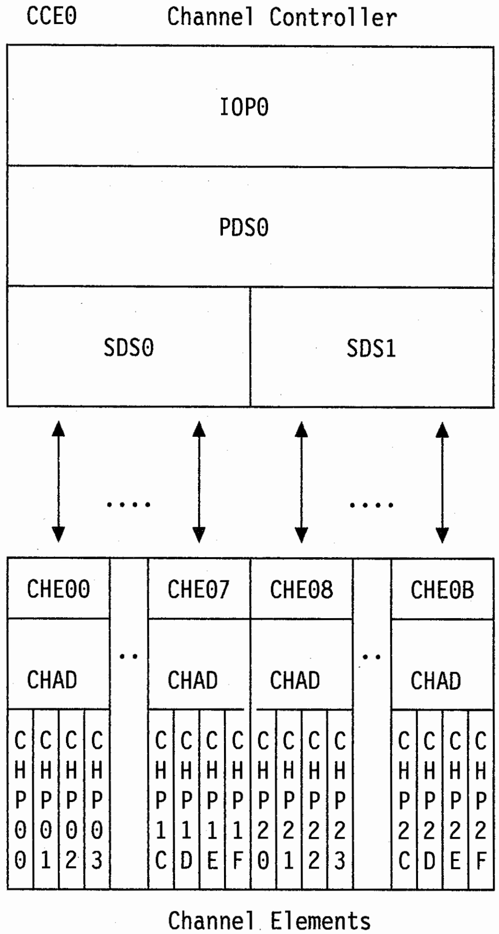


Figure 7-1. Overview of the Channel Subsystem

```
              Channel Configuration (ESA/390 Mode) (1 of 2)

CHPID          = 0000 0000 0000 0000 1111 1111 1111 1111
                 0123 4567 89AB CDEF 0123 4567 89AB CDEF
TYPE           = YYBB YYBB BBBB BBBB B BB BBBB YYBB BBBB

RESERVED       = ---- ---- ---- S--- -E-- ---- ---- S---
STANDBY        = ---- ++-- ---- --C+ ---- --+- ---- ----
ONLINE         = ++++ --++ ++C+ -+-- *-+* *+-+ ++*+ -+*C

CHPID          = 2222 2222 2222 2222
                 0123 4567 89AB CDEF
TYPE           = BBBB BBBB BBBB B BB

RESERVED       = ---- ---- ---- SE--
STANDBY        = ---- ++-- --+- --C+
ONLINE         = ++++ --++ *+-+ ----
```

Figure 7-2. CHPID Fields on the Channel Configuration (CHNCFA) Frame

Channel Subsystem Operation

The channel subsystem allows the processors to order I/O operations and immediately disconnect to perform other functions. The channel subsystem initiates I/O operations, terminates I/O operations, and provides automatic recovery.

When a processor requires an I/O operation, the processor fetches a subchannel control block for the necessary I/O device from the hardware system area (HSA, see Figure 7-4). The processor writes the necessary control information in the subchannel, replaces it in the HSA, and signals the I/O processor (IOP). The signal to the IOP informs it that an I/O operation is pending. The IOP fetches the subchannel, assigns the I/O operation to the necessary channel path, replaces the subchannel in the HSA, and signals the channel path. The signal informs the channel path that an I/O operation is pending. The channel path fetches the subchannel and performs the I/O operation according to the control information. When the I/O operation is complete, the channel path writes the status in the subchannel, replaces it in the HSA, and signals the IOP. The IOP, in turn, signals all processors that an I/O interruption is pending. The first available processor responds to the I/O interruption by fetching the subchannel and performing any necessary operations based on the status of the I/O operation.

9034-Mode Channels

A 9034-mode channel is an ES Connection channel attached to a 9034.

The 9034-mode channel (CVC) feature provides fiber-extended channel paths for the processor unit. The maximum length of the 9034-mode channel depends on the type of control unit attached. See the *9034 ES Connection Converter Planning Guide* for information regarding CVC installations.

Note: All channel paths to an I/O device must be the same type; either standard parallel or CVC.

A 9034 ES Connection Converter (Figure 7-3) converts 9034-mode channel protocol so that standard I/O interface cables may be connected to the control unit. During normal operation of the 9034 ES Connection Converter, the Power On indicator should be on and the Not Operational indicator should be off (Figure 7-5 on page 7-5). The Not Operational indicator comes on momentarily during power on of the unit, but indicates a problem if it remains on continuously.

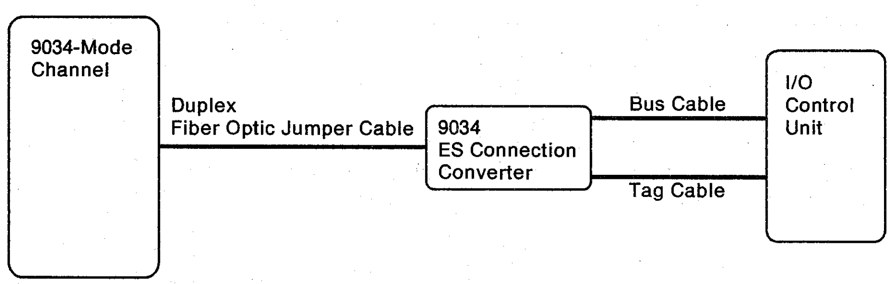


Figure 7-3. 9034-Mode Channel Overview

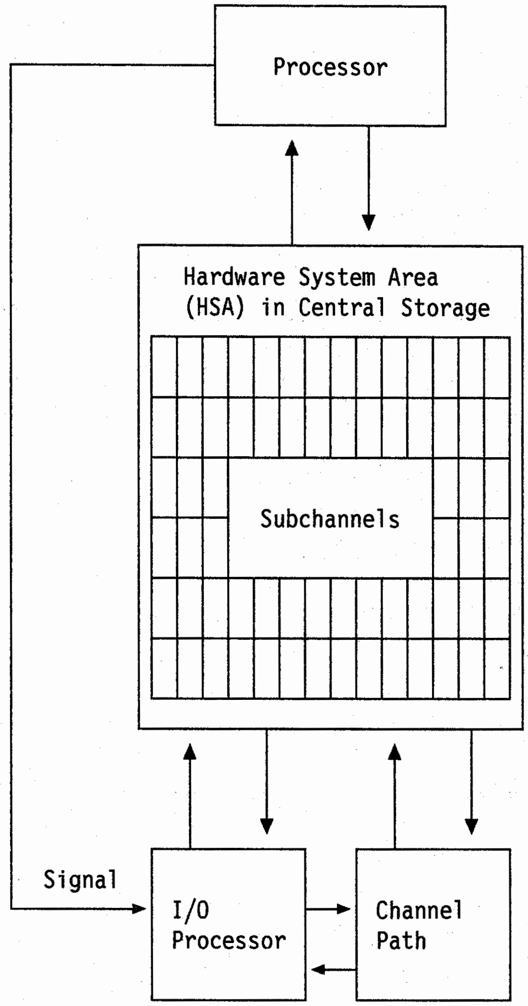


Figure 7-4. Channel Subsystem Operation

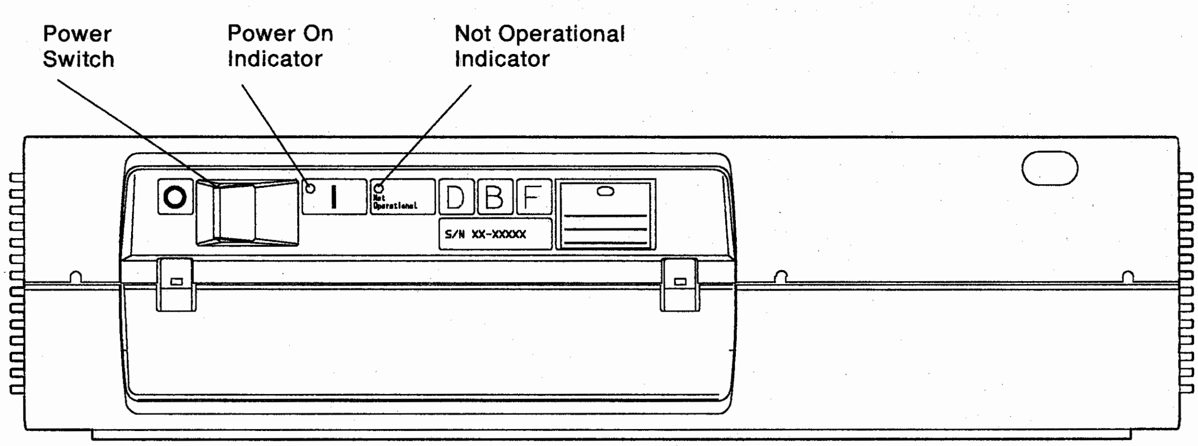


Figure 7-5. 9034 ES Connection Converter

Channel Subsystem Recovery Actions

Depending on the model and operating configuration, the following topics provide recovery actions for channel control element (CCE) failures.

Note: Channel path (CHP), channel element (CHE), and secondary data stager (SDS) failures do not normally require a recovery action in any model. See "Channel Paths and I/O Devices" on page 1-20.

The following indications appear at the system console unless otherwise noted. A channel subsystem or related failure is indicated by one or more of the following:

- Channel control element (PDS or IOP) threshold exceeded message
- Channel subsystem problem indicated by the PA facility
- Reference code:

ID	Location
0600xxxxxxxx	IOP0, CCE0, side 0
0700xxxxxxxx	PDS0, CCE0, side 0
0800xxxxxxxx	SDS0, CCE0, side 0
0Bnnxxxxxxxx	CNC CHPnn, side 0
0Dnnxxxxxxxx	CVC CHPnn, side 0
0E01xxxxxxxx	SDS1, CCE0, side 0
120nxxxxxxxx	CHE0n, side 0
24nnxxxxxxxx	LSSG (even clocking), side 0
25nnxxxxxxxx	LSSG (odd clocking), side 0
2Annxxxxxxxx	Block CHPnn: 00–2F, side 0
2Cnnxxxxxxxx	Byte CHPnn: 00–2F, side 0
1D03xxxxxxxx	LSS03, CCE0, side 0
1F04xxxxxxxx	LSS04, channel paths 00–2F, side 0

- Channel subsystem damage (CK) machine check (master console message IOS019 and an A19 wait state if the SCP is MVS/ESA).

Note: In all models, any configuration (Figure 7-1 on page 7-3):

- If a channel element (CHE) fails, the channel paths associated with it are automatically taken offline.
- If a secondary data stager (SDS) fails, the channel paths associated with it are automatically taken offline.

In all models, these failures result in a system check-stop state. See "All Models" on page 7-7.

All Models

Channel Control Element Recovery Actions:

If the channel control element fails, a channel subsystem damage (CK) machine check is generated (master console message IOS019 and an A19 wait state if the SCP is MVS/ESA).

SCP Active	It is not possible to continue processing. Perform the following recovery action (SCP not active).
SCP Not Active	IPL the SCP. If the IPL fails, allow the service representative to repair the processor unit or perform a power-on reset: • If the power-on reset completes, IPL the SCP. Service may be deferred but processing involves risk because the channel control element may fail again. **Note:** If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again. • If the power-on reset does not complete, allow the service representative to repair the processor unit.

Channel Path Swap Procedure

The channel path swap procedure can be used to maintain the availability of a critical I/O device if a channel path fails. The procedure is performed jointly by the operator and the service representative.

A channel path swap requires two channel paths, the affected channel path and a spare channel path. The following guidelines apply to the swapped channel paths:

- Both channel paths must be of the same hardware type.
- Both channel paths must be defined in the IOCDS.

If the SCP is active, the operator should go to the master console and enter the SCP configuration command for channel paths to take the affected channel paths offline. If the SCP is not active (or does not support channel path reconfiguration), the operator should go to the system console and enter the CHPID command to take the affected channel paths offline.

After taking the channel paths offline, the operator turns on service mode from the system console. The service representative logically swaps the channel paths, swaps the cables at the channel tailgate, and turns off service mode. The operator brings the previously spare channel path online (which now has the same channel path identifier as the original failing channel path) and, if the SCP is not active, performs an IPL of the SCP from the system console. The channel path swap is written to the processor controller DASD. The channel paths remain swapped until the service representative resets the swap. For an example of before and after a channel path swap, see Figure 7-6.

Channel paths 02 and 03 are swapped in the Channel Summary Status frame example shown in Figure D-4 on page D-7.

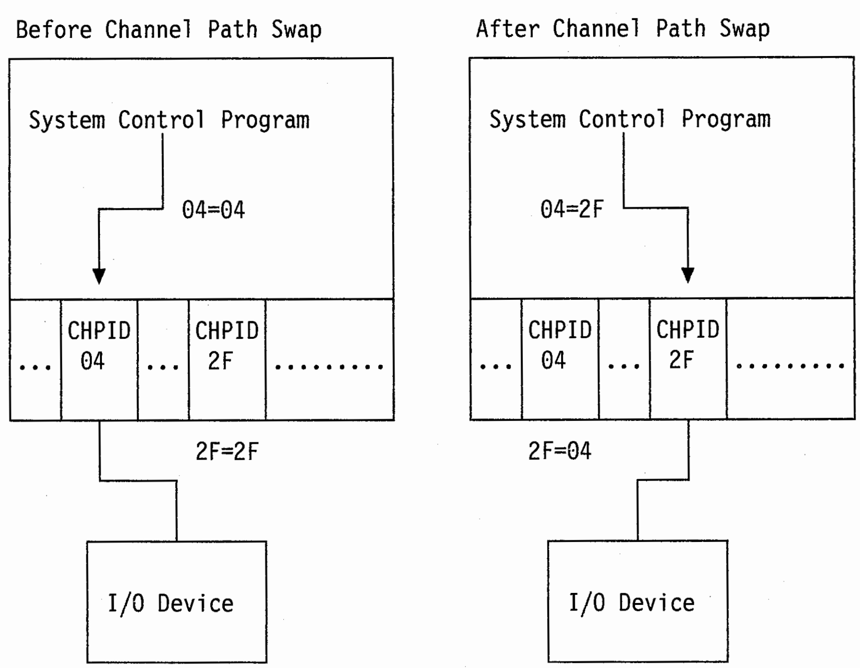


Figure 7-6. Before and After a Channel Path Swap

Taking a Channel Path Offline

The operator should use the following procedure to take a channel path offline:

1. Go to the system console.
2. Enter **F CHNCFA** to display the Channel Configuration frame.
3. Perform one of the following to take the channel path offline.
   - If MVS/ESA is not active:

     Enter **CHPID nn OFF**, where nn is the channel path ID.
   - If MVS/ESA is active:

     Enter **CF CHP(nn),OFFLINE**, where nn is the channel path ID.
4. Press the Refresh key.
5. Verify that the channel path is offline. The plus (+) sign changes to a minus (−) sign in the ONLINE field.
6. Enter **SCS nn IN**, where nn is the ID of the failed channel path, to put it into single-channel service mode and write the mode of the channel path to the processor controller DASD. See "SCS" on page B-9.
7. IPL the SCP. Schedule service for the failed channel path.

Note: If the SCP is active, but does not support channel path reconfiguration, use the CHPID command.

Channel Configuration (CHNCFA) Frame

Channel path status is indicated by the ONLINE field of the CHNCFA frame. See Figure 7-7 on page 7-10. Each channel path is displayed in a group of four channel paths that corresponds to a channel element (CHE). See Figure 7-1 on page 7-3.

TYPE field. The channel type of each CHPID is indicated in this field as one of the following:

B	Parallel block
Y	Parallel byte
V	9034-mode
C	Channel to Channel
N	ES Connection

RESERVED field. The reserved state of the channel path is indicated in this field as one of the following:

E	Definition error in the IOCDS
U	Not defined in the IOCDS
S	Single Channel Service
-	Not in reserved state
X	Error during frame processing

STANDBY field. The standby state of the channel path is indicated in this field as one of the following:

C	Checkstop
x	In standby
-	Not in standby state
X	Error during frame processing

ONLINE field. The architected configured state of the channel path is indicated in this field as one of the following:

- **C** Checkstop
- ***** Specific test or operational state - see IOPD frame
- **?** Online (configured)
- **-** Not in online state
- **X** Error during frame processing

```
                                                                 dd mmm yy
               Channel Configuration (ESA/390 Mode) (1 of 2)    (CHNCFA)

    CHPID         = 0000 0000 0000 0000 1111 1111 1111 1111
                    0123 4567 89AB CDEF 0123 4567 89AB CDEF      TYPE
    TYPE          = YYBB YYBB BBBB BBBB B BB BBBB YYBB BBBB      B = BLOCK
                                                                 Y = BYTE
    RESERVED      = ---- ---- ---- S--- -E-- ---- ---- S---      V = CV CHANNEL
    STANDBY       = ---- ++-- ---- --C+ ---- --+- ---- ----      C = CHAN TO CHAN
    ONLINE        = ++++ --++ ++C+ -+-- *-+* *+-+ ++*+ -+*C      N = CN CHANNEL

    CHPID         = 2222 2222 2222 2222                          LEGEND
                    0123 4567 89AB CDEF                          + = YES
    TYPE          = BBBB BBBB BBBB B BB                          - = NO
                                                                 E = DEF'N ERROR
    RESERVED      = ---- ---- ---- SE--                          U = UNDEFINED
    STANDBY       = ---- ++-- --+- --C+                          S = SERVICE
    ONLINE        = ++++ --++ *+-+ ----                          C = CHECK  STOP
                                                                 X = ERROR
  Syntax of associated channel commands:                         * = SEE IOPD A1
   CHPID xx {ON | OFF}        SCS xx {IN | OUT}                        SELECTION

 COMMAND ==>
 SYSTEM 1          1 .... 2 ....                                 PSW0  Operating
 ________________________________________________________________________________
         A:a MODE
```

Figure 7-7. Channel Configuration (CHNCFA) Frame, 1 of 2

Releasing a Shared I/O Device

If two or more SCPs share an I/O device and a failure occurs so that the shared I/O device is reserved to the failed SCP (the SCP that was directly affected by the failure), the device may not be available to the sharing systems until it is released. The device remains reserved to the failed SCP because the SCP had issued a Reserve command to the device before the failure or because the device was moving data for the failed SCP at the time of failure.

Warning: The interface reset (IFRST), system reset (SYSRESET), initial program load (IPL), and power-on reset (POR) functions attempt to reset channel paths. The reset clears any existing reserves. Because a reserve establishes exclusive access to an I/O device, a data integrity problem may result from clearing a reserve in a shared DASD environment.

The most common indicator that a failed SCP holds a reserve for a shared I/O device is an I/O error message (for example, MVS/ESA message IOS071I, START PENDING) appearing at the master consoles of the sharing SCPs.

The sharing SCPs may hang or fail if the reserved device is not released as quickly as possible. Try to release the reserved device first and recover the failed SCP later because the reserved device may be required by the sharing SCPs before the failed SCP is recovered.

The operator should consider the following procedure and the corresponding flow-chart, Figure 7-8:

1. Go to the system console of the processor unit that failed (that includes the failed SCP).
2. Enter **F CONFIG** to display the Configuration frame:
   a. If POWER ON RESET Required is indicated, enter **IFRST ALL**.

      The IFRST ALL command resets all channel paths in the processor unit and should release the device; if it does not, go to step 3.

   b. If POWER ON RESET Complete is indicated, enter **SYSRESET**.

      The SYSRESET command resets all channel paths and should release the device; if it does not, enter **IFRST ALL** to reset all channel paths. Do not release the configuration if POWER ON RESET Complete is indicated.
3. If the IFRST ALL command does not release the device, power off and power on the failed processor unit.

   Note: Depending on the extent and location of the failure, it may not be possible to complete the power-on sequence. The only purpose of the power-on sequence in this situation is to release the shared device. Follow local procedures for reporting problems.

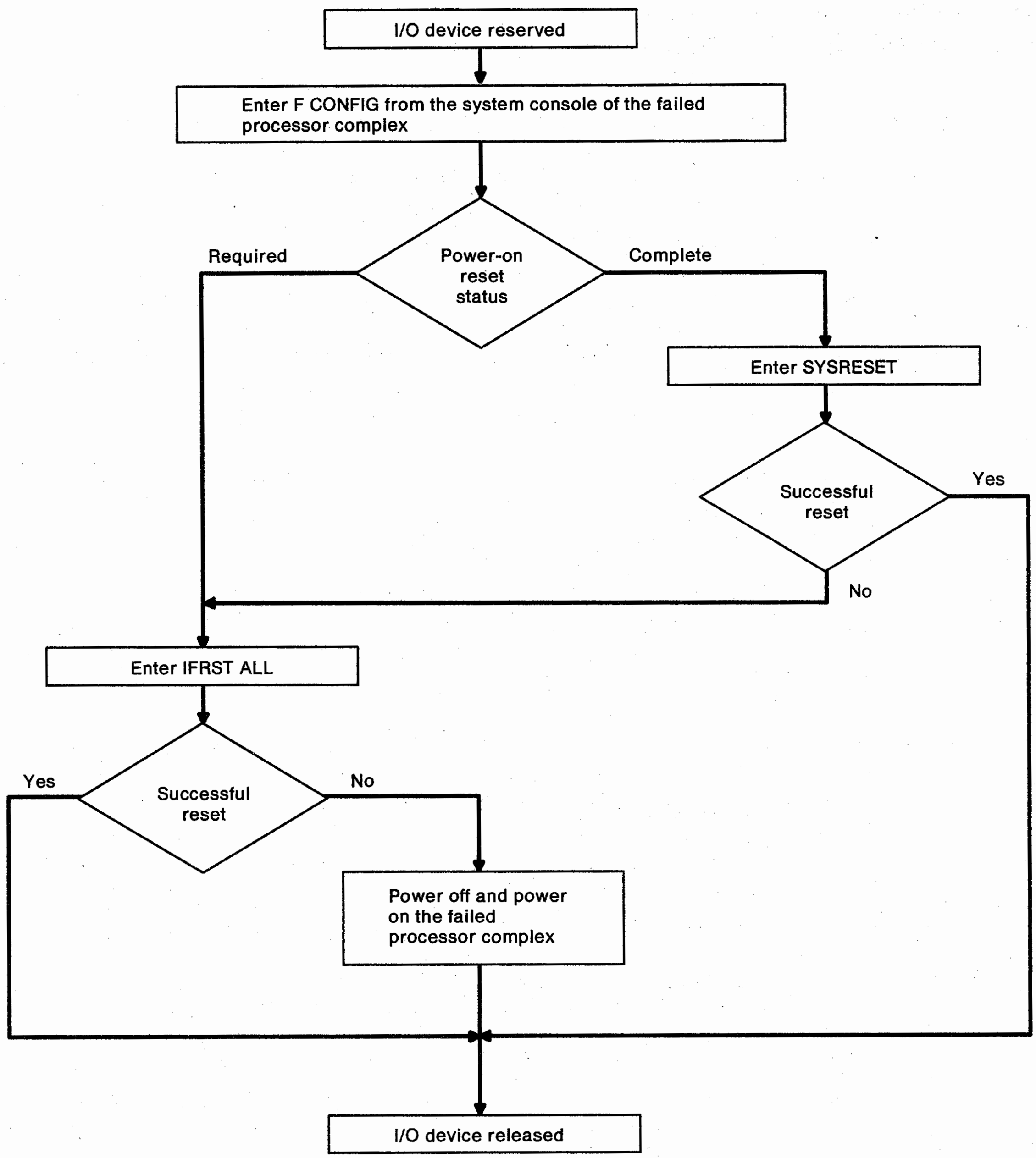


Figure 7-8. Releasing a Shared I/O Device

Chapter 8. Processor Controller

This chapter discusses the following topics:

Overview of the Processor Controller Element (PCE)

The Processor Controller Element (PCE) is an integral part of the ES/9000 system that is designed to start, operate, and maintain the processor unit. Specifically, the PCE provides the following services for the processor unit:

- Power-on and -off
- System IPL and IML
- Error logging and usage statistics
- Problem analysis
- Monitoring of power
- Monitoring of the cooling system
- System console
- Communications with the remote support center.
- System personalization (IOCDS selection, etc.)
- Configuration control of the hardware
- Patch installation and EC support.

PCE Components

I/O Support Processor (IOSP)

The IOSP performs channel, control unit and I/O device functions. It provides the I/O system and operates as the support processor for the Primary Support Processor (PSP). See Figure 8-2 on page 8-5.

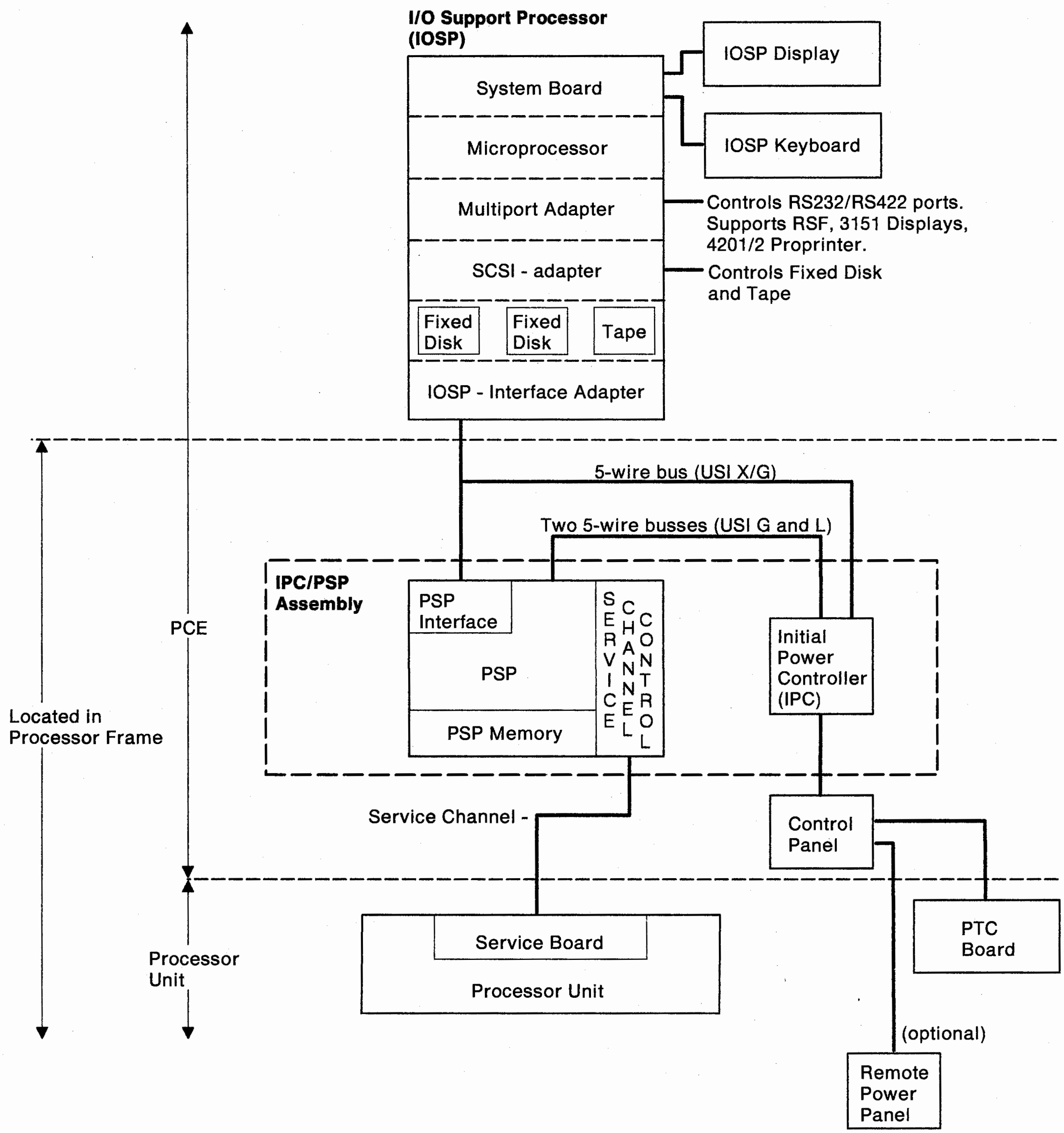


Figure 8-1. Processor Controller Overview

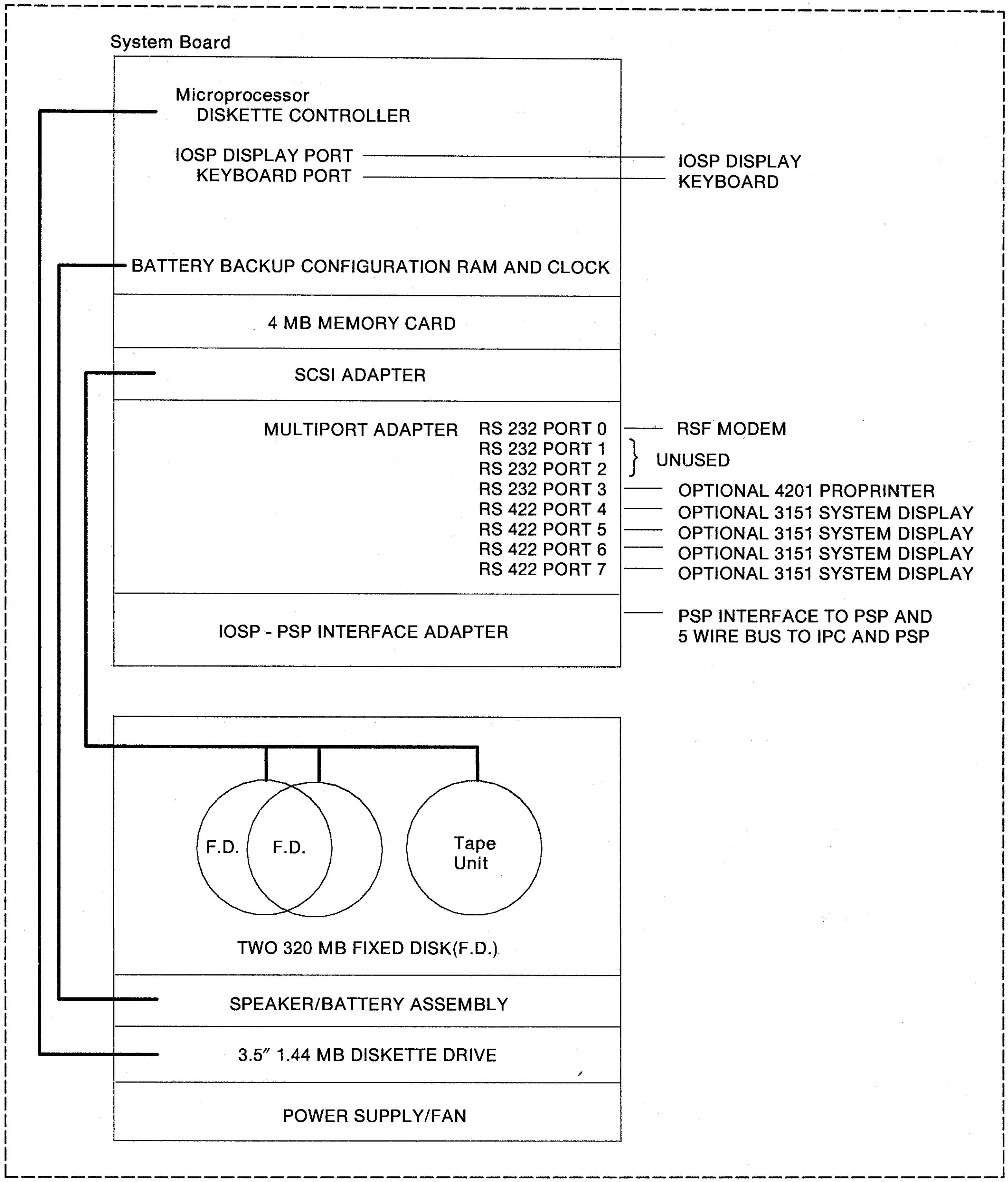


Figure 8-2. IOSP Overview

IOSP Controls and Indicators

The controls and indicators, located on the front of the IOSP, are identified in the illustration below.

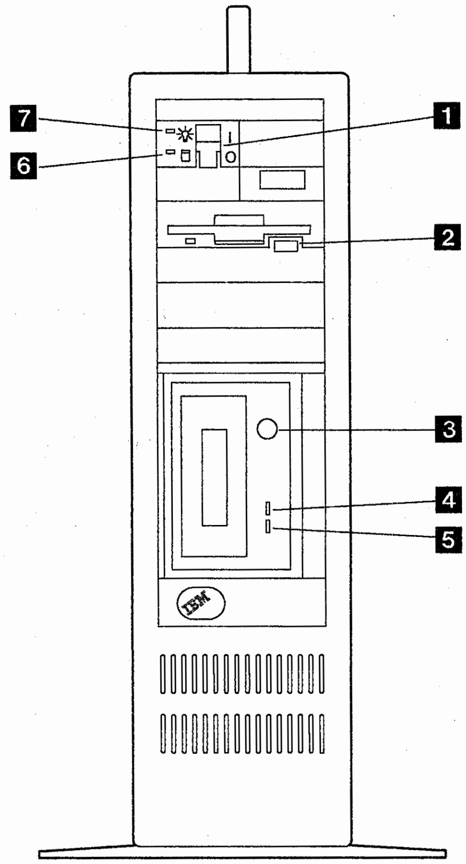


Figure 8-3. IOSP Hardware

1 DC Power ON/Off switch

This switch should always be in the ON position, since IOSP power is controlled from the control panel.

2 Diskette Eject pushbutton

This pushbutton releases a diskette from the drive. (The number 1.44 printed on the pushbutton indicates that it is a 1.44 MB diskette drive.)

3 Tape Unload pushbutton

Pressing this pushbutton with power on in the IOSP causes the Ready light to turn off and the tape to rewind and unload. If the tape is already positioned at the beginning, the unload operation takes approximately 25 seconds. When a tape is inserted, approximately 25 seconds elapse before it is positioned at the beginning of the tape, however, the ready indicator comes on immediately. Pressing the Unload pushbutton while the drive is in Power-On Self-Test (POST) will delay the unload function until POST is complete (70 seconds). Also, pressing the Unload pushbutton while the drive is in a loading process will delay the unload function until the load is complete. Note that if you do the unload under IOSP screen control, follow the screen instructions for tape unload operations.

4 Green and **5** Amber indicators

Table 8-1. Tape Drive Indicators		
Green	**Amber**	**Meaning**
On	Off	Drive Is Ready (cassette installed)
On	On	Drive Is In Power-On Self-Test
On	Flashing	Drive Is In Use (busy sending or receiving data)
Off	On	Drive Has An Unrecoverable Error

6 Fixed Disk Drive In-Use indicator

This indicator, when lit, indicates that a fixed disk is presently selected and is being used.

7 DC Power On/Off indicator

This indicator, when lit, indicates that IOSP power is on.

System Board

The system board contains:

- The IOSP microprocessor
- Keyboard port
- Pointing device port (unused)
- ES Connection port (unused)
- Parallel port (unused)
- Interfaces to the memory card
- All adapter card slots.

IOSP Memory Card

The IOSP memory card contains four megabytes of storage. Note that during the power-on self-test of memory, the memory size is displayed in the top left of the service display screen. It increases in 64KB increments until the entire memory is tested. Then "3968 Kb OK" is displayed.

IOSP Display Port

The IOSP display port- Video Graphics Array- provides communication with the IOSP display.

IOSP Keyboard Port

The IOSP keyboard port is used to communicate with the IOSP keyboard. Note that the keyboard connector is identified by a small keyboard figure, molded next to it, in the back panel.

IOSP Adapters

The IOSP contains the following adapters:

- A multiport adapter that is used to communicate with the attached I/O devices. It supports RSF via a modem, an optional 3151 Remote Display Station, and an optional 4201 printer Model III.
- The Small Computer System Interface (SCSI) adapter for controlling the fixed disk files and the tape unit.

  The SCSI adapter communicates with its devices over a parallel bus with each device having a unique identification. The specific identifications are:

  - Tape= 0
  - Hard file 2= 5
  - Hard file 1= 6
  - SCSI adapter= 7

  The SCSI identification for the adapter is assigned by the adapter. The tape unit is shipped with an ID of zero (no jumpers plugged). Both hard files must have jumpers installed in their J2 connector, which assigns the correct ID.

  Note: These jumpers must be attached to their correspondingly marked fixed disk drive, otherwise the wrong drive will be accessed.
- A PSPI adapter that interfaces with the PSP via the Primary Support Processor Interface and with both the IPC and the PSP.

Fixed Disk Storage Devices

Fixed disk storage devices contain the PCE Licensed Internal Code. The IOSP has two fixed disk storage devices with the addresses 240 and 241. Each one has a capacity of 320 MB and contains the following data:

- The Licensed Internal Code
- The PCE history error log
- Configuration data.

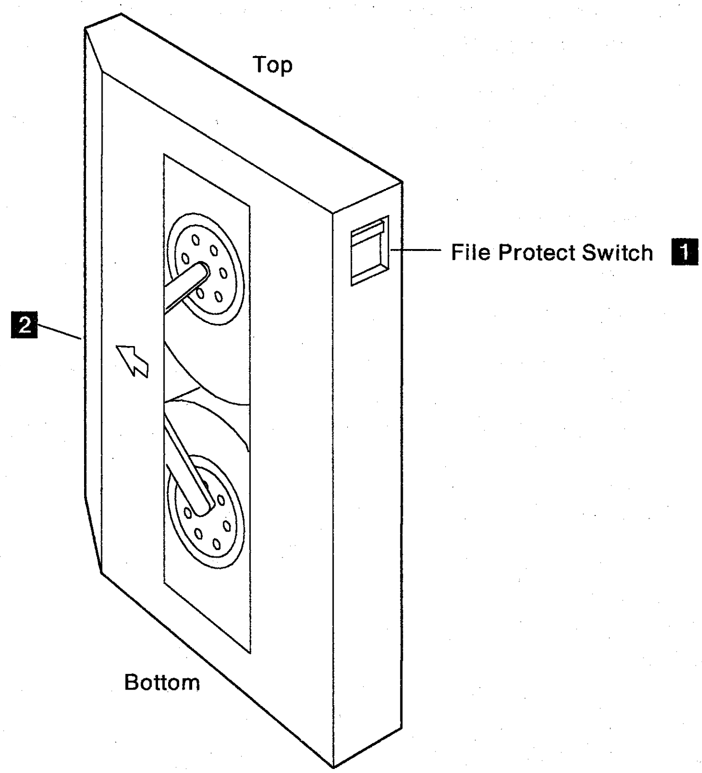
Tape Drive

The tape drive is used by the Service Representative for EC and patch installations, and also for data dumps. The 8mm tape cartridge has a capacity of 2332 MB.

Warning: Separate tape cartridges which contain IBM data such as IOSP IBM Licensed code, PCC, backup restore, or machine dumps must be kept in a secure place when not in use. A scratch tape is provided for testing the tape drive, which does not have to be secured.

Tape Cartridge

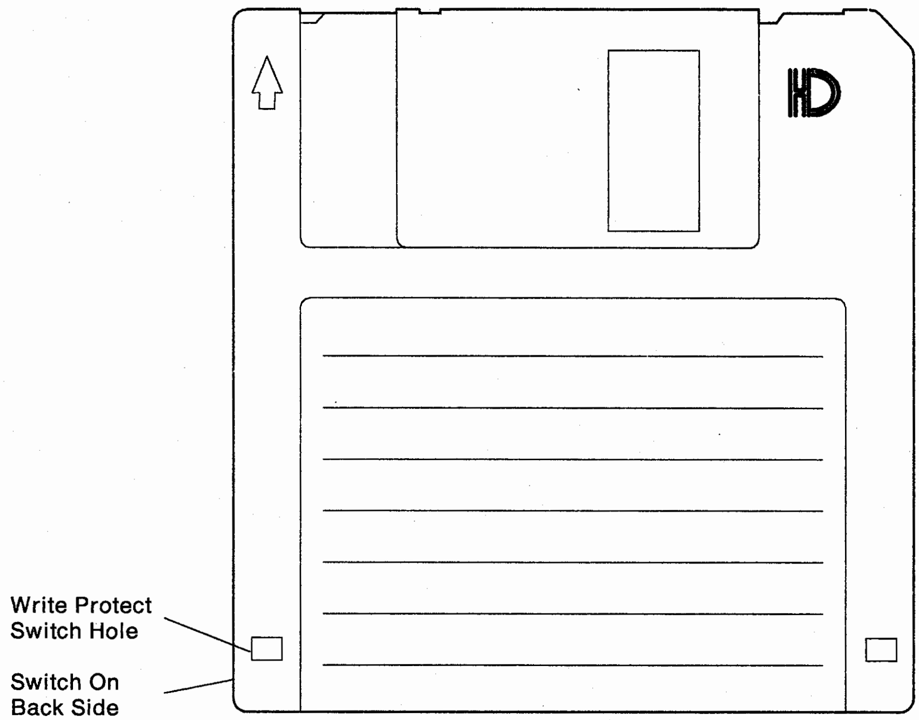
- The file protect switch **1** is shown in the "not write protect" position. Slide the switch down for "write protected."
- To insert the tape cartridge, slide the edge **2** into the tape drive slot. Push the door until it latches.



3.5-Inch Diskette Drive

The diskette drive attaches via a cable to the IOSP system board. The 3.5-inch diskette has a capacity of 1.44MB and contains the following data:

- Diagnostics
- Utilities
- IOSP configuration data



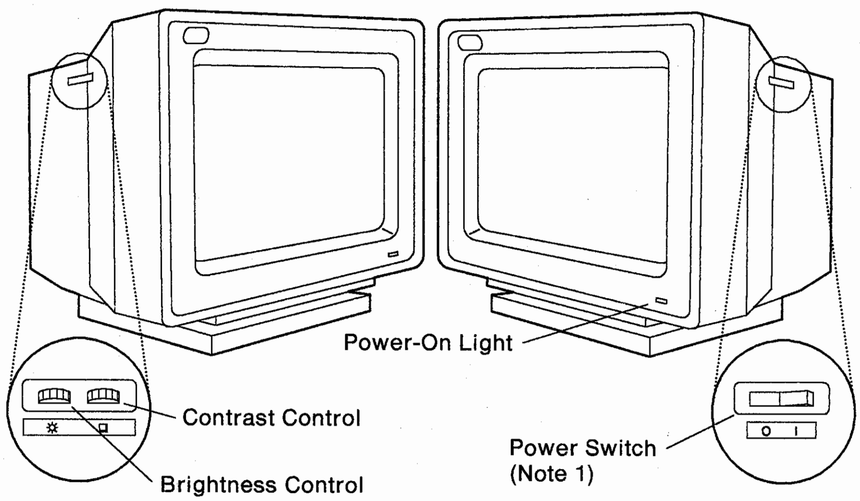
Write protect switch

- Open: protected
- Closed: not protected.

The write protect slide switch located on the diskette, opens or closes the hole present on the diskette. The diskette must be inserted with the label up. The arrow shows the direction of insertion.

IOSP Display

The IOSP Display attaches (must be within 6 feet) via the display port (IOSP Display Adapter) on the system board. This display, shown in the illustration below, is used during installation and in the servicing of the PCE, and is located within 6 feet of the IOSP. When not used for servicing, PCC logical consoles may be assigned to this display by means of a key at the IOSP keyboard. The SV PCE key located in the upper right hand portion of the keyboard when activated, will toggle between PCC and IOSP screens.



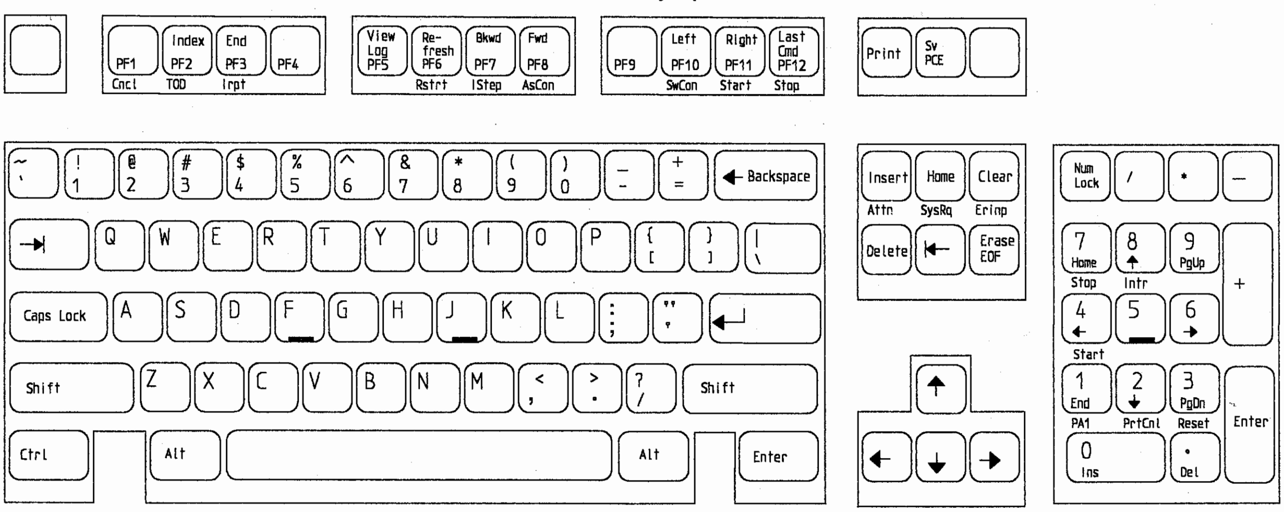
Notes:

1. A power switch located on the upper right side is not used. However, it should be left in the On (|) position.
2. Brightness and contrast controls are located on the upper left side.

IOSP Keyboard

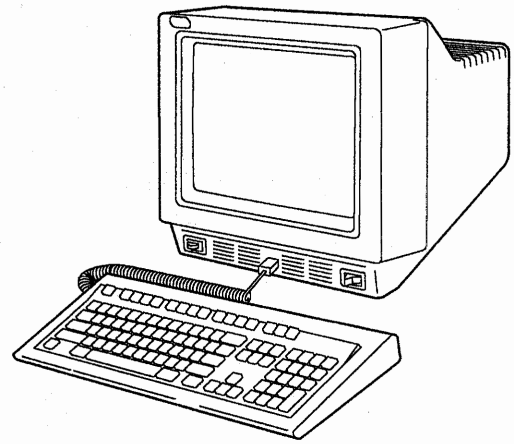
A US English keyboard with PCE nomenclature, for use with the IOSP support display, is connected (must be within 8 feet) to the keyboard port at the IOSP. The keyboard is shown below.

Note: The ATTN and SYSRQ keys provide no function.



Optional Remote Display 3151 Models 31 or 41

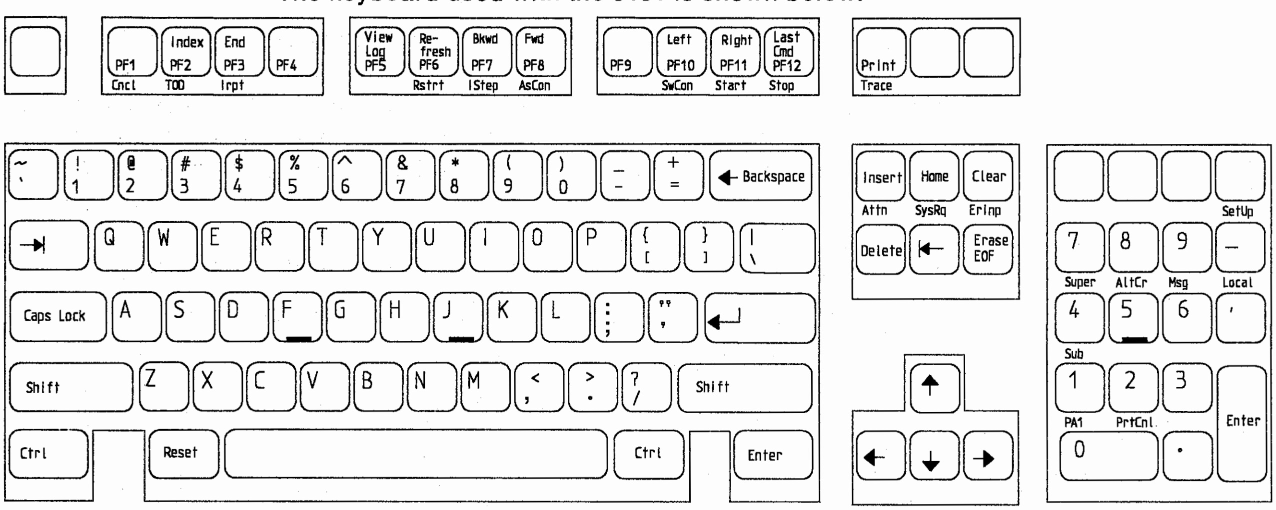
The optional 3151 ASCII terminals, shown below, may be connected (within a maximum of 2000 feet) to the multiport adapter through the EIA RS422 interfaces on ports 4 through 7.



Notes:

1. A "cartridge for expansion" must be present in each IOSP Remote Display Station and the IOSP Remote Display Station terminal must be located within 2000 feet from the IOSP. Refer to *IBM 3151 ASCII Display Station User's Guide,* GA18-2805.
2. The ATTN and SYSRQ keys provide no functions.

The keyboard used with the 3151 is shown below.



Modems 5853, 5853J, and 5858

The 5853 is a U.S. 2400 bps modem with automatic call and automatic answer capability. It is driven from the multiport adapter through the EIA RS232 interface on port 0, and is used to communicate using a bisync protocol to the remote support facility. The 5853J modem is used in Japan, and the 5858 modem is used in other countries.

Printer, 4201 Proprinter III

An optional 4201 Proprinter III* which must have an ES Connection interface, attaches to the multiport adapter (must be within 40 feet) through the EIA RS232 interface port 3.

The optional printer is used only for local copy of PCC screens (PA displayed on line 25) under session selection "PCE Consoles." Printing the PCC console screens is accomplished by pressing the Print key on the attached keyboard where the PCC screen is displayed.

Note: Each time after the system is switched on or off there may appear on the paper a number of question marks printed backward. These question marks appear randomly and do not in any way affect the printer operation. To prevent this from occurring, the printer should be switched on after the system is switched on and switched off before the system is switched off.

Primary Support Processor (PSP)

The Primary Support Processor consists of the processor which includes a memory interface, a service board interface (Service Channel), and a Primary Support Processor Interface-bus interface for channel operations. A 5-wire unit support interface is also provided to the IOSP.

Processor Unit Memory

PSP memory contains 16MB. It has single-bit error correction and double-bit error detection.

Service Channel

The service channel provides an interface between the PCE, the logic support adapter, and the Power Thermal Control (PTC).

Initial Power Controller (IPC)

The operation of the IOSP is monitored by the Initial Power Controller (IPC). The IPC controls all power functions in the PCE and provides a link between the Processor Unit and the control panel. It controls the power-on and -off sequences in the PCE and the processor unit, through the Power Thermal Component (PTC). It also continually monitors PCE status during operation. The IPC tasks are as follows:

- Senses the PCE configurations
- Controls base power to the Processor Unit, the PTC, and the service board
- Controls service gate blowers and senses for blower rotation
- Controls the IOSP power
- Provides the processor unit power control interface (Power off, timer power off, etc.)
- Provides an interface to the control panel (For reference codes, indicators, and switches)
- Supports the remote power control interface
- Controls the audible alarm and the alarm relay
- Controls the battery-operated clock, and senses the battery condition

Proprinter III is a trademark of the IBM Corporation.

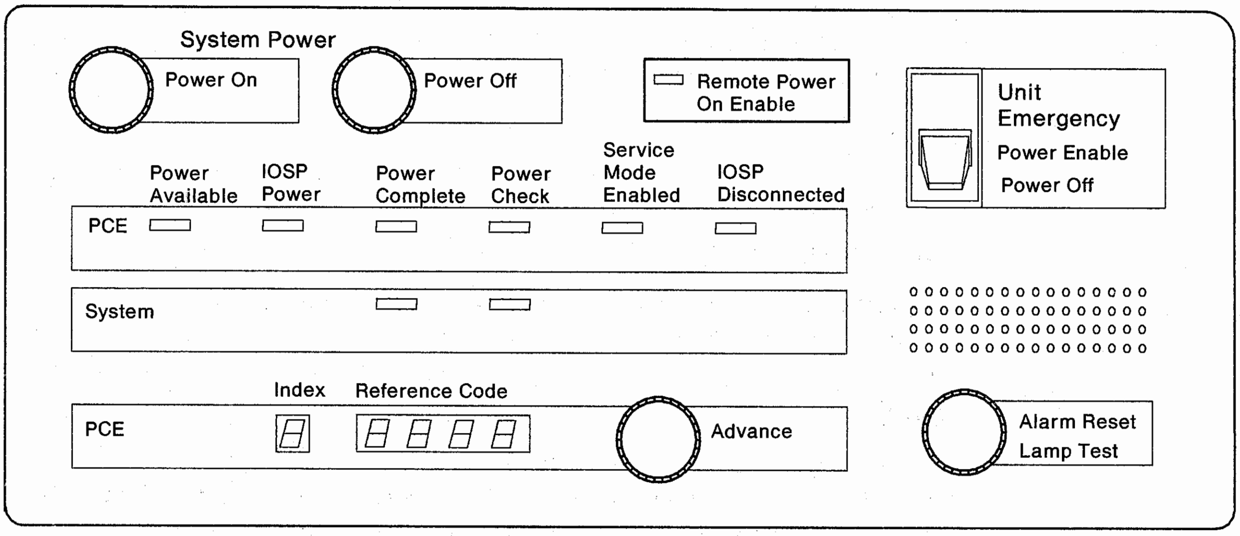
- Provides communication with the processor unit
- Provides communication with the I/O support processor
- Provides a communication path from the I/O support processor to the processor unit
- Provides the timer power off (TPO) function as a backup to the normal processor unit powering-off procedure.

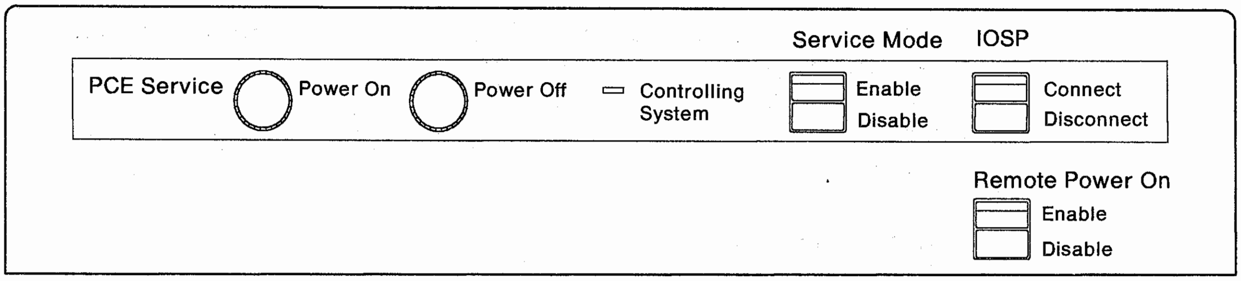
IPC Battery Operated Clock (BOC)

The IPC has a battery operated clock which maintains the current date and time even when there is no power to the IPC. The processor unit and the IOSP access the BOC. The BOC is used by the system time-of-day (TOD) clock in the processor unit, and is also used to update the IOSP's own TOD clock. You can display and alter the BOC with a selection from the IOSP operational main menu.

Control Panel Assembly

The control panel assembly for the processor unit and the Processor Controller Element (PCE) is located on the back side of the ES/9000 frame. The control panel is divided into two panels: the System Power Panel (upper) and the Service Panel (lower).





System Power Panel

The switches and controls on the system power panel are used by both the user and maintenance personnel to control power within the PCE and the processor unit.

Switches

- **Unit Emergency**

  This is a rocker switch that, when operated, will immediately open the 24V path, to all contactors. However, the standby power supply remains powered on. This maintains +5V at the Initial Power Controller card and the operator's panel.

  The Unit Emergency switch must be manually reset, behind the control panel, in order to bring up power again in the PCE and the processor unit.

Pushbuttons

- SYSTEM POWER

  Note: See also, "Step 1. Switching On Power to the Processor Controller" on page 8-37 for a step by step Power On and Power Off Procedure.

  - POWER ON

    Pressing this pushbutton causes the Initial Power Controller (IPC) to invoke the power-on sequence in both the PCE and in the processor unit. The system Power On switch is disabled when the PCE Service Mode switch is placed in the Enable position.

  - POWER OFF

    Pressing this pushbutton causes the Initial Power Controller to invoke a controlled power-off in both the PCE and in the processor unit.

- ALARM RESET-LAMP TEST

  This pushbutton forces all indicators on the system power panel and all indicators on the service panel to be lit. It also resets the audible alarm. It places an eight period (8.) in the Index and all eights (8)s in the Reference Code display.

- ADVANCE

  The Advance pushbutton works with the Reference Code display and the Index indicator. The Advance pushbutton is used to sequence the contents of the Reference Code display and to change the mode and the number shown by the Index indicator.

You can find explanations of the Reference Code display "Reference Code" on page 8-17 and the Index indicator "Index" on page 8-17.

Indicators

PCE

- POWER AVAILABLE

  This indicator is lit (green) when power is available at the Initial Power Controller hardware. It remains lit as long as the Unit Emergency switch is not activated, and the AC input is present at the standby power supply.

- IOSP Power

  This indicator is turned on and off by the IPC, which monitors a signal from the IOSP interface adapter. When the IOSP power is sensed as being in the wrong state (off when it should be on or vice-versa) this indicator will blink.

- POWER COMPLETE

  After power is switched on, this indicator (green) blinks. After IML is complete, it remains on steadily. When the PCE power is in the process of turning off, the indicator will blink until the power is completely off, then the indicator goes off.

- POWER CHECK

  This indicator (red) is lit when a power fault occurs during a power- on sequence or during the monitoring of the PCE. The indicator will also blink as a result of the IPC sensing a missing +5 V at the Control Panel.

- SERVICE MODE ENABLED

  This indicator (green) is lit if the service mode switch is set to Enable. It is turned off when the Service Mode switch is returned to the Disable position.

- IOSP DISCONNECTED

  This indicator (yellow) is lit when the PCE is operating in IOSP Concurrent Maintenance Mode. If this indicator is blinking, it indicates that IOSP Concurrent Maintenance Mode is in a transitional state.

System

- POWER COMPLETE

  After the PCE is powered on, and IML is complete, this light (green) blinks. After the processor controller is loaded and the power sequencing is completed in the processor unit, the indicator remains on steadily.

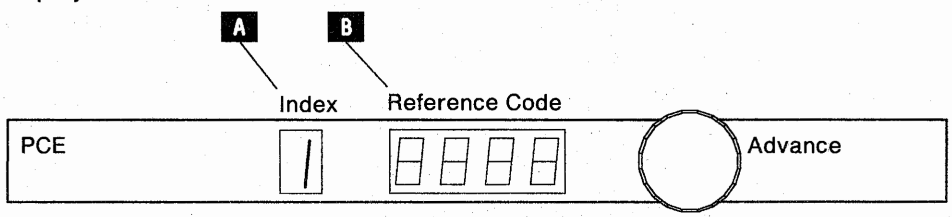
- POWER CHECK

  This indicator is lit (red) when a power fault occurs during a power-on sequence or during the monitoring of the processor unit.

Other Indicators

Index: The Index indicator **A** tells you, by whether it flashes or not, the kind of information being presented in the Reference Code display **B**.

The number shown in the Index indicator represents the horizontal or vertical position of that information which is contained in a reference code buffer. The buffer drives the Reference Code display. See an explanation of the Reference Code display "Reference Code."



Since only one frame (4 digits) of a reference code can be displayed at a time, two modes of operation, vertical and horizontal, are provided:

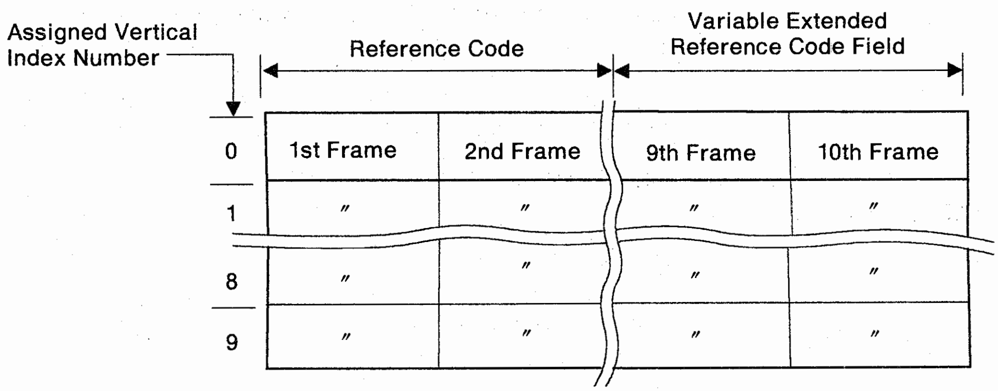
Vertical mode

- Vertical mode is indicated by a flashing index number displayed in the Index indicator
- Vertical mode allows you to display the first frame of each reference code in the buffer by means of the Advance pushbutton.

Horizontal mode

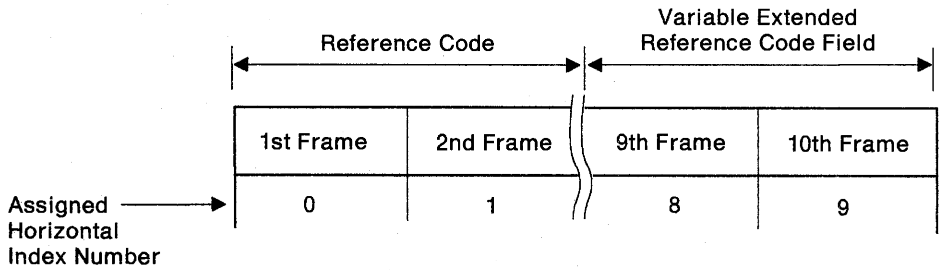
- Horizontal mode is indicated by a nonflashing index number in the Index indicator
- Horizontal mode allows you to display every frame associated with a reference code entry by means of the Advance pushbutton.

Reference Code: Reference codes are generated by the IPC, following the detection of machine malfunctions. The IPC places the reference code in a reference code buffer, along with an assigned vertical index number. The buffer is illustrated below.



The reference code buffer can contain up to ten reference codes, each with its own vertical index number (0–9). The most recent reference code entered in the buffer is displayed in the reference code display. Usually, the first frame of a reference code, displayed at the control panel, is all that is required to fix a given problem. If multiple reference codes exist, pressing the Advance pushbutton momentarily (less than 2 seconds) causes the Reference Code display to change to the next reference code. Also its vertical index number is displayed flashing, along with its first frame.

A typical reference code is shown below:



Changing Modes:

To change the mode (horizontal-to-vertical, and vice versa), press and hold the Advance pushbutton for more than 2 seconds.

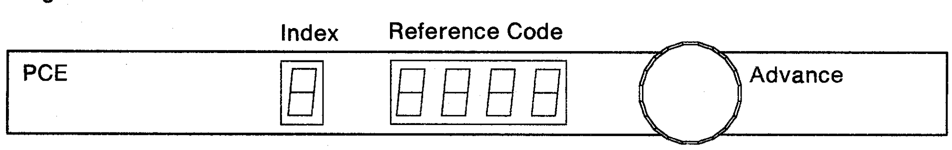
Usually, you will not have to use the horizontal mode unless directed to do so by the next level of support.

Changing the mode always causes an advance to the next available index position in the new mode.

Progress Codes: Progress codes represent various stages during the power-on/off and the IML/IPL process. They're displayed in the Reference Code display, however, the Index indicator is blank. The last normal progress code in a series will remain displayed for 4 minutes, or until a power on/off or an IML/IPL is initiated. Normal progress codes are replaced by a reference code if an error is detected. Then the Index indicator flashes.

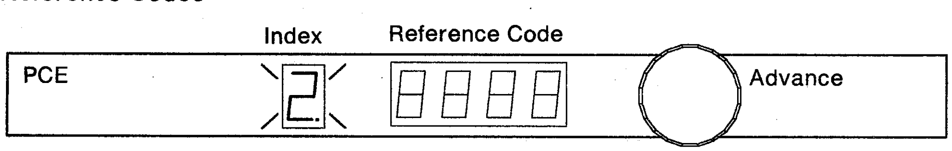
Some Typical Examples:

Progress Codes



- The Advance pushbutton does not affect progress codes
- With progress codes, the Index indicator remains blank.

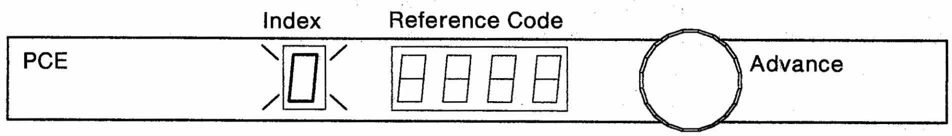
Reference Codes



In the illustration above:

- Vertical mode is indicated by a flashing Index indicator
- A period after the number in the Index indicator indicates the most recently detected error
- The first frame of the third reference code is displayed.

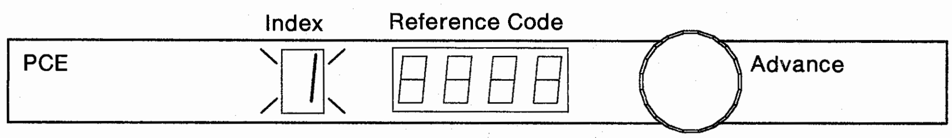
The Advance pushbutton is pressed momentarily (less than 2 seconds) once.



- The vertical mode is still indicated by a flashing index number
- The first reference code is displayed.

Note: Pressing Advance without the presence of further data, will return the Index indicator to zero.

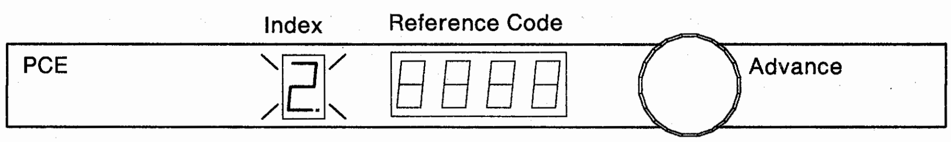
The Advance pushbutton is pressed momentarily again.



- The second reference code is displayed
- Vertical mode is still indicated by the flashing index number.

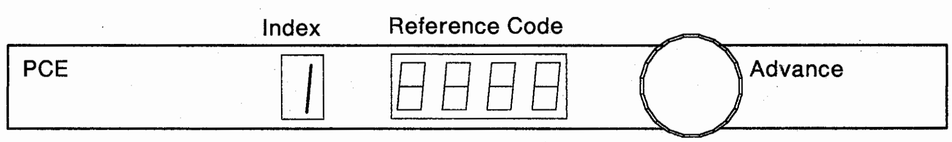
The Next Level of Support Requests Additional Frame Information: (for the most recent reference code)

Press the Advance pushbutton momentarily (less than 2 seconds) to advance to the most recent reference code, that is, the Index indicator number displayed with a period after the digit.



Note: This is the first frame of the most recent reference code.

To Change Mode



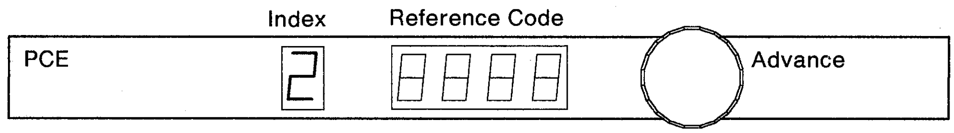
Press and hold the Advance pushbutton for more than 2 seconds, to change from vertical to horizontal mode.

- Horizontal mode is indicated by a non-flashing index number
- Index number 1 indicates the second frame of data, for the most recent reference code:

  (Vertical index= 2.).

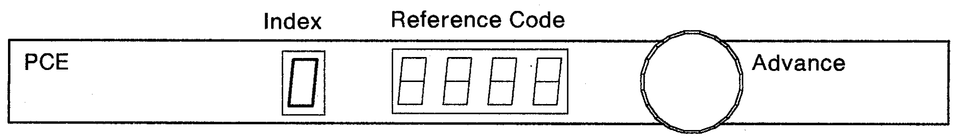
Note: The mode change caused the Index indicator to be advanced to the next available index number in the horizontal mode.

The Advance pushbutton is pressed momentarily to advance to the next horizontal frame



- Horizontal mode is still indicated by a non-flashing index number
- The index number 2 indicates the third frame of data for this reference code.

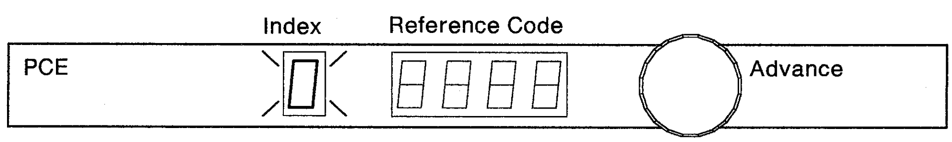
The Advance pushbutton is pressed momentarily again to advance to the next horizontal frame



- Horizontal mode is still indicated by a non-flashing index number
- Index number 0 indicates that this is the first frame of data for this reference code.

Note: Normally, each time you press the Advance pushbutton, the display advances to the next index number (up to a maximum of 9) until a wraparound occurs, or no more data exists. In this example, only three frames of data exist for this reference code as indicated by the return to index number 0, from index number 2, when advanced.

Return to Vertical Mode



Press and hold the Advance pushbutton for more than 2 seconds to change from horizontal, back to vertical mode.

- Vertical mode is indicated by a flashing index number
- Index number 0 indicates that this is the first reference code in the buffer.

Note: Normally, a mode change would advance to the next available index position for that mode, providing that data is available. Since we were observing the reference code at vertical index 2, and it was the last reference code in the buffer, we cannot advance to 3, but will instead return to 0.

Other Reference Code Display Attributes

- When in vertical mode (Index number flashing) for two minutes, the present reference code will be replaced by the most recent reference code
- If you press the Advance pushbutton with no reference codes in the buffer, and with no progress codes present, a flashing 0 is displayed in the Index indicator, with blanks in the Reference Code display.

- When in horizontal mode (Index number not flashing) for 6 minutes, without pressing the Advance pushbutton, the Index indicator and the Reference Code display will return to vertical mode and display the most recent reference code: a flashing index number followed by a period.
- The reference code buffer is cleared when a PCE power-on is initiated or a Clear Panel command is issued from the IOSP.
- The IOSP Disconnect Switch, when enabled, clears the reference codes, but not the power codes (except for the IOSP power code).
- The IOSP Connect Switch, when enabled, and not in IOSP Concurrent Maintenance Mode clears the reference codes, but not the power codes (except for the IOSP power code).
- Whenever an IOSP IML occurs, all of the IOSP reference codes are cleared.
- If more than ten reference codes occur, each additional code replaces the previous one entered at index number 9.
- When going to horizontal mode, a new reference code is added to the reference code buffer, but it will not replace the reference code (frame) being displayed.
- There may be gaps in the index numbers when sequencing through the reference codes in vertical mode with the Advance pushbutton because:
  - A temporary reference code was displayed and then removed when it was logged
  - Reference codes were manually cleared using the Clear Panel reference code screen.

Alarm: This is an audible alarm, used by the Licensed Internal Code to signal the operator of an abnormal condition. It can be reset by depressing the ALARM RESET-LAMP TEST pushbutton.

An alarm relay is also activated when the alarm is sounded and its contacts may be used to interface with a customer's remote alarm.

Service Panel

The service panel is not normally visible to the user. It is for the service representative's use only.

Checking the Processor Controller by Means of Displays

The hardware of the processor unit is controlled by means of displays attached to the processor controller. The displays are defined as consoles that provide the control and communication functions.

Display Compared with Console

For more information on the displays that are used as consoles on the processor unit, see "IOSP Display" on page 8-11, "IOSP Keyboard" on page 8-11, "Optional Remote Display 3151 Models 31 or 41" on page 8-12, and the following publications:

- *IBM 3151 ASCII Display Station Guide to Operations*, GA18-2633
- *IBM ES/9000 Operating Guide*, GA23-0375, for the 8503 Display

The following terms are used extensively in this publication with the following meanings:

Console A console is a logical entity, a set of frames and associated commands. A console is defined by the functions that the console supports (for example, a system console or a service console). More than one console may be assigned to the same display.

Display A display is a physical device to which consoles are assigned.

Port A port connects a display or printer to the processor controller.

The following displays have names that are determined by the port to which they are attached (Figure 8-4 on page 8-23):

- The *service support display* is the display attached to port A and is used to service the processor controller.
- The *system display* is the display attached to port C and is primarily used for the system console. The system display should be located near the master console.
- The *optional displays* are used as additional consoles, such as monitor consoles.

The operator assigns consoles to the displays connected to the processor controller. Assigning a console to a display means that the display assumes the functions of the console when the operator activates the console (makes an assigned console the active console). For the console assignment procedure, see "Console Assignment and Activation" on page 8-23.

Consoles are assigned from the Console Assignment frame. The operator must press the Assgn Cons key to select the Console Assignment frame. (The Console Assignment frame is displayed automatically on any configured display to which no consoles have been assigned.)

Several consoles may be assigned to the same display, if the consoles:

- Are not already assigned to other displays
- Are not mutually exclusive

Mutually exclusive means that the operator cannot assign some consoles together on one display.

The port to which a display is attached is indicated by a port number on line 3 of the Console Assignment frame (Figure 8-5 on page 8-24). The ports to which other displays (with assigned consoles) are attached are also indicated on the Console Assignment frame. The operator may change a console assignment only from the display to which the console is assigned. (The exceptions are the system and service consoles. See "TAKECONS" on page B-11.)

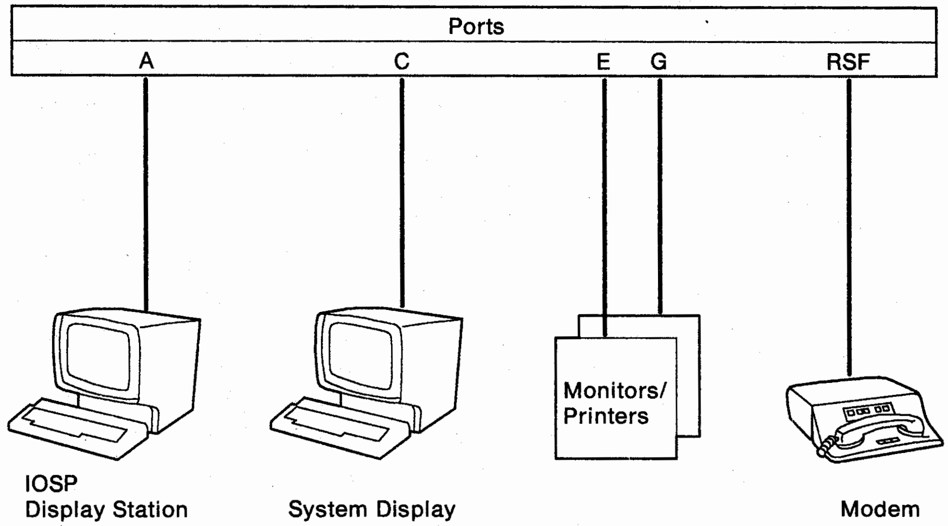


Figure 8-4. Display/Printer Adapter Overview

Console Assignment and Activation

The Console Assignment frame on a display indicates those consoles that cannot be assigned to that display. An x appears to the left of the console name if the console is assigned to another display, or if the console is mutually exclusive with another console already assigned to the display.

The operator may assign several consoles to a display, but only one console may be the active console. To assign and activate a console:

1. Press the **Assgn Cons** key to display the Console Assignment frame (Figure 8-5).
2. Enter **An**, where n is the number of the console to be assigned.
3. The name of the desired console must appear in the *To activate the console* window.

   If the desired console does not appear in the *To activate* window, press the **Swap Cons** key until it does.
4. Press the **End** key to activate the console.

Notes:

1. Consoles are deassigned just as the consoles are assigned. To deassign a console from the Console Assignment frame, enter **An**, where n is the number of the console to be deassigned.
2. See "TAKECONS" on page B-11 to move the system and service consoles by means of the TAKECONS command.

3. See "FREECONS" on page B-3 to interrupt the processor unit when all console input appears to be locked out for extended intervals.

   Note: This procedure is disruptive to the SCP and requires a power-on reset. See "FREECONS" on page B-3.

4. After a switchover, consoles assigned to the port A display may no longer be assigned. If this occurs, reassign the consoles.

```
                                                        dd mmm yy 19:47:07
                                  Console Assignment

                               PHYSICAL DEVICE PORT: C

      A= ASSIGN CONSOLE       Port
     -> 1. System............  C
     -> 2. Service...........  A
       x3. Program Mode......
       x4. System-Monitor....
       x5. Service-Monitor...
       x6. Data Bank Access..
       x7. URSF Console......
       x8. Remote Console....


   To activate the System      console, press END.
   To switch between assigned consoles, press SWAP CONS.


COMMAND ==>
SYSTEM 1
_______________________________________________________________________________
         A:a MODE
```

Figure 8-5. Console Assignment Frame

Processor Controller and System Indicators

This topic provides an overview of the indicators important for determining processor controller and system status.

Processor Unit Status (Line 24)

Line 24 is the *processor unit status line*. Line 24 indicates the name assigned to the system by the customer, the processor (CP) status indicators, and the program status word (PSW).

Power-On Reset Required: When power-on reset is required, line 24 displays the system name and a blanked PSW field. See Figure 8-6.

```
 COMMAND ==>
SYSTEM 1                                                  PSW
________________________________________________________________________
        A:a MODE
```

Figure 8-6. Line 24, Power-On Reset Required

Power-On Reset Complete: When power-on reset is in process or is complete, line 24 displays the system name, a status indicator for each configured processor, and a PSW field that includes a PSW (may be 0's). See Figure 8-7.

```
COMMAND ==>
SYSTEM 1          1 CMWT 2 CMWT                           PSWn hhhhhhhh hhhhhhhh
________________________________________________________________________
        A:a MODE
```

Figure 8-7. Line 24, Power-On Reset Complete

Processor Status Indicators: The processor status (CMWT) indicators are:

C Clock stopped. The processor clocks are stopped.

X indicates that the processor is in the check-stop state.

M Manual state. The processor is in the stopped state.

L indicates that the processor is in the load state.

W Wait state. The processor is in an enabled or disabled wait state.

T Test condition. For example, an address compare is active.

. None of the above conditions present (normal operation).

Other information about the processor status field:

- When **?** is displayed, processor status cannot be determined.
- The ID of the target processor is highlighted.
- No status is indicated for offline processors.

Console Status (Line 25)

Line 25 is the *console status line*. Line 25 indicates that the console is connected to the processor controller(A-side), and it also indicates the mode the processor controller is in. (Figure 8-8).

Console Side Indicator

The indicator on the left shows that the console is connected to the processor controller as the A-side.

Side Mode Indicator

The indicator to the right of the console side indicator shows the mode of the processor controller.

a This indicator is always lowercase for any processor controller without a backup side (such as the ES/9000). *Make sure the Display Case switch on the display is not set to uppercase.*

O Offline.

R Reset. The processor controller is receiving an initial machine load (IML). This is an intermediate state if the processor controller has not failed. This indicator is normally displayed only during the power-on sequence.

S Service. For example, the processor controller is ready for the installation of an EC.

X Transition. The processor controller is being varied offline (and loading). This is an intermediate state if the processor controller has not failed.

```
COMMAND ==>
System
_______________________________________________
       A:a MODE
```

Figure 8-8. Console Status (Line 25)

Operating Status Indicator

Line 25 of the service support display (the display attached to port A) indicates the operating status of the processor controller. See Figure 8-9. If a failure is indicated or suspected, see "Recovering from Processor Controller Problems" on page 8-32.

Waiting: If column 22(on the 3151 Display), or column 26(on the 8503 Display) displays **S ()**, the processor is *waiting*. If the operating status indicator stays on continuously, the processor controller may be in a wait state that is not valid.

```
System
_______________________________________________
       A:a MODE                         S ()
```

Figure 8-9. Processor Controller Operating Status (Waiting)

Running: If column 22(on the 3151 Display), or column 26(on the 8503 Display) is blank, the processor controller is *running*(not in a wait state). If operating status is never displayed, the processor controller may be in a loop that is not valid. During normal operation, the operating status indicator should blink on and off as the processor controller alternately runs and waits.

Stopped: If an **X** is displayed to the right of the **S**, the processor controller is in the stopped state. See Figure 8-10 on page 8-27.

```
System
________________________________________________________
       A:a MODE                              SX()
```

Figure 8-10. Processor Controller in the Stopped State

Check-Stopped: If an **X** is displayed on each side of the parenthesis, the processor controller is in the check-stop state. See Figure 8-11.

```
System
________________________________________________________
       A:a MODE                              SX()X
```

Figure 8-11. Processor Controller in the Check-Stop State

Console Line Definitions

The bottom of the system and service consoles includes four lines that are important to the operator of the processor unit. See Figure 8-12.

```
            Line 22 is the system message line
Command ==> Line 23 is the command line
            Line 24 is the processor unit status line
_______________________________________________________________
            Line 25 is the processor controller console status line
```

Figure 8-12. Console Lines 22, 23, 24, 25

If the processor unit status line is displayed at the system console, the system console owns the configuration (service mode is not on). If the processor unit status line is displayed at the service console, the service console owns the configuration (service mode is on). See "When SERVMODE ON Is Indicated" on page 3-9.

Input Inhibited

If a console is waiting for a response from the processor controller or for availability of the processor controller, the input-inhibited symbol indicates that the console is not ready for further input. The input-inhibited symbol is an **X** and a clock symbol (represented by an asterisk in Figure 8-13) that appears to the right of the side mode indicator.

```
Command ==>
System
________________________________________________________
       A:a X *
```

Figure 8-13. Line 25, Input Inhibited

Determining the Cause of Suspected Problems

If a problem with the processor controller is suspected, the operator should consider the following:

1. Has a display attached to the processor controller failed? Power off the display, wait 30 seconds, and power on the display. If the failed display is a service support display, press the Chg Dply key after power on is complete to restore normal display mode. If recovery is not successful, follow local procedures for reporting problems.
2. Is the system console operational? See "System Console Problem Determination" on page 2-8.
3. Is the processor controller available? See "Availability of the Processor Controller."
4. Is the processor controller in a loop, wait, stopped, or check-stop state? Look at the operating status indicator to determine these states (see "Operating Status Indicator" on page 8-26). If one of these states is indicated, go to "Problem Operating States" on page 8-29.
5. Does the SCP have a message that the processor controller has failed? See "Stall Detected" on page 8-29.
6. Is the processor controller running in IOSP Concurrent Maintenance Mode. See "IOSP Concurrent Maintenance Mode" on page 8-30. Follow local procedures for reporting problems.

Note: If service is found to be necessary, use the telephone to call the service representative, because a processor controller failure may prevent a successful RSF call.

Availability of the Processor Controller

The processor controller may not always be available to the processor unit. For example, during a processor controller warm start, the processor controller is not available (because an IPL is in progress).

Such a *not available* condition is normally a temporary (intermediate) state that has little effect or no effect on the operation of the processor unit. For example, if the processor controller is not available because of a warm start and the operator enters the MVS/ESA command CF or D M, the command is accepted but not executed until the warm start is complete and the processor controller is available.

To find the status of the processor controller, go to the system console and look at line 25 ("Side Mode Indicator" on page 8-26 and "Operating Status Indicator" on page 8-26). Also, see the system console log for priority messages related to processor controller performance.

The processor controller is not available during a warm start.

During a Warm Start: If an error is detected, the processor controller Licensed Internal Code initiates a warm start (an IPL) to reset itself.

During a warm start, the processor controller is not available. A successful warm start is an intermediate state that requires several minutes.

During a warm start, the system console displays the IBM logo (full screen) or PC RUNNING (line 24). The side mode indicator is probably an X (see "Side Mode Indicator" on page 8-26).

Problem Operating States

The operator should use the operating status indicator to determine the state of the processor controller. See "Operating Status Indicator" on page 8-26. If one of the following operating states is indicated read the appropriate section to determine recovery procedures.

Loop or Wait State

Loops or wait states in the processor controller are often seen first as slow or disabled consoles. For example, SAD may be seldom or never updated.

If the operating status indicator seldom blinks or never blinks (the indicator is always off or always on), the processor controller may be in a loop or wait state that is not valid:

- If the operating status indicator is always off, the processor controller is in a loop that is not valid.
- If the operating status indicator is always on, press the Refresh key and look for a response. If the processor controller responds to the Refresh key, the processor controller is operational (but waiting normally). No recovery action is necessary.

  If the processor controller does not respond to the Refresh key, the it is in a wait state that is not valid.

Attempt a forced warm start (see "Forced Warm Start of the Processor Controller" on page 8-32) to recover from a loop or wait state that is not valid. If the warm start does not recover the processor controller, follow local procedures for reporting problems.

Stopped State

As with a loop or wait state that is not valid, when the processor controller is in the stopped state, attempt a forced warm start. If the warm start does not recover the processor controller, follow local procedures for reporting problems.

Check-Stop State

Follow local procedures for reporting problems.

Stall Detected

If the SCP is MVS/ESA, message IEA470W indicates that the processor controller has failed and that automatic recovery was not successful. See "Stall Detection" on page 1-18 for a discussion of stall detection.

Use the telephone to call the service representative because a processor controller failure may prevent a successful RSF call.

The Processor Controller Is Not Available	**All Models:** If stall detected is indicated, the processor controller is not available. The operator should plan to shut down the SCP. Continued processing involves risk. No system console is available and the processor unit has no recovery capability. ***Recovery Action:*** Switch off and switch on power to the processor unit (see "Step 1. Switching On Power to the Processor Controller" on page 8-37): • If the power-on sequence is successful, IPL the SCP. Service may be deferred, but processing involves risk because the original problem may occur again. • If the power-on sequence is not successful, allow the service representative to repair the processor controller.

IOSP Concurrent Maintenance Mode

The processor controller recovers from most errors by performing an automatic warm start. If, for some reason, the processor controller is not able to perform automatic recovery it will attempt to enter IOSP concurrent maintenance mode. In IOSP concurrent maintenance mode the processor controller will continue to run with an abbreviated set of critical functions. In IOSP concurrent maintenance mode, all non-critical functions are suspended, such as the IOSP-attached consoles, the SAD status display, error analysis, and the Remote Support Facility (RSF). Operating in this mode allows the IOSP to be powered off for repairs. When repairs are complete, the IOSP can be powered on again without the PSP IML being reinitiated. The PCC restarts, and normal processor unit support is resumed without disturbing ongoing processor unit operations.

How You Know Your ES/9000 Is in IOSP Concurrent Maintenance Mode

There are two ways to know that your ES/9000 is in IOSP Concurrent Maintenance Mode.

- A message is displayed at the system console of the SCP indicating that the PCE can only perform a subset of functions. It then informs you to follow local procedures for reporting the PCE problem.

  Note: If you have more than one operating system running under LPAR mode, this message will be written to the system console of all the active logical partitions.

- The **IOSP Disconnected** light on the system power panel turns on when the ES/9000 is in IOSP concurrent maintenance mode. (See Figure 8-14.) A reference code also appears on the system power panel; write down the reference code to help IBM service personnel when they come to your site. At the ES/9000 processor unit, the audible alarm will sound.

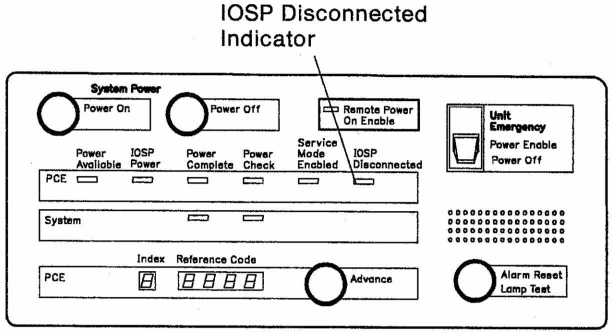


Figure 8-14. IOSP Disconnected Light on the System Power Panel

What Works in IOSP Concurrent Maintenance Mode

Operations that are necessary for the processor unit to operate are supported. You can keep running whatever jobs are on the processor unit, but you cannot change anything. Your operating system console should function normally, and it may support the following operations in IOSP concurrent maintenance mode.

- Configure or deconfigure channel path IDs
- Write the event data
- Write the event mask
- Suppress or unsuppress the I/O devices
- Reply to LPAR Call
- Channel path reset
- Read:
  - Operating system information
  - Processor unit information
  - Channel path information
  - Channel set information
  - Channel subsystem information
  - Event data
  - Expanded storage information
  - LPAR Call
  - Storage element information.

What Does Not Work in IOSP Concurrent Maintenance Mode

The Remote Support Facility (RSF) function does not work in IOSP concurrent maintenance mode; therefore, **you must manually place a call to IBM service personnel.**

Also, when your ES/9000 system is in IOSP concurrent maintenance mode, you cannot use the IOSP display station or the 3151 display stations, that is, you will not be able to do things such as assign storage or write the IOCDS. You also will not be able to change the mode your ES/9000 is in, for instance, if the machine is in LPAR mode when it goes into IOSP concurrent maintenance mode, you cannot change the LPAR mode to any other mode.

Repairing the Hardware While in IOSP Concurrent Maintenance Mode

Generally, the IBM service representative can repair most hardware failures without disturbing the normal operation of the system(SCP).

Exiting IOSP Concurrent Maintenance Mode

Your IBM service representative will make sure that the system leaves IOSP concurrent maintenance mode.

Recovering from Processor Controller Problems

In most circumstances the processor controller provides automatic recovery without any operator intervention. There are some instances, however, when automatic recovery will not take place. For example, a hardware error of a critical device causes the PCE to go into IOSP concurrent maintenance mode. In this case, your IBM service representative will have to be called to fix the hardware, but the SCP will continue to run. The processor controller will continue to run also, but with an abbreviated list of functions. Your IBM service representative will provide recovery from IOSP concurrent maintenance mode by fixing the problem and returning the system to normal operating mode (see "IOSP Concurrent Maintenance Mode" on page 8-30).

Other recovery actions include the following:

- Forced Warm Start of the Processor Controller
- Switching Power On and Off to the Processor Controller

Forced Warm Start of the Processor Controller

A forced warm start is a RESTART of the processor controller when performed from the service support display (the display attached to port A).

An *RSF Authorization Required* priority message may appear during or after any attempt to warm start the processor controller. If necessary, follow local procedures for reporting problems.

The following pages will walk you through the menus needed to perform a warm start of the processor controller.

Step 1 - Selecting the Session Select Frame

- Go to the service support display.
- Press the Alt and SvPCE keys to display the **Session Selection** frame.

A US English keyboard with PCE nomenclature, for use with the IOSP support display, is connected (must be within 8 feet) to the keyboard port at the IOSP. The keyboard is shown below.

Note: The ATTN and SYSRQ keys provide no functions.

See Figure 8-15 below:

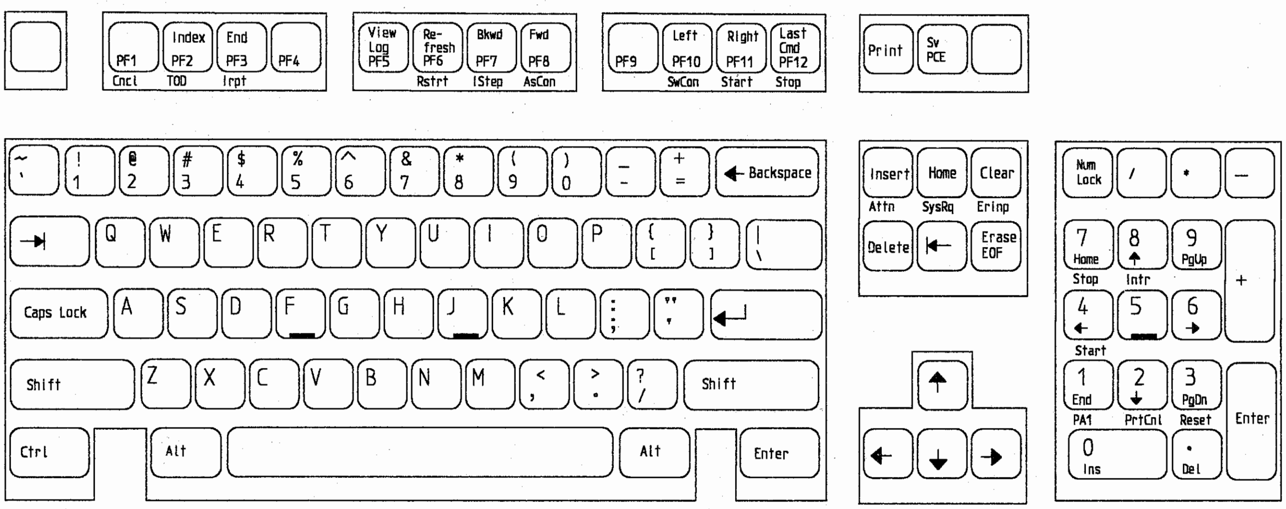


Figure 8-15. Service Support Display Keyboard

Step 2 - Selecting the PCE Operational Main Menu Frame

- From the Session Selection frame Select option 1 (PCE Service Mode) to display the **PCE OPERATIONAL MAIN MENU** frame.

See Figure 8-16 below:

```
                         SESSION SELECTION

          Press the number of the session that you want.

            1  PCE Service Mode

            2  PCE Consoles

            3  ECP Tape Drive Control




               Select: _

          PF1=Help        PF2=MainMenu                         PF5=PrvMenu
 ----------------------------------------------------------------------------
       A:a MODE      Sv PCE
```

Figure 8-16. SESSION SELECTION Frame

Step 3 - Selecting the System Operator Functions Frame

- From the PCE Operational Main Menu frame Select option 1 (System Operator Functions) to display the **SYSTEM OPERATOR FUNCTIONS** frame.

See Figure 8-17 below:

```
                    PCE OPERATIONAL MAIN MENU

     Select one of the following options and press Enter.

       1  System Operator Functions      5  Display/Alter IPC Codes

       2  Problem Analysis               6  Clear Panel Reference Codes

       3  PSP Tests                      7  Configuration

       4  PSP Load



            Select: _

     PF1=Help
  ______________________________________________________________________
  A:a MODE     Sv PCE
```

Figure 8-17. PCE OPERATIONAL MAIN MENU Frame

Step 4 - Warm Starting the Processor Controller

- From the System Operator Functions frame Select option 3 (Restart PSP) to force a warm start of the processor controller.

See Figure 8-18 below:

```
                      SYSTEM OPERATOR FUNCTIONS

      Select one of the following options and press Enter.

        1  IPL PSP, Fixed Disk 1 ADR = 240

        2  Display PSP PSW

        3  Restart PSP



            Select: _

      PF1=Help        PF2=MainMenu                           PF5=PrvMenu

 ________________________________________________________________________
          A:a MODE     Sv PCE
```

Figure 8-18. SYSTEM OPERATOR FUNCTIONS Frame

Note: Wait several minutes for the warm start to complete:

- If the warm start is successful, the INDEX0 frame is displayed. If necessary, reassign the consoles attached to the processor controller.
- If the warm start is not successful, follow local procedures for reporting problems.
- If the warm start is not successful, the processor controller can be recovered only by an IML of the processor controller or by a power-on sequence of the processor unit. The service representative can IML the processor controller at any time if the SCP is not active (power-on reset is required).

Switching Power On and Off

Step 1. Switching On Power to the Processor Controller

Note: If possible, do an orderly shut down of the SCP before powering the processor controller on and off, otherwise warm start data may be lost.

Do the following to switch on power to the processor controller.

Warning: To prevent false errors during the power-on sequence, always wait at least 60 seconds after power to the processor controller is completely switched off before attempting to switch power on again.

1.	**GO TO**	System Power panel (see the following diagram)
2.	**PRESS**	**Power On**
3.	**VERIFY**	The PCE Power Complete and System Power Complete indicators are lighted steadily, not blinking.

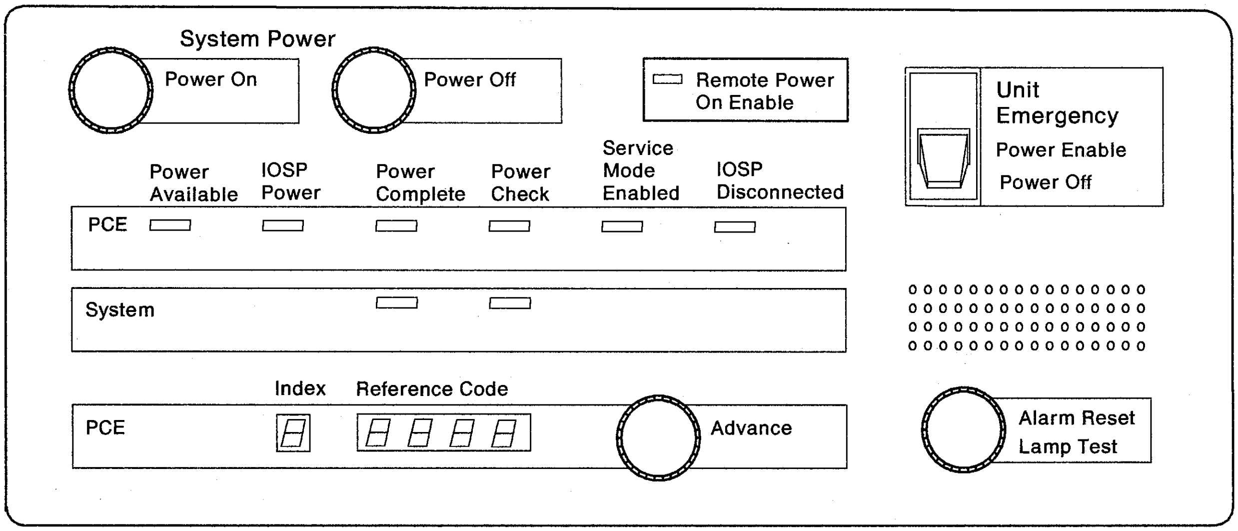


Figure 8-19. System Power Panel

Step 2. Switching Off Power to the Processor Controller

Do the following to switch off power to the processor controller.

1.	**GO TO**	System Power panel (see diagram above)
2.	**PRESS**	**Power Off**
3.	**VERIFY**	The Power Complete indicator goes out.

End of Task

Part 2. Logically Partitioned Mode

Part 2 is a guide to recovery on the processor unit when LPAR mode is selected.

Part 1 is written to address the processor unit in one of the basic modes (not LPAR mode). Much of Part 1 also applies to LPAR mode, but LPAR mode is seldom mentioned. For example, all of the problem determination tools mentioned in "How to Use the Recovery Guide" on page 2-2 are available in LPAR mode. The recovery capability of the processor unit in LPAR mode is the same as in the basic modes, but recovery in LPAR mode requires additional considerations. This chapter addresses the differences in recovery between the basic modes and LPAR mode.

Conventions in Part 2: The following conventions are unique to Part 2 of this publication. See "Conventions Used in This Publication" on page xvii for the conventions common to both Part 1 and Part 2.

- Where Part 1 used *master console* (an MVS term), Part 2 often substitutes *operator console* (a generic term) for the console from which the operator controls the SCP.
- *Main* storage and *central* storage are the same in LPAR mode.
- Where the operator is asked to *shut down* the SCP, the operator should stop all application programs and the SCP in a logical partition in such a way that a SYSRESET (for example) *could* then be executed in the logical partition without causing any disruption.
- Where the IOCDS is referred to as having been *rewritten*, the IOCDS file may have been copied, renamed, or changed. LPAR mode checks the IOCDSM filename first and the time stamp second; if either have changed, LPAR mode considers the IOCDS to be a new IOCDS (even if copied or renamed and otherwise identical to the original).

The following topics correspond to information provided in this chapter as follows:

Chapter 1. Planning for Recovery: See "Planning for Recovery in LPAR Mode" on page 9-2.

Chapter 2. Problem Determination: See "Problem Determination in LPAR Mode" on page 9-12.

Chapter 3. Procedures for Recovery: See "Procedures in LPAR Mode" on page 9-23.

Chapters 4, 5, 6, and 7. Processor Unit Hardware: Given the characteristics of LPAR mode, the hardware generally operates as in the basic modes. Recovery of the hardware in LPAR mode may require special considerations. See Chapter 10, "Recovery Actions in LPAR Mode" on page 10-1.

Chapter 8. Processor Controller: Chapter 8 is generally applicable to this chapter, given the characteristics of LPAR mode. An exception is console line 24. See "Processor Unit Status (Line 24)" on page 9-12.

Chapter 9. Recovery Topics in LPAR Mode

This chapter discusses the following topics:

Planning for Recovery in LPAR Mode

Overview of LPAR Mode

The Processor Resource/Systems Manager (PR/SM) allows the processor unit to operate several system control programs (SCPs) simultaneously in LPAR mode. The operator, by means of system console frames, allocates the resources of the processor unit (processors, vector facilities, processor storage, channel paths) among the various SCPs. All SCPs may then operate simultaneously, each with its own set of resources. A set of resources for an SCP is called a logical partition (LP). The operator controls the logical partitions as though each logical partition is a processor unit operating in one of the basic modes. The basic modes include any CP mode that is available on the Configuration (CONFIG) frame, except LPAR mode.

The characteristics of LPAR mode include:

- LPAR mode is a CP mode selection that is chosen before a power-on reset is performed.
- LPAR mode allows physical processors and vector facilities to be shared among all logical partitions that do not use dedicated processors.
- Logical partitions may be activated and deactivated at any time and in any order.
- Processor (main and expanded) storage is allocated to logical partitions in 1M-byte increments.
- Channel paths are assigned to logical partitions during IOCP execution. Channel path assignments may be changed among logical partitions while the logical partitions are active or deactivated.

Overview of Logical Partitions

Logical partitions are logical divisions of the processor unit hardware. For an example of this perspective, see Figure 9-1. A logical partition owns its channel paths and processor storage. Each logical partition operates independently of the others.

When allocating processors to logical partitions, consider the following:

- The number of processors allocated to a logical partition should reflect both the capability of the SCP to use the processors and the processor utilization rate expected by the application.
- Shared processors enhance recoverability and may provide higher throughput rates. Dedicated processors may sometimes be necessary.

When allocating processor storage to logical partitions, consider the following:

- Configured = defined. The total of configured storage is the same as the total of defined storage when all logical partitions are activated at the same time.
- Configured > defined. The total of configured storage is greater than the total of defined storage. This condition leaves storage that is not being used, even if all logical partitions are activated at the same time.
- Configured < defined. The total of defined storage is greater than the total of configured storage. This condition may be legal and intentional if all logical partitions are not activated at the same time.

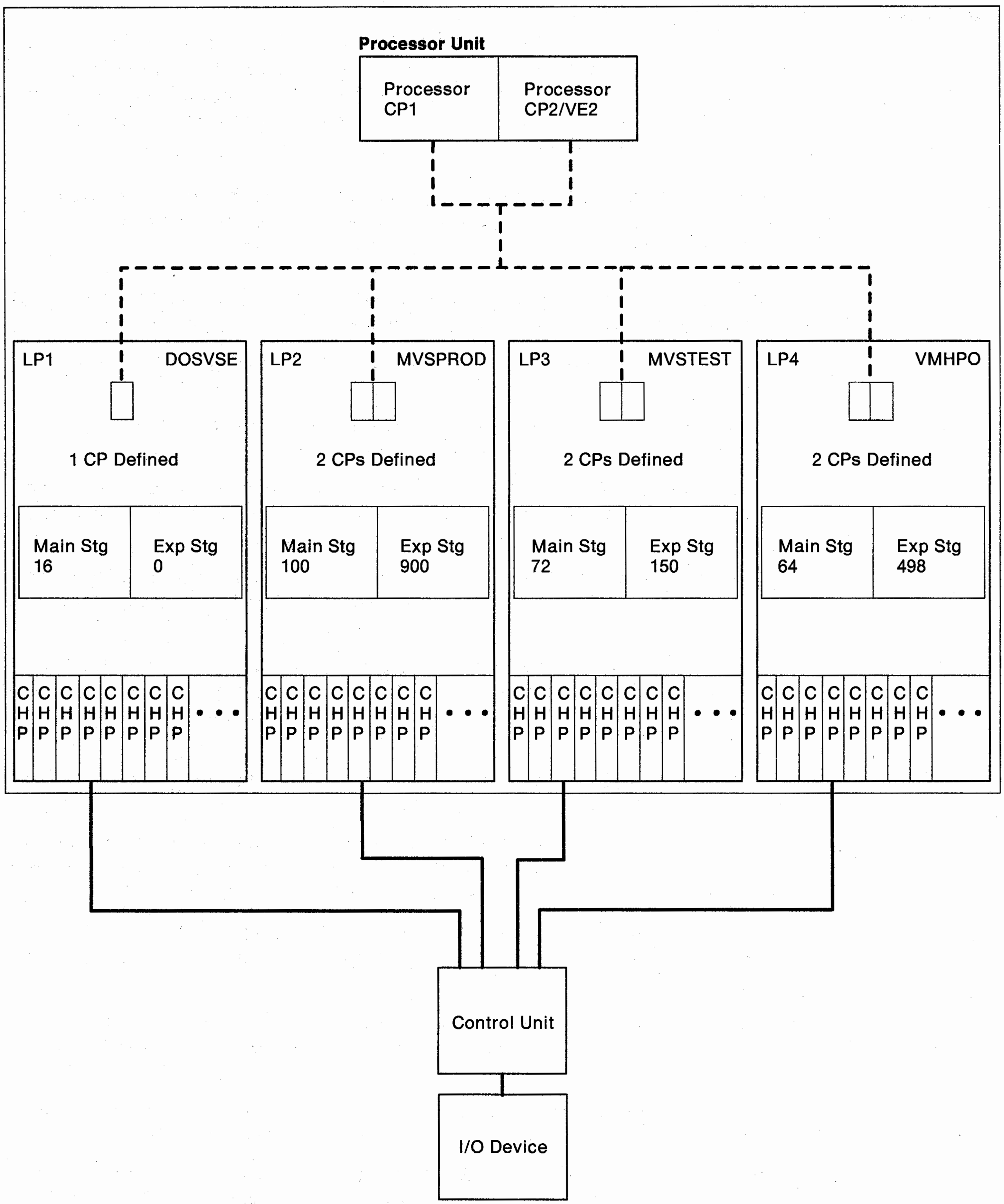


Figure 9-1. Overview of Logical Partitions

Recovery Strategy in LPAR Mode

The recovery strategy in LPAR mode requires that the operator understand the relationship between LPAR mode and the logical partitions. See "Recovery Strategy" on page 1-3 for a discussion of the recovery strategy in one of the basic modes of operation. Also see Figure 9-2 for an overview of the recovery strategy when operating in LPAR mode.

Recovery is considered successful if a logical partition is able to perform useful work after a failure occurs. The ability to recover depends on the extent and location of the failure and the ability of the SCP to handle the failure.

The operator should follow local procedures for reporting problems and consider the following recovery actions (ranked from least to most disruptive):

- If an affected logical partition continues to operate with a problem, allow it to do so.
- If the SCP in a logical partition remains active but processing is interrupted, consider the applicability of a program restart or IPL.
- Enter the LOGLP command for the affected logical partition. See "LOGLP" on page B-6. When the logout completes, perform a stand-alone dump and IPL the SCP.
- Enter the LOGLP command for the affected logical partition. See "LOGLP" on page B-6. When the logout completes, perform a stand-alone dump. Deactivate the logical partition, activate the logical partition, and IPL the SCP.
- Enter the LOGLP command for the affected logical partition. See "LOGLP" on page B-6. When the logout completes, perform a stand-alone dump. Deactivate the logical partition, redefine it to exclude failed hardware, activate the logical partition, and IPL the SCP.
- Shut down the SCP in an affected logical partition. If the logical partition is not critical, allow the other logical partitions to continue.

If all logical partitions are affected, or if a critical logical partition is affected and it did not respond to recovery actions directed only to it, the operator should consider the following recovery actions (also ranked from least to most disruptive):

- Shut down all SCPs. Initialize LPAR mode by entering the LPAR RESTART command (see "LPAR" on page B-7). Activate the logical partitions and IPL the SCPs.
- Shut down all SCPs. Perform the most appropriate recovery action (for example, in response to a hardware failure) as in one of the basic modes of operation. Perform a power-on reset in LPAR mode.
- If a power-on reset fails to initialize LPAR mode, perform a power-on reset in one of the basic modes as a last resort. IPL the most critical SCP.

Note: Recovery in LPAR mode may be considered successful if one or more logical partitions are disabled, as long as the most critical applications remain operational.

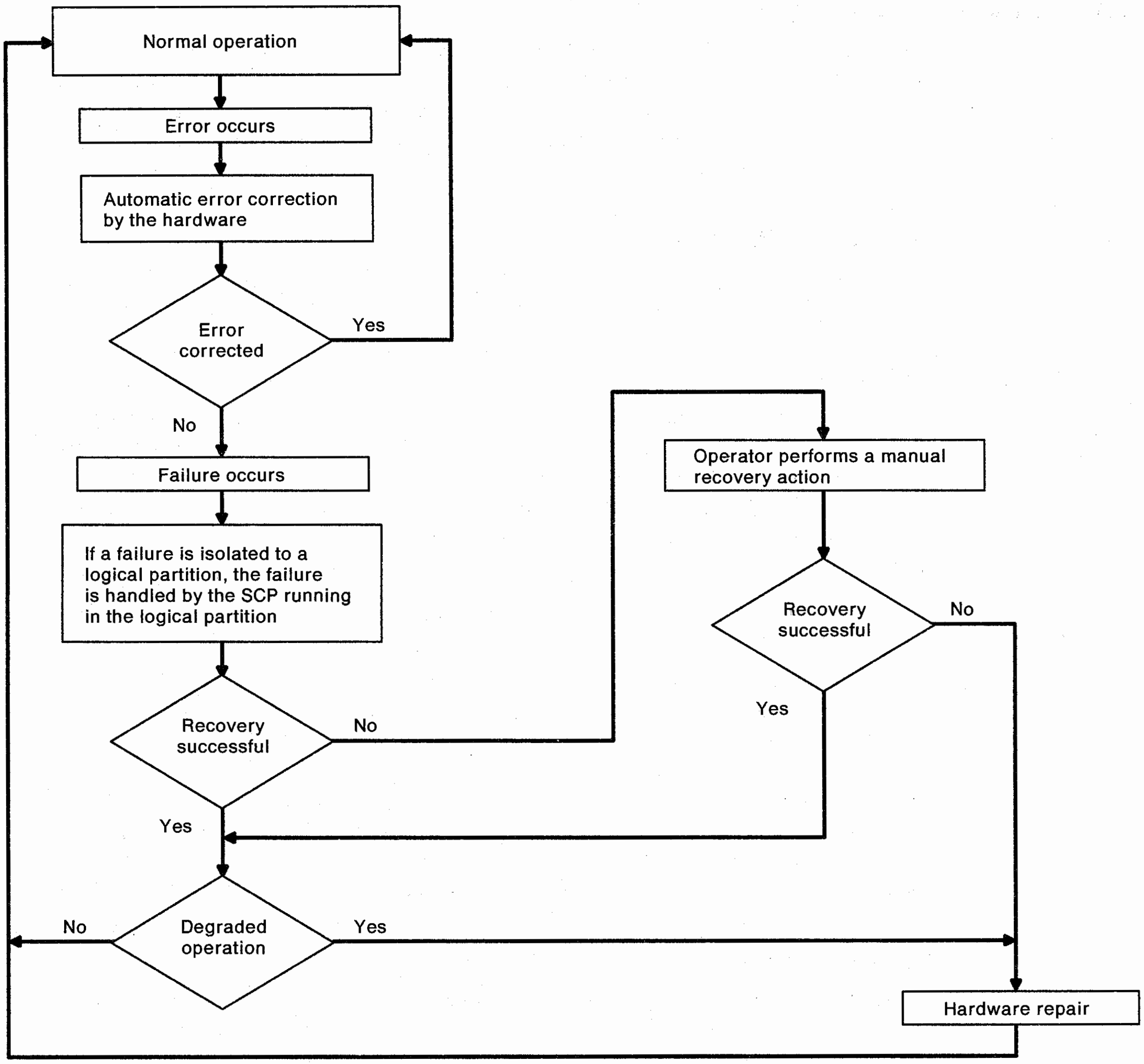


Figure 9-2. Error and Failure Flowchart for LPAR Mode

Problem Analysis Facility in LPAR Mode

The problem analysis (PA) facility operates in LPAR mode as it does in one of the basic modes. The PA facility reports hardware failures and does not recognize logical partitions. See "Problem Analysis Facility" on page 1-5 for a discussion of the PA facility in one of the basic modes. See "Using the Problem Analysis Facility in LPAR Mode" on page 9-19 for the differences in the PA facility in LPAR mode.

Remote Support Facility in LPAR Mode

The remote support facility (RSF) operates in LPAR mode as it does in one of the basic modes. See "Remote Support Facility" on page 1-10.

Stall Detection in LPAR Mode

Stall detection for the processor controller operates in LPAR mode the same as it does in one of the basic modes. From the OPRCTL frame, the operator may separately enable or disable stall detection for each logical partition. Installation management may choose to have stall detection disabled for any logical partition that uses an SCP that is not capable of handling a service processor damage (SP) machine check. See "Stall Detection" on page 1-18.

Single Points of Failure in LPAR Mode

The single points of failure in LPAR mode include the PR/SM hardware and the single points of failure in one of basic modes. See "Single Points of Failure in LPAR Mode" on page 10-16.

Failures such as uncorrectable errors (UEs) in critical processor storage areas (outside of the HSA), or unrecoverable problems in critical I/O devices and paths are confined to a logical partition. In LPAR mode, a single point of failure may involve the failure of a critical logical partition or the failure of all logical partitions.

Channel Paths and I/O Devices in LPAR Mode

In addition to the guidelines for I/O device configuration given in "Channel Paths and I/O Devices" on page 1-20, installation management should try to assign channel elements to logical partitions so that if a channel adapter fails, the failure is isolated to one logical partition. See "Channel Subsystem Overview" on page 7-2 for a discussion of the relationship between failures in channel subsystem hardware, I/O device configuration, and recoverability.

Each logical partition is independent of the others. The IOCP creates unique subchannels (SCHs or UCWs) and logical control units (LCUs) for each device. If an I/O device is connected to more than one logical partition, unique subchannels and logical control units are created for each logical partition.

Channel path reassignments are written to the processor controller DASD and are associated with the IOCDS (the IOCDS itself is not changed). If the IOCDS is rewritten, the channel path reassignments are erased (the next time the IOCDS is loaded into the HSA). If the IOCDS is not rewritten, the changes to channel path assignment take effect when the logical partitions are activated.

A power-on reset initially configures all channel paths in their original logical partitions as defined in the IOCDS. As each logical partition is activated, if a channel path was moved out of a logical partition, the channel path is taken offline to that logical partition; if a channel path was moved into a logical partition, the channel path is brought online to that logical partition. These logical configuration changes are reflected on the CHNCFA frame.

When an S/370 logical partition is activated, only those channel paths that have been assigned a channel number on the LPCHND frame are brought online. Otherwise, the channel paths are left offline when the logical partition is activated. Such offline channel paths cannot be reassigned to another logical partition until the operator enters the SETLP command to select the logical partition to which the channel path is assigned, and enters the CHPID command (CHPID nn OFF) to configure the channel path offline.

Operator Console Configuration in LPAR Mode

In LPAR mode, each logical partition requires the same operator console configuration as an SCP in one of the basic modes. For the MVS/ESA requirements, see "Master Console Configuration" on page 1-21.

IOCP Reports in LPAR Mode

IOCP reports should be produced in LPAR mode as in one of the basic modes. See "IOCP Reports" on page 1-22. IOCP reports for LPAR mode IOCDSs also indicate logical partition names and the channel paths assigned to each logical partition.

Note: Current copies of the LPCHNA frame provide a record of any reassigned channel paths. Channel path reassignments associated with an IOCDS are erased if the IOCDS is rewritten and then selected prior to a power-on reset.

Resource Measurement Facility in LPAR Mode

RMF operation in LPAR mode is similar to that in one of the basic modes. See "Resource Measurement Facility" on page 1-22. In LPAR mode, RMF also provides additional data regarding processor utilization and channel subsystem activity counts by other logical partitions.

ACTIVE IOCDS Field on the CONFIG Frame in LPAR Mode

The ACTIVE IOCDS field on the CONFIG frame operates in LPAR mode as it does in one of the basic modes. See "Modification of the Active IOCDS" on page 1-23 for a discussion of this field. At the beginning of a power-on reset, the IOCDS is checked to make sure that it is a correct type of IOCDS (BASC or LPAR) for the CP mode.

IOCDS Considerations in LPAR Mode: Values on the Logical Partition Controls (LPCTL) frame are associated with an IOCDS and *not* with logical partition definitions. Rewriting an LPAR mode IOCDS may affect LPCTL values. See "Changing the Weight of Logical Partitions" on page 9-35.

Duplicate Device Number Conflicts

When systems are migrated to a processor unit in LPAR mode, the combination of systems probably includes different devices and shared devices, each with identical device numbers. IOCP generates an LPAR mode IOCDS that allows duplicate device numbers if the device numbers are not duplicated in a logical partition. LPAR mode thereby allows systems to be integrated in a processor unit without changing device numbers.

LPAR mode requires that the system programmer provide IOCP a unique device number for each device in each logical partition. If IOCP completes without error, the initial configuration contains no duplicate device number conflicts within logical partitions.

Conflicts may occur when the I/O configuration is changed. If a reconfigurable channel path is reassigned to another logical partition and devices attached to the channel path have device numbers that are already assigned in the receiving logical partition to other online channel paths, a conflict results. The conflicts are detected during the execution of commands that change the I/O configuration (the CHPID command or an SCP configuration command) or during logical partition activation.

The operator is informed of device number conflicts by means of one or more line 22 messages that identify a device, several devices, or a range of devices in conflict. The identified device cannot be accessed while a conflict exists. Two types of conflict are possible: between device numbers for the same device (a shared device) or between device numbers for different devices (nonshared devices).

Examples: Figure 9-3 on page 9-10 provides two examples of duplicate device number conflict. As indicated, both examples use identical IOCP macroinstructions. Channel path 04 is reassigned from MVSPROD to MVSTEST in each example. This creates a duplicate device number conflict regarding device number 180 because a device numbered 180 already exists on the original channel path 10. If such conflicts occur, the operator must know what configuration is desired.

Shared Device In the example on the left, the duplicate device numbers refer to the same device from different logical partitions (a new path to the same device has been moved to MVSTEST). This may result in a performance problem because the SCP in logical partition MVSTEST may not access the device from the desired channel path.

Nonshared Device In the example on the right, the duplicate device numbers refer to a different device from each logical partition (a new device has been moved to MVSTEST). This may result in a data integrity problem because the SCP in logical partition MVSTEST may not access the correct device from channel path 04.

Options: Consider the following options when planning the I/O configuration and the reconfigurability of channel paths. The operator, after consulting with installation management, must resolve duplicate device number conflicts by performing one of the following:

A **Do nothing and use the original channel path.** If the receiving logical partition does not need a new path to a shared device or does not need the new (nonshared) device, the operator should do nothing. The conflict is resolved by using only the *original* path (shared device) or the *original* device. (Access is still allowed to any nonconflicting devices on the reassigned channel path.)

In Figure 9-3, MVSTEST can access device 180 only through channel path 10 if the operator does nothing in response to the conflict message.

B **Deconfigure the original channel path and use the reassigned channel path.** If the logical partition must have the reassigned channel path to a shared device or access to a new (nonshared) device, the conflict is resolved by substituting the reassigned channel path for the original channel path. Perform the following steps:

1. Configure offline the original channel path (CHP 10 in Figure 9-3).

2. Configure offline and then online the reassigned channel path (CHP 04 in Figure 9-3).

3. If necessary or appropriate, configure online the original channel path (CHP 10 in Figure 9-3). Another conflict message is issued because a new conflict has been created. The operator then ignores this conflict as in option A. (Access is still allowed to any nonconflicting devices on the original channel path.)

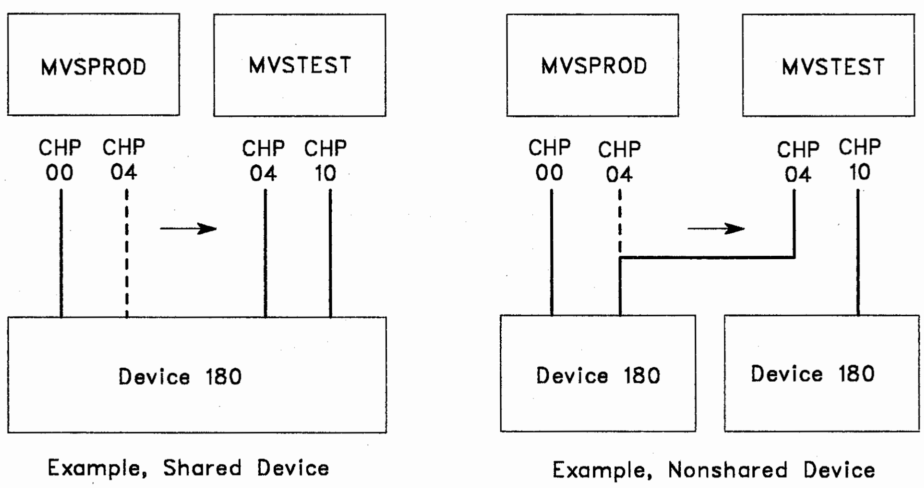
In Figure 9-3, MVSTEST can access device 180 only through channel path 04 if the operator performs the above steps in response to the conflict message.

C **Change the IOCDS.** If the logical partition must have access to all devices over the original channel path **and** the reassigned channel path (shared devices), or to a new device **and** the original device (nonshared devices), the operator must perform one of the following:

- Select an existing LPAR IOCDS that reflects the desired configuration and perform a power-on reset. Or,
- Change the current LPAR IOCDS to provide unique device numbers to the conflicting devices and perform a power-on reset. Or,
- Generate a new LPAR IOCDS that provides unique device numbers to the conflicting devices and perform a power-on reset.

In Figure 9-3 (shared device), MVSTEST can access device 180 through CHP 04 and CHP 10 if CHP 04 is defined to MVSTEST in the IOCDS.

In Figure 9-3 (nonshared device), MVSTEST can access either device 180 (nonshared device) if one or both of the devices is renumbered in the IOCDS.




```
CHPID PATH=(00,04),PARTITION=(MVSPROD,REC)
CNTLUNIT CUNUMBR=001,PATH=(00,04),UNITADD=80
IODEVICE ADDRESS=180,CUNUMBR=001,UNITADD=80

CHPID PATH=(10),PARTITION=(MVSTEST)
CNTLUNIT CUNUMBR=002,PATH=(10),UNITADD=80
IODEVICE ADDRESS=180,CUNUMBR=002,UNITADD=80
```

Figure 9-3. Examples of Duplicate Device Number Conflicts

Logical Partition Activation: Logical partitions may fail to activate because of device number conflicts if (1) the receiving logical partition was deactivated when a channel path is reassigned or (2) the receiving logical partition is deactivated after a channel path is reassigned. Such a failure to activate may be the result of having used option A or B. (Option C provides a permanent resolution to a conflict.) If a logical partition fails to activate, option B or C must be used to resolve the conflict and activate the logical partition.

In Figure 9-3, if MVSTEST is not active when CHP 04 is reassigned, or MVSTEST is deactivated and then activated after CHP 04 is reassigned, MVSTEST does not activate until the conflict over device 180 is resolved. If the operator resolves the conflict by using option B, the operator must establish the correct configuration by configuring offline one of the channel paths (CHP 04 or CHP 10), and configuring offline and then online the other channel path. After activation, the operator may, if necessary, configure online the first channel path (ignoring the resulting conflict message).

Problem Determination in LPAR Mode

The following topics discuss the differences in problem determination indicators in LPAR mode.

Processor Unit Status (Line 24)

In LPAR mode, line 24 on the system console indicates the status of the logical processors that are allocated to the *target* logical partition. Line 24 also includes a physical processor summary status indicator. Line 24 is also described in *Operator Tasks for the System Console.*

Note: For more information on the target logical partition, see "Target Logical Partitions" on page 9-23.

Power-On Reset Required: When the configuration is released (power-on reset is required), line 24 displays the system name and -------- for the name of the target logical partition. See Figure 9-4.

```
SYSTEM 1  --------                                      PSW
-----------------------------------------------------------------
       A:a MODE
```

Figure 9-4. Line 24, Power-On Reset Required

Logical Partition Not Active: When the power-on reset is complete, but the target logical partition is not active, line 24 displays the system name, the name of the target logical partition, and the physical processor summary status indicator. See Figure 9-5.

```
SYSTEM 1  MVSPROD                                    P. PSW
-----------------------------------------------------------------
       A:a MODE
```

Figure 9-5. Line 24, Power-On Reset Complete, Logical Partition Not Active

Logical Partition Active: When the power-on reset is complete and the target logical partition is active, line 24 displays the system name, the name of the target logical partition, the logical status indicator for each processor allocated to the logical partition, the physical summary status indicator, and the logical summary status indicator. See Figure 9-6.

```
SYSTEM 1  MVSPROD   1 MW 2 MW                   L. P. PSWn hhhhhhhh hhhhhhhh
-----------------------------------------------------------------
       A:a MODE
```

Figure 9-6. Line 24, Power-On Reset Complete, Logical Partition Active

Logical Processor Status Indicator: Line 24 displays the status of the processors in the target logical partition. The logical processor status (MW) indicators are:

M Manual state. The logical processor is in the stopped state.

L (in place of the M) indicates the load state.

If the logical processor is not in the manual or load state, a period (.) is displayed (in place of the M).

W Wait state. The logical processor is waiting (disabled or enabled wait state).

If the logical processor is not in a wait state, a period (.) is displayed (in place of the W).

Logical Processor Summary Status Indicator: **L** (on the right side of line 24) is the logical processor summary status indicator for the processors in the target logical partition. Immediately to the right of the L one of the following status symbols is displayed:

X Check-stop state (at least one logical processor)

T Test mode (at least one logical processor)

***** More than one condition (both X and T) present

. None of the above conditions present (normal operation)

Physical Processor Summary Status Indicator: **P** (on the right side of line 24) is the physical processor summary status indicator for the processors in the hardware configuration. Immediately to the right of the P one of the following status symbols is displayed:

X Check-stop state

C Clock-stop state

T Test mode

***** More than one condition (X, C, or T) present

. None of the above conditions present (normal operation)

When the physical summary status indicator is other than a period (.), the CPSTAT frame indicates the physical status of individual physical processors. See "Status of Physical Processors" on page 9-16.

Processor in Check-Stop State

If a processor is in the check-stop state, the operator should use the following procedure:

1. The operator should go to the system console and look carefully at the message that is first displayed:
   - If a physical processor is in the check-stop state, it is identified by the first priority message. The operator should note the ID of the physical processor and press the Enter key to clear the message. Priority message 51640 (Figure 9-7) then appears to identify the logical partition and the affected logical processor. (If a physical processor is check-stopped, a logical processor was probably dispatched on it and so a logical processor is also check-stopped.)
   - If a logical processor is check-stopped but a physical processor was not the reason for its failure, priority message 51640 (Figure 9-7) appears first and is probably *not* followed by another priority message.

   Note: Priority messages remain available after being cleared. Look in the console log.

```
19:47:07                                                          (51640)

 ************************ PRIORITY MESSAGE *************************
 *                                                                 *
 *   Partition MVSPROD :         is in the check-stop state.       *
 *                                                                 *
 * Intended Console: SYSTEM                                        *
 *                                                                 *
 * Detailed Information: The processor is in the check-stop state. *
 *                                                                 *
 *                      Reason Code = D1                           *
 *                                                                 *
 * System Action: The partition may continue to operate without the *
 *                failing processor.  If there are no remaining    *
 *                processors in the logical partition, the logical *
 *                partition is placed in the system check-stop     *
 *                state.                                           *
 *                                                                 *
 * User Action: Continue running without the specified processor.  *
 *                                                                 *
 *******************************************************************
```

Figure 9-7. Logical Processor Check-Stopped, Priority Message

2. Note the name of the logical partition and the ID of the logical processor, CPn, in priority message 51640.
3. Press the Enter key to clear priority message 51640.
4. Use the SETLP command to select the logical partition named in priority message 51640 as the target logical partition.
5. Enter **PSW CPn**, where n is the ID of the processor, CPn, in priority message 51640. The PSW field on line 24 may indicate *Check-stopped*.
6. Look at the Logical Processor Summary Status indicator (L) on the right side of line 24. This status indicator is LX (or L* if other processors in the logical partition are also in Test mode).

7. Look at the Physical Processor Summary Status indicator (P) on the right side of line 24. If this status indicator is:

P. The logical processor is in the check-stop state, but *not* because a physical processor is in the check-stop state. To recover the logical processor, perform one of the following:

- If the logical partition has only one processor, an outage of the SCP is the result. Go to the system console and IPL the SCP. If the IPL fails, deactivate the logical partition, activate the logical partition, and IPL the SCP.
- If the logical partition has more than one processor, the SCP may remain active. Go to the operator console and reset the processor by entering the SCP configuration commands to take the failed processor offline (if the SCP has not already taken the processor offline) and then online. If the processor is reset by the configuration command, the PSW field indicates a PSW or the message *Operating*.

  If the SCP configuration command does not reset the processor and:

  - If the processor is not necessary to the logical partition, continue without the processor. The next scheduled IPL should recover the processor.
  - If the processor is necessary to the logical partition, shut down the SCP at the operator console, go to the system console, and IPL the SCP. If the IPL fails, deactivate the logical partition, activate the logical partition, and IPL the SCP.

PX The logical processor is in the check-stop state because it was dispatched on a physical processor when the physical processor entered the check-stop state. The physical processor remains configured, but processors in logical partitions are no longer dispatched on it:

- If the logical partition has only one processor, an outage of the SCP is the result.
- If the logical partition has more than one processor, the SCP may remain active.

The operator recovers by considering the effect of the failed physical processor on the overall configuration and taking an appropriate recovery action as required in LPAR mode. See "Processor and Vector Facility Recovery Actions in LPAR Mode" on page 10-2.

P* The logical processor is in the check-stop state and it *may* have been dispatched on a physical processor when the physical processor entered the check-stop state. The asterisk (*) indicates multiple conditions, one of which may be an X.

If necessary, enter **F CPSTAT** to display the CP Status frame (Figure 9-8). If a processor is indicated as check-stopped (that was not previously in the check-stop state, handle the failure as if the status indicator were PX. If no processor is indicated as check-stopped (that was not previously in the check-stop state), handle the failure as if the status indicator were P. .

PT Handle the failure as if the status indicator were P.

Status of Physical Processors

In LPAR mode, the logical processor status indicators on line 24 indicate the status of the logical processors in the target logical partition.

To determine the status of the physical processors, enter **F CPSTAT** to display the CP Status (CPSTAT) frame (Figure 9-8). CPSTAT indicates the status of all configured physical processors, not just the logical processors in the target logical partition.

If a condition indicated on the left exists on a physical processor, the ID of the physical processor is indicated on the right in place of the . (period). Remember that the IDs of logical processors (line 24) and those of physical processors (on CPSTAT or CONFIG frames) do not necessarily correspond.

```
                                                            dd mmm yy  19:47:07
                                       CP Status                   (CPSTAT)

  ---- STATE ----     PHYSICAL CP
                      1 2
  X  Checkstopped     . .
  C  Clockstopped     . .

  T  Test             . .









  Press 'REFRESH' to update this frame.

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                      LX PX PSW1 Check-stopped
------------------------------------------------------------------------------
       A:a MODE
```

Figure 9-8. CP Status (CPSTAT) Frame

Status of Logical Partitions and LPAR Mode

If the operator enters **F LPDEF** at the system console and the LPDEF frame appears, power-on reset is complete in LPAR mode. The S (status) field on the LPDEF frame indicates whether each logical partition is active (A), deactivated (D), or pending (P).

If the operator can display the LPDEF frame and the status of a desired logical partition is active, the operator, to further determine the status of the logical partition, must:

1. Stay at the system console, enter the SETLP command to select the desired logical partition, and look at the processor unit status (line 24).
2. Go to the operator console for the desired logical partition, look for system messages, and use SCP commands that respond with the system status.

System console and operator console messages remain the primary method for alerting the operator to error conditions. See "Error Messages" on page 2-6 for a discussion of error messages.

The processor controller detects and reacts to failures associated with LPAR mode in one of three ways: an RSF call for minor or intermittent errors (nondisruptive problem); an LPAR mode logout and initialization for more serious problems (operator must activate and IPL the logical partitions); and a system check-stop state of all logical partitions (operator must perform a power-on reset to recover LPAR mode).

The following priority message is an example of a failure that results in an automatic logout and initialization. Press the Enter key to clear the priority message. If the logout is in progress, the line 22 message shown in Figure 9-10 appears. When the logout completes, activate the logical partitions and IPL the SCPs.

```
19:47:07                                                                 (51678)

   ************************ PRIORITY MESSAGE *************************
   *                                                                  *
   *                LPAR failure.  Logging started.                   *
   *                                                                  *
   * Intended Console: All                                            *
   *                                                                  *
   * Detailed Information: An LPAR failure has occurred. The logging  *
   *                       of data has started.  Code= xxxxxxxx.      *
   * System Action:  The logging of LPAR data has started.            *
   *                                                                  *
   *                                                                  *
   *                                                                  *
   * User Action:  None.  Information only                            *
   *                                                                  *
   *                                                                  *
   *                                                                  *
   *                                                                  *
   *                                                                  *
   ********************************************************************
```

Figure 9-9. LPAR Failure Priority Message

LPAR Mode Logouts

An LPAR mode logout automatically occurs in the following situations:

- If the processor controller detects a nondisruptive error and initiates a logout for later analysis by the service representative. Or,
- If the processor controller detects a disruptive failure and displays the *LPAR failure* priority message 51678 (Figure 9-9). Or,
- If the operator enters the LPAR or LOGLP command.

  The operator may use the LPAR command or the LOGLP command in one of the following general situations:

  - The operator is gathering problem determination information for a logical partition and wants an LPAR logout for only the affected logical partition while the other logical partitions continue to operate. The operator uses the SETLP command to select the desired logical partition, stops the processors and enters the LOGLP command:

    Example

    LOGLP MVSPROD

    See "LOGLP" on page B-6.

    After the LPAR log is completed, the operator may, depending on the situation, start the processors and continue, or perform a stand-alone dump and IPL the SCP.

  - The operator is attempting to recover from a failure without clear indications of the cause, for example, and all logical partitions have failed. The operator enters LPAR RESTART LOG (see "LPAR" on page B-7) to write an LPAR log to the processor controller DASD and to initialize LPAR mode. Assuming that LPAR mode is initialized, the operator activates the logical partitions and performs an IPL of each SCP. If LPAR mode fails to initialize or fails again after initialization, the operator must give the processor unit to the service representative for repair or recover the processor unit by resetting or isolating the failure (for example, with a power-on reset).

After an LPAR mode logout begins, a line 22 message informs the operator of the progress of the logout. The logout requires several minutes. Processing stops during the logout. When the logout completes, the operator may activate the logical partitions and IPL the SCPs to restart processing.

```
           LPAR logging in progress.  47 percent completed.
COMMAND ==>
SYSTEM 1  MVSPROD   1 .. 2 ..                      L. P. PSW0 Operating
_____________________________________________________________________
       A:a MODE
```

Figure 9-10. LPAR Logout Progress Message

Using the Problem Analysis Facility in LPAR Mode

The PA facility operates in LPAR mode as it does in one of the basic modes. See "Using the Problem Analysis Facility" on page 2-16.

The PA facility recognizes LPAR mode, but does not recognize logical partitions. If all logical partitions fail, the operator should use the PA facility to identify a possible hardware failure.

If a failure associated with LPAR mode occurs, the PA Status frame (PA)-03 displays the message *LPAR failures exist — authorize call.* See Figure 9-11.

```
                                                              dd mmm yy  19:47:07
                                PROBLEM ANALYSIS - STATUS             (PA)-03

 CP1: Running                      CP2: Running


                                   VE2: Offline


 Hardware errors present           LPAR failure exists - authorize call
 Interface control checks (IFCCS) present

 CHPID (CHECKSTOPPED): 0A  1C  2D
 CHPID (SERVICE MODE): 04

   R= CALL OR RETURN TO
      1. PA STATUS SELECTION


COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                      L. PX PSW0 Operating
--------------------------------------------------------------------------------
        A:a MODE
```

Figure 9-11. Problem Analysis — Status (PA)-03 Indicating LPAR Failure

The *call* referred to in the message is an RSF call. If the PA facility indicates an LPAR failure, the operator should go to "Recovering a Logical Partition or LPAR Mode" on page 10-17 and follow local procedures (which may direct an attempt to recover the logical partitions, to initiate the RSF call, to attempt recovery and initiate the call, or to do something else).

SCP Message Facility in LPAR Mode

The SCP message facility in LPAR mode operates similar to that in the basic modes (see "SCP Message Facility" on page 2-12). A priority message is displayed first to inform the operator as to which SCP (which logical partition) generated the SCP message.

Priority Message: If priority message 51609 (Figure 9-12) is displayed, press the Enter key to clear the priority message, enter the SETLP command to select the logical partition named in the message, go to "SCP Message Facility" on page 2-12, and follow the directions. The only differences are that priority message 51609 is displayed instead of priority message 64400, and line 22 message 51619 is displayed instead of line 22 message 35201.

```
   19:47:07                                                           (51609)

   ************************ PRIORITY MESSAGE *************************
   *                                                                 *
   *       Audible Alarm From the SCP in Partition  MVSPROD          *
   *                                                                 *
   * Intended Console: System                                        *
   *                                                                 *
   * Detailed Information: The SCP in the specified logical partition *
   *                       is signaling for operator attention.      *
   *                                                                 *
   * System Action: The audible alarm is sounded and the partition's *
   *                SCP waits for operator intervention.             *
   *                                                                 *
   * User Action: Identify the cause of the trouble with the SCP.    *
   *              Ensure an operator console exists and is operative *
   *              for the SCP.                                       *
   *                                                                 *
   *                                                                 *
   *******************************************************************
```

Figure 9-12. Example of Priority Message 51609

Line 22 Message: If line 22 message 51619 (Figure 9-13) is displayed after clearing priority message 51609, enter the SETLP command at the system console to select the logical partition named in the message, and enter **F SCPMSG**. If line 22 message 51619 is not displayed, assume a *no console condition* (see "Master Console Problem Determination" on page 2-10).

```
    SCP MESSAGES FROM PARTITION MVSTEST.  INVOKE SCPMSG FRAME.        (51619)
COMMAND ==>
SYSTEM 1  MVSPROD   1 .. 2 ..                       L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-13. Example of Line 22 Message 51619

Using a Reference Code in LPAR Mode

The operator looks for and uses a reference code in LPAR mode as in one of the basic modes. See "Using a Reference Code" on page 2-20.

System Activity Display in LPAR Mode

The following topics discuss system activity display and activity display definition procedures in LPAR mode. The operation of SAD in one of the basic modes is discussed in "System Activity Display Frame" on page 2-22.

Define System Activity Display Frame: In LPAR mode, the first line under selection group B requires the operator to specify whether the display to be defined is for physical hardware or for a logical partition. Figure 9-14 shows the Define System Activity Display as it appears in LPAR mode. When the entry is *PHYSICAL* (default), the defined display contains physical hardware data. When the entry is a logical partition name, the defined display contains logical partition data.

When the operator specifies a processor number in selection group B, it is important to remember that a logical processor in a logical partition is requested. Logical processor data can only be displayed if the logical partition uses dedicated processors.

Selection B8 (Summary) is only valid for logical partitions. A summary line of all activity within the logical partition is displayed. For a logical partition that shares processors (does not use dedicated processors), the summary line is *normalized.* For example, if the summary line indicates 100%, the logical partition is using all of the processor resources allowed by the weight specified on the LPCTL frame (Figure 9-28 on page 9-36). See *Operator Tasks for the System Console* for more information on defining activity displays.

```
 SAD: __                                                dd mmm yy  19:47:07
                        Define System Activity Display            (SAD)-00
   A= LINE NO.                  B= LINE ELEMENT
     1.                           Activity display for: PHYSICAL
     2.                           1. CP(Hex): _
     3.                           2. CP(Hex): _ Key(Hex): _
     4.                           3. CP(Hex): _ Ex Key(Hex): _ State: _ (S/P/B)
     5.                           4. CH(Hex):ESA CHPID: __   370 Set: _ No. __
     6.                           5. CH List: __ (HI/LO) ; Thru line(Dec): __
     7.                           6. Blank Line
     8.                           7. Grid                E= REFRESH RATE
     9.                           8. Summary               1. Seconds(Dec): __
    10.                         C= PROCESSOR STATE
    11.                           1. Supervisor          F= SAD ID INFORMATION
    12.                           2. Problem               1. SAD Name(A/N):
    13.                        -> 3. Both                   _______________
    14.                                                    2. Save as No.(Dec): __
    15.                         D= THRESHOLD               3. Review SAD List
    16.                           1. >(Dec): __
    17.                           2. <(Dec): __          G= EXECUTE SAD
    18.                        -> 3. None                  1. Number(Dec): __
 A SAD must be specified.
COMMAND ==>
SYSTEM 1  MVSPROD  1 .. 2 ..                    L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-14. Define System Activity Display Frame in LPAR Mode

Example of a System Activity Display: Figure 9-15 shows an example of an activity display defined for a dedicated logical partition. The summary line for the logical partition is at the top of the display. The next two lines are the logical processors in the partition showing the correspondence between the logical and physical processors. For example, 1/2 indicates that logical processor 1 is dispatched on physical processor CP2. The high-usage CHPIDs for the logical partition follow.

```
                                                              dd mmm yy  19:47:07
                  System Activity Display - PARTITION PAYROLL        (SAD  3)
   Prob=* Supv=@    0----1----2----3----4----5----6----7----8----9----10

PAYROLL              *****************************************@@@@@@@@    >90


                    0----1----2----3----4----5----6----7----8----9----10

PAYROLL  1/2         *****************************************@@@@@       >90
PAYROLL  2/1 P   K2  ********************************                     >90


High Usage PAYROLL  0----1----2----3----4----5----6----7----8----9----10
CHPID 22 PAYROLL     @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@           >99
CHPID 23 PAYROLL     @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@                  >99
CHPID 28 PAYROLL     @@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@                     >99



COMMAND ==>
SYSTEM 1  MVSPROD  1 .. 2 ..                         L. P. PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 9-15. System Activity Display Frame in LPAR Mode

SAD may be useful for determining whether processor resources are allocated efficiently. For example, a logical partition summary line that is never more than 50% busy may indicate that the logical partition has more processor resource allocated to it than is necessary.

Procedures in LPAR Mode

Target Logical Partitions

The name of the *target* logical partition is indicated on line 24 to the right of the system name. In Figure 9-16, the system name is SYSTEM 1 and the target logical partition is MVSPROD. When the operator uses the SETLP command to select a logical partition as the target logical partition (for example, by entering SETLP MVSPROD), the operator then looks at and operates on the processor unit resources allocated to that logical partition. The target logical partition represents an entire processor unit while it is selected.

```
COMMAND ==>
SYSTEM 1  MVSPROD   1 .. 2 ..                         L. P. PSW0 Operating
------------------------------------------------------------------------------
        A:a MODE
```

Figure 9-16. Target Logical Partition

System Console Procedures in LPAR Mode

Warning: In LPAR mode, it is extremely important that the operator perform all system console procedures in the desired logical partition. Failure to do so may disrupt one or all logical partitions.

It is possible to enter commands or make frame selections that are not intended for the logical partition to which they are directed (the correct target was not set or the wrong target was set). It is also possible to enter commands or make frame selections that are disruptive to all logical partitions (for example, power-on reset).

LPAR mode provides two ways for the operator to ensure that the desired logical partition is the *target* logical partition. When the operator goes to the system console to perform any procedure, the operator should always perform one of the following:

- Always use the SETLP command to select the correct logical partition before performing any procedure from the system console (see "SETLP" on page B-10). Or,
- Always use the LOCKLP and UNLOCKLP commands to lock or unlock logical partitions before performing any procedure from the system console (see "LOCKLP" on page B-5 and "UNLOCKLP" on page B-12).

Procedures from the SYSCTL Frame in LPAR Mode

The SCP Manual Control (SYSCTL) frame in LPAR mode is shown in Figure 9-17. The SYSCTL frame allows the operator to IPL the SCP, initiate a program restart, or perform a stand-alone dump in a logical partition. After the desired logical partition is selected (made the target logical partition) by means of the SETLP command, the following procedures are similar to those in one of the basic modes.

Procedure for Program Restart

See "Procedure for Program Restart" on page 3-10.

Procedure for Instruction Trace

Instruction trace from the SYSCTL frame is not supported in LPAR mode.

Procedure for Stand-Alone Dump

Do not deactivate the logical partition. See "Procedure for Stand-Alone Dump" on page 3-12.

Note: A STORSTAT operation in LPAR mode is similar to a STORSTAT operation in one of the basic modes.

Procedure for IPL of the SCP

See "Procedure for IPL of the SCP" on page 3-13.

```
                                                     dd mmm yy  19:47:07
                      SCP Manual Control (ESA/390 Mode)        (SYSCTL)

     A= INITIALIZE SYSTEM CONTROL PROGRAM            T= TARGET CP
    -> 1. Load Unit Addr : 0150                     -> 0. CP1
       2. Load Parm(a/n) : ________                    1. CP2
       3. Initiate SCP Initialization

     B= INITIALIZE STANDALONE DUMP                   R= Not used
       Auto Store Status =   On
       1. Load Unit Addr : 0840
       2. Initiate Standalone Dump

     C= RESTART
       1. Initiate Restart

     D= Not used


 COMMAND ==>
 SYSTEM 1 MVSPROD  1 .. 2 ..                    L. P. PSW0 Operating
 ------------------------------------------------------------------------
        A:a MODE
```

Figure 9-17. SCP Manual Control (SYSCTL) Frame in LPAR Mode

Procedures from the CONFIG Frame in LPAR Mode

The Configuration (CONFIG) frame in LPAR mode is shown in Figure 9-18.

Warning: The CONFIG frame is not logical-partition sensitive. Selections made from the CONFIG frame affect the entire processor unit (as in one of the basic modes) and disrupt all active SCPs.

Releasing the Configuration

The operator should use the following procedure to release the configuration:

1. Shut down all SCPs. Always leave the logical partitions activated unless the logical partitions must be deactivated for a specific reason.
2. Go to the system console.
3. Enter **F CONFIG** to display the Configuration frame (Figure 9-18).
4. If POWER ON RESET Complete is indicated, enter **A1** to release the configuration. Enter **X1** to confirm the request.
5. When the CONFIG frame indicates POWER ON RESET Required, the configuration is released.

Performing a Power-On Reset

The operator should use the following procedure to perform a power-on reset in LPAR mode:

1. Go to the system console.
2. Enter **F SYSDEF** to display the System Definition frame. Make sure that the battery-operated clock (BOC) in the processor controller has the correct local time and that the B2 selection is entered. The TODs are then set from the BOC during power-on reset.

   See “System Definition (SYSDEF) Frame” on page 3-15.

   To check the BOC time, go to the system console, press the Refresh key, and look in the upper right corner of any frame.

   Note: Selection group D on the SYSDEF frame is not active in LPAR mode because the new frame is always LPDEF and automatic IPL is controlled from LPDEF. Also, automatic TOD setting must be enabled to perform a power-on reset in LPAR mode.
3. Enter **F CONFIG** to display the Configuration frame (Figure 9-18).
4. POWER ON RESET Required must be indicated. If POWER ON RESET Complete is indicated, enter **A1** to release the configuration. Enter **X1** to confirm the request.
5. Enter **A4** to select the IOCDS Management (IOCDSM) frame and select the desired LPAR mode IOCDS. Enter **A4** on the IOCDSM frame to return to the CONFIG frame.
6. Enter **B4** to select LPAR mode.
7. Enter **A2** to perform a power-on reset.
8. When the power-on reset is complete, go to “Activating Logical Partitions” on page 9-31.

```
                                                                  dd mmm yy 19:47:07
                                    Configuration                         (CONFIG)

  A= ACTION                          D= PROCESSORS          F= STORAGE (TOTAL=1024MB)
    1. Release                    -> 1. CP1                     CENTRAL    EXPANDED
    2. Power on reset                2. CP2                  1.  32MB        992MB
    3. Maximum Installed                                     2.  48MB        976MB
    4. Select IOCDS Mgmt.                                    3.  64MB        960MB
  B= CP MODE                                              -> 4.  96MB        928MB
 -> 1. ESA/390 tm                                           5. 128MB         896MB
    2. Not Used                      E= VECTORS              6. 192MB        832MB
    3. Not Used                   -> 1. VE1                  7. 256MB        768MB
    4. LPAR                          2. VE2

  C= I/O TRACE
    1. Type(hex): ________                                  ---- CHPID STATUS ----
       Units: __                                            Online: 32 Offline: 16
 ESA/390 is a trademark (tm) of the IBM Corporation.

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..              L. P. PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 9-18. Configuration (CONFIG) Frame in LPAR Mode

Initializing LPAR Mode

To initialize LPAR mode when POWER ON RESET Complete is indicated (and LPAR mode is selected), the operator should use the LPAR RESTART command. See "LPAR" on page B-7 and "LPAR Mode Logouts" on page 9-18. After the LPAR RESTART command is used to initialize LPAR mode, the logical partitions must be manually activated.

Procedures from the LPAR Mode Frames

The following topics provide procedures that are unique to LPAR mode.

Redefining Logical Partitions

This publication assumes that the logical partitions have been initially defined. The allocation of processor unit hardware to logical partitions is performed from the Logical Partition Definition (LPDEF) frame (Figure 9-19) after performing a power-on reset in LPAR mode.

To redefine a logical partition, the operator should use the following procedure:

1. Go to the system console.
2. Enter **F LPDEF** to display the Logical Partition Definition frame.
3. Shut down the SCP in the affected logical partition.
4. Enter **An B2**, where n is the number of the desired logical partition, to deactivate the logical partition.
5. Enter **An B3**, where n is the number of the desired logical partition, to update the logical partition. The fields for the logical partition are displayed in the center of the frame.

   Notes:

   a. Do not change the ID field unless directed to do so by installation management. This field provides a logical partition identifier for the CPUID. For information regarding the CPUID, see *Processor Resource/Systems Manager Planning Guide*.
   b. Update is not allowed when the current access level is 2.
6. Update the fields as necessary and press the Enter key. Enter **X1** to confirm the update or **B3** to cancel the update. If confirmed, the changes are written to the processor controller DASD.
7. Activate the logical partition. See "Manual Activation" on page 9-31.
8. If necessary, IPL the SCP.

Notes:

1. Each logical partition is validated against the total amount of installed resources at definition time. The operator cannot allocate more resources to one logical partition than are installed.
2. Totals of resources allocated across all logical partitions are not validated at definition time, but only during activation. This allows the operator to allocate more resources than are configured to all logical partitions if one or more logical partitions are not active. For example, four logical partitions may be defined, but perhaps only two are active during the day shift and the other two are only active at night.
3. On the processor controller DASD, logical partition definitions (LPDEF values) are *not* associated with a specific IOCDS (as are LPCTL values and channel reassignments). Each IOCDS could use the same logical partition definitions, different definitions, or any combination.

```
                                                              dd mmm yy  19:47:07
                    Logical Partition Definition                      (LPDEF)
IOCDS: A0/LPARPROD

  A=  PARTITION  S   ID MODE L/U MSG SUM CHPS           B=  ACTION
    1. DOSVSE    D   _        L   .   .   16              1. Activate
    2. MVSPROD   D   _        L   .   .   16              2. Deactivate
    3. MVSTEST   D   _        L   .   .   16              3. Update
    4. VMHPO     D   _        L   .   .   16
    5. VMSP1     D   _        L   .   .   16            C=  VIEW
    6. VMSP2     D   _        L   .   .   16           -> 1. Summary
    7. VMSP3     D   _        L   .   .   16              2. Description
                                                          3. Storage
                                                          4. Processor
                                                          5. Auto IPL
                                                          6. One Partition



COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                      L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-19. Logical Partition Definition (LPDEF) Frame — Summary View

```
                                                              dd mmm yy  19:47:07
                    Logical Partition Definition                      (LPDEF)
IOCDS: A0/LPARPROD

  A=  PARTITION  S   ID MODE                            B=  ACTION
    1. DOSVSE    D   _                                    1. Activate
    2. MVSPROD   D   _                                    2. Deactivate
    3. MVSTEST   D   _                                    3. Update
    4. VMHPO     D   _
    5. VMSP1     D   _                                  C=  VIEW
    6. VMSP2     D   _                                    1. Summary
    7. VMSP3     D   _                                 -> 2. Description
                                                          3. Storage
                                                          4. Processor
                                                          5. Auto IPL
                                                          6. One Partition



COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                      L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-20. Logical Partition Definition (LPDEF) Frame — Description View

```
                                                          dd mmm yy  19:47:07
                      Logical Partition Definition                  (LPDEF)
IOCDS: A0/LPARPROD
                       --CENTRAL (MB)--  --EXPANDED (MB)-
  A=  PARTITION  S   INIT  RSVD  ORIG  INIT  RSVD  ORIG  B=  ACTION
    1. DOSVSE    D     0     0           0     0           1. Activate
    2. MVSPROD   D     0     0           0     0           2. Deactivate
    3. MVSTEST   D     0     0           0     0           3. Update
    4. VMHPO     D     0     0           0     0
    5. VMSP1     D     0     0           0     0         C=  VIEW
    6. VMSP2     D     0     0           0     0           1. Summary
    7. VMSP3     D     0     0           0     0           2. Description
                                                        -> 3. Storage
                                                           4. Processor
                                                           5. Auto IPL
                                                           6. One Partition
                       ----CS Total----  ----ES Total----
          Defined:               0                 0
         Assigned:               0                 0
       Configured:             507              1024
COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                    L. P. PSW0 Operating

        A:a MODE
```

Figure 9-21. Logical Partition Definition (LPDEF) Frame — Storage View

```
                                                          dd mmm yy  19:47:07
                      Logical Partition Definition                  (LPDEF)
IOCDS: A0/LPARPROD
                        PROCESSOR
  A=  PARTITION  S    DED CPs VEs                          B=  ACTION
    1. DOSVSE    D     N   0   1                             1. Activate
    2. MVSPROD   D     Y   0   1                             2. Deactivate
    3. MVSTEST   D     N   0   1                             3. Update
    4. VMHPO     D     N   0   1
    5. VMSP1     D     N   0   1                           C=  VIEW
    6. VMSP2     D     N   0   1                             1. Summary
    7. VMSP3     D     N   0   1                             2. Description
                                                             3. Storage
                                                          -> 4. Processor
                                                             5. Auto IPL
                                                             6. One Partition

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                    L. P. PSW0 Operating

        A:a MODE
```

Figure 9-22. Logical Partition Definition (LPDEF) Frame — Processor View

```
                                                          dd mmm yy  19:47:07
                   Logical Partition Definition                   (LPDEF)
 IOCDS: A0/LPARPROD
                    --- AUTO IPL ----
   A=  PARTITION  S  A  ADDR  PARM                     B=  ACTION
     1. DOSVSE    D  N  0000  ________                   1. Activate
     2. MVSPROD   D  N  0000  ________                   2. Deactivate
     3. MVSTEST   D  N  0000  ________                   3. Update
     4. VMHPO     D  N  0000  ________
     5. VMSP1     D  N  0000  ________                 C=  VIEW
     6. VMSP2     D  N  0000  ________                   1. Summary
     7. VMSP3     D  N  0000  ________                   2. Description
                                                         3. Storage
                                                         4. Processor
                                                      -> 5. Auto IPL
                                                         6. One Partition

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                     L. P. PSW0 Operating

        A:a MODE
```

Figure 9-23. Logical Partition Definition (LPDEF) Frame — Auto IPL View

```
                                                          dd mmm yy  19:47:07
                   Logical Partition Definition                   (LPDEF)
 IOCDS: A0/LPARPROD
                   + BIGSYS -------Current-----------+
   A=  PARTITION  S | Id          =                  |  B=  ACTION
     1. DOSVSE    D | Mode        =                  |    1. Activate
  -> 2. MVSPROD   D | CS Initial  =       0          |    2. Deactivate
     3. MVSTEST   D | CS Rsvd     =       0          |    3. Update
     4. VMHPO     D | CS Origin   =                  |
     5. VMSP1     D | ES Initial  =       0          |  C=  VIEW
     6. VMSP2     D | ES Rsvd     =       0          |    1. Summary
     7. VMSP3     D | ES Origin   =                  |    2. Description
                    | CPs         =       0          |    3. Storage
                    | VEs         =       0          |    4. Processor
                    | Auto IPL    =       N          |    5. Auto IPL
                    | IPL Addr.   =    0000          | -> 6. One Partition
                    | IPL Parm.   =  ________        |
                    |                                |
                    |                                |
                   +---------------------------------+

SYSTEM 1 MVSPROD  1 .. 2 ..                     L. P. PSW0 Operating

        A:a MODE
```

Figure 9-24. Logical Partition Definition (LPDEF) Frame — One Partition View

Activating Logical Partitions

After the operator has defined the resources for the logical partitions, the operator activates the logical partitions and performs an IPL of the appropriate SCP in each logical partition. The activation and the IPL for each logical partition may be manual or automatic.

Automatic Activation: If the following requirements are met, activation is automatic when power-on reset is complete. Automatic activation is interrupted by perceived changes to the configuration since the last time a particular IOCDS was active. Automatic activation of logical partitions requires the following:

- The same physical configuration. Automatic activation does not occur if the amount of configured main or expanded storage is changed, or if the number of configured processors is changed.
- Logical partitions that are pending. The status (S) field on the LPDEF frame indicates whether a logical partition is active (A), deactivated (D), or pending (P). Automatic activation does not occur if the logical partitions are deactivated before the configuration is released.
- The same logical partition definitions. Automatic activation does not occur if the definitions are not made or if the definitions have been changed.
- The same IOCDS. If the physical configuration has not changed and at least one defined logical partition is pending, the following IOCDS checks are performed:
  - If the active IOCDS is the previous IOCDS and the IOCDS has not been rewritten, automatic activation is allowed.

    Automatic activation does not occur the first time an IOCDS is selected after it is written.
  - If the active IOCDS is not active for the first time and does not name *any* of the logical partitions that were previously activated with a different IOCDS, automatic activation is allowed.

    Automatic activation does not occur if the active IOCDS names *any* pending logical partitions that were last activated with a different IOCDS.
- Power-on reset in LPAR mode. Automatic activation does not occur if LPAR mode is initialized by the LPAR command. Automatic activation also does not occur if the Licensed Internal Code detects a failure, performs an LPAR logout, and initializes LPAR mode.

To cancel the automatic activation of all logical partitions, press the Reset key and then the Cncl key within 10 seconds after the LPDEF frame is displayed. If the cancellation is requested after 10 seconds, any activation in progress completes and the other logical partitions remain deactivated or pending until manually activated.

Manual Activation: The operator should use the following procedure to manually activate a logical partition:

1. Go to the system console.
2. Enter **F LPDEF** to display the Logical Partition Definition frame (Figure 9-25).
3. Enter **An B1**, where n is the number of the logical partition to be activated. Several logical partitions may be activated at one time. For example, enter **A1 A2 A3 A4 B1** to activate all of the logical partitions shown in Figure 9-25. The logical partitions are activated in the order in which they are entered.

Notes:

1. If, for example, four logical partitions are activated at the same time and a problem is encountered during the activation of the second or third logical partition, the command fails and the remaining logical partitions must be activated separately.

2. To activate individual logical partitions, the operator may use the ACTLP service language command. See "ACTLP" on page B-1.

3. If a logical partition is indicated as *favored (F)* on the LPDEF frame and is automatically activated, it is activated first.

Automatic and Manual IPL: Logical partitions that have an IPL device specified (AUTO IPL ADDR field) and that are indicated to receive an automatic IPL (AUTO IPL A field, Y) begin the IPL immediately after activation of the logical partition.

Note: S/370 logical partitions should specify a device attached to channel set 0 to receive an automatic IPL.

See "Procedures from the SYSCTL Frame in LPAR Mode" on page 9-24 for information regarding manual IPL in logical partitions.

```
                                                        dd mmm yy  19:47:07
                    Logical Partition Definition                (LPDEF)
 IOCDS: A0/LPARPROD

   A=  PARTITION  S   ID MODE L/U MSG SUM CHPS           B=  ACTION
     1. DOSVSE    D    _        L   .   .   16              1. Activate
     2. MVSPROD   D    _        L   .   .   16              2. Deactivate
     3. MVSTEST   D    _        L   .   .   16              3. Update
     4. VMHPO     D    _        L   .   .   16
     5. VMSP1     D    _        L   .   .   16           C=  VIEW
     6. VMSP2     D    _        L   .   .   16          -> 1. Summary
     7. VMSP3     D    _        L   .   .   16              2. Description
                                                            3. Storage
                                                            4. Processor
                                                            5. Auto IPL
                                                            6. One Partition



 COMMAND ==>
 SYSTEM 1 MVSPROD  1 .. 2 ..                        L. P. PSW0 Operating
 ________________________________________________________________________
         A:a MODE
```

Figure 9-25. Logical Partition Definition (LPDEF) Frame

Deactivating or Idling Logical Partitions

The operator may deactivate logical partitions at any time. Deactivation of a logical partition includes a system reset (SYSRESET) for the logical partition that is deactivated.

When a logical partition is deactivated, it releases any dedicated processors and the storage allocated to the logical partition. The channel paths are reset and left configured to the logical partition. After deactivation, the operator can allocate the resources that belonged to the deactivated logical partition to other logical partitions or leave the deactivated logical partition intact (but not active).

If a processor is dedicated to a logical partition, the processor is no longer dedicated when the logical partition is deactivated. The processor is then available to other logical partitions. The same is true of a vector facility associated with a dedicated processor.

Deactivating a Logical Partition: To deactivate a logical partition, the operator should use the following procedure:

1. Go to the operator console for the logical partition and shut down the SCP.
2. Go to the system console.
3. Enter **F LPDEF** to display the Logical Partition Definition frame. See Figure 9-26 on page 9-34.
4. Enter **An B2**, where n is the number of the logical partition to be deactivated. For example, if all of the logical partitions listed on the LPDEF frame are active, enter **A1 A2 A3 A4 B2** to deactivate all of the logical partitions shown in Figure 9-26. The logical partitions are deactivated in numerical order (A1, A2, and so on) and not necessarily in the order in which they are entered.

Notes:

1. If any of the logical processors are not stopped (are not in the manual state), the operator is notified and a confirmation is required before the logical partition is deactivated. The notification gives the operator an opportunity to cancel the deactivation and shut down the SCP. The operator may proceed with the deactivation if a shutdown of the SCP is not applicable.
2. To deactivate individual logical partitions, the operator may use the DEACTLP service language command. See "DEACTLP" on page B-3.

Idling a Logical Partition: To idle a logical partition, the operator shuts down the SCP in the logical partition and leaves the logical partition activated.

If a logical partition is idle (not deactivated) and the configuration is released (power-on reset is required), the status of the idle logical partition becomes *pending (P)*. One requirement for the automatic activation of logical partitions is a status of pending. Idle logical partitions may therefore enable faster recovery than deactivated logical partitions. See "Automatic Activation" on page 9-31.

```
                                                          dd mmm yy  19:47:07
                     Logical Partition Definition                 (LPDEF)
 IOCDS: A0/LPARPROD

   A=  PARTITION  S    ID MODE L/U MSG SUM CHPS          B=  ACTION
     1. DOSVSE    D    _        L   .   .   16             1. Activate
     2. MVSPROD   D    _        L   .   .   16             2. Deactivate
     3. MVSTEST   D    _        L   .   .   16             3. Update
     4. VMHPO     D    _        L   .   .   16
     5. VMSP1     D    _        L   .   .   16           C=  VIEW
     6. VMSP2     D    _        L   .   .   16          -> 1. Summary
     7. VMSP3     D    _        L   .   .   16             2. Description
                                                           3. Storage
                                                           4. Processor
                                                           5. Auto IPL
                                                           6. One Partition

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                        L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-26. Logical Partition Definition (LPDEF) Frame

Changing Storage Assignments

The Logical Partition Storage Assignment (LPSMAP) frame (Figure 9-27 on page 9-35) shows how processor storage is allocated for the logical partitions. If dashes are shown, they indicate that a logical partition does not have expanded storage defined.

Note: Main storage is that area of central storage that is assigned to the logical partitions. The central storage required by the hardware system area (HSA) is automatically subtracted.

To reallocate processor storage, the operator should:

1. Enter **F LPSMAP** to display the Logical Partition Storage Assignment frame.

   Main storage is allocated from the top down, beginning with the first logical partition activated. The last logical partition activated has the lowest storage. The logical partitions are automatically activated in alphabetical order (as listed on the LPDEF frame in figure Figure 9-27 on page 9-35). If the logical partitions are manually activated, the storage assignments may be arranged in a different order.

   Look at the storage assignments. To reassign storage among the logical partitions, the logical partitions must be contiguous in the storage that is to be reallocated. For example, in Figure 9-27, storage may be reallocated between logical partitions MVSPROD and MVSTEST, or between logical partitions MVSTEST and VMHPO, or among all three. Storage may not be reallocated between logical partitions MVSPROD and VMHPO because the storage boundaries are not contiguous.

2. Enter **F LPDEF** to display the Logical Partition Definition frame.

3. Shut down the SCPs and deactivate the affected logical partitions. See "Deactivating a Logical Partition" on page 9-33.

4. Reallocate processor storage by redefining the storage in the affected logical partitions. See "Redefining Logical Partitions" on page 9-27.

5. Activate the affected logical partitions. See "Activating Logical Partitions" on page 9-31.

6. IPL the SCP in the affected logical partitions.

```
                                                            dd mmm yy  19:47:07
                 Logical Partition Storage Assignment                 (LPSMAP)

IOCDS: A0/LPARPROD

  ACTIVE      -----CENTRAL STORAGE (MB)----   ----EXPANDED STORAGE (MB)----
 PARTITION   ORIG  INIT  CURR   MAX    GAP   ORIG  INIT  CURR   MAX    GAP

 DOSVSE       391   116   116   116      0     --     0     0     0      *
 MVSPROD      160   128   128   128    103    960    64    64    64      0
 MVSTEST      144    16    16    16      0    896    64    64    64      0
 VMHPO         96    32    48    64      0    768    64   128   192      0
 VMSP1         64    32    32    32      0    512   256   256   256      0
 VMSP2         32    32    32    64      0    256   256   256   512      0
 VMSP3          0    16    32    32      0      0   128   256   256      0


Available                   0MB                       0MB


COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                     L. P. PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 9-27. Logical Partition Storage Assignment (LPSMAP) Frame

Changing the Weight of Logical Partitions

Installation management assigns relative weights to the logical partitions by means of the Logical Partition Controls (LPCTL) frame.

The operator should use the following procedure:

1. Go to the system console.

2. Enter **F LPCTL** to display the Logical Partition Controls frame. See Figure 9-28. The status of the logical partitions is indicated in the STATUS field: active (A) or deactivated (D).

3. Enter **A1** to set or change the weight of any or all logical partitions:

   A= PROCESSING WEIGHTS field. Perform one of the following for each logical partition:

   - Enter **nnn**, where nnn is a number between 001 and 999, to set the relative weight for a logical partition. Assign weights to each logical partition according to the relative importance of each application to the other applications. For an example, see Figure 9-28. MVSPROD is as important an application as VMHPO; both are given equal weight (900). MVSPROD and VMHPO are very important applications, but DOSVSE is much less important and is given a weight much less that of MVSPROD or VMHPO (300). The test logical partition, MVSTEST, is given a weight of 100.

The weights should reflect the relative importance that installation management gives to the work that is done in each logical partition. If logical partitions contend for processor time, the weight is used to resolve the conflict.

- Enter **DED** to indicate that *physical* processors should be dedicated to a logical partition. For example, suppose that all logical partitions in this example are deactivated and the two processors that are defined for VMHPO are dedicated by means of this frame. If VMHPO is then activated, VMHPO has the exclusive use of two physical processors. After dedication, the DEDicated processors are not available to any other logical partition.

  Dedication is allowed only if the affected logical partition is deactivated. The processors are not dedicated until the logical partition is activated. Deactivating such a logical partition releases (undedicates) the dedicated processors and any associated vector facilities. Any released processor may then be dedicated to another logical partition or shared by all active logical partitions.

B= PROCESSOR RUNNING TIME field. The default is B1, running time is determined by the Licensed Internal Code. The operator should only use the manual selection (B2) when directed to do so by installation management.

```
                                                    dd mmm yy  19:47:07
                          Logical Partition Controls         (LPCTL)

 IOCDS: A0/LPARPROD

  A= PROCESSING WEIGHTS
  ->1= Set Weights (1-999 OR D FOR Dedicated)
         LP NAME  STATUS  WEIGHT  CAPPED
         DOSVSE   A        300     NO
         MVSPROD  A        900     YES
         MVSTEST  A        100     NO
         VMHPO    A        900     NO


  B= PROCESSOR RUNNING TIME
  ->1. Dynamically Determined
    2. Set Running Time
        Time (Dec): 015 (Milliseconds)
        Wait Completion: N (Y/N)

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                        L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-28. Logical Partition Controls (LPCTL) Frame

Note: On the processor controller DASD, LPCTL values are associated with an IOCDS and *not* with logical partition definitions:

- If an IOCDS is not rewritten, the LPCTL values are retained.
- If an IOCDS is rewritten (by using IOCP to overwrite the *same* IOCDS data set) and the logical partition names (and the number of logical partitions defined) remains the same, the LPCTL values are retained.

For example, assume IOCDS A1 defines logical partitions LP1, LP2, LP3, and LP4, and IOCDS A2 defines logical partitions LPA, LPB, LPC, and LPD. If IOCDS A2 is rewritten and now defines logical partitions LP1, LP2, LP3, and IP4, the values on the LPCTL frame will be reset to the default values.

- If an IOCDS is rewritten and any of the logical partition names (or the number of logical partitions defined) is changed, default values appear on the LPCTL frame.

Changing Channel Path Assignments

The Logical Partition Channel Assignments (LPCHNA) frame indicates the logical partition to which each channel path is assigned and indicates whether or not the channel path may be reassigned. The Logical Partition S/370 Channel Definition (LPCHND) frame also indicates which channel paths may be reassigned (Figure 9-31, selection B2). The Channel Configuration (CHNCFA) frame is used, as it would be in one of the basic modes, to determine the status of channel paths (Figure 7-7 on page 7-10). The Logical Partition Security (LPSEC) frame defines which logical partitions are isolated. Channel paths assigned to isolated logical partitions must be released before being reassigned to another partition.

The RECONFIGURABLE field indicates whether the channel path is available for reassignment between logical partitions. A channel path is indicated by an R on the LPCHNA frame if it is defined as reconfigurable in the IOCDS.

R Reconfigurable
. Not reconfigurable
* Channel path is not defined in the IOCDS

The operator may reassign any channel paths that are indicated as reconfigurable by using the following procedure.

Note: If the SCP in the logical partition is active and supports a channel path configuration command, the SCP command should be used instead of the CHPID command. Service language commands, like CHPID, are entered at the system console. SCP configuration commands, like CF, are entered at the operator console.

1. Go to the system console.
2. Enter **F LPCHNA** (Figure 9-29) or **F LPCHND** (Figure 9-30 on page 9-40, selection B2); either frame displays the reconfigurable channel paths. If the desired channel paths are not reconfigurable, they cannot be reassigned.
3. Perform one of the following to take the channel path offline.
   - If MVS/ESA is not active in the logical partition:
     a. Enter the SETLP command to select the logical partition from which the channel path is taken.
     b. Enter **CHPID nn OFF** to take channel path nn offline.
   - If MVS/ESA is active in the logical partition:

     Enter **CF CHP(nn),OFFLINE** to take channel path nn offline.
4. Perform one of the following to bring the channel path online:
   - If MVS/ESA is not active in the logical partition:
     a. Enter the SETLP command to select the logical partition to which the channel path is going.
     b. Enter **CHPID nn ON** to bring channel path nn online.

- If MVS/ESA is active in the logical partition:

  Enter **CF CHP(nn),ONLINE** to bring channel path nn online.

  Note: If MVS master consoles are widely separated, one operator may use the *Display Matrix* command (D M=CHP) to verify when the channel path is online to the receiving logical partition.

5. Enter **F LPSEC** to display logical partition security. If the channel path to be varied offline is assigned to an isolated logical partition:

   - Enter **CHPID nn OFF RELEASE** to release channel path nn from the isolated logical partition.

Notes:

1. When a channel path is taken offline, it remains associated with the logical partition from which it is taken offline until it is brought online in another logical partition.

   When a channel path is moved from one logical partition to another, the channel path remains with the receiving logical partition until moved again by means of the CHPID command or an SCP configuration command. If the receiving logical partition is not activated, the channel path is offline until the logical partition is activated or until the channel path is moved again to an activated logical partition.

2. On the processor controller DASD, channel path reassignments are associated with the active IOCDS and *not* with the logical partition definitions. If another IOCDS is chosen, the channel path configuration is determined by the active IOCDS and any channel path reassignments associated with it. If an IOCDS is rewritten, any channel path reassignments associated with it are erased.

3. As in all examples throughout this publication, MVS/ESA is the SCP used for illustration. If a logical partition does not use MVS/ESA, the information in this publication must be interpreted by the installation management and the operator for proper application to the specific SCP. For example, some SCPs may require the operator to use the CHPID command to reassign channel paths when the SCP is active.

```
                                                          dd mmm yy  19:47:07
                Logical Partition Channel Assignments (1 of 2)     (LPCHNA)

 IOCDS: A0/LPARPROD

 CHPID            = 0000 0000 0000 0000 1111 1111 1111 1111   PARTITION #
                    0123 4567 89AB CDEF 0123 4567 89AB CDEF   1 = DOSVSE
                                                              2 = MVSPROD
 PARTITION #      = 1122 3344 1111 1111 2222 2222 1111 1111   3 = MVSTEST
 RECONFIGURABLE   = RRRR RRRR RRRR RRRR RRRR RRRR RRRR RRRR   4 = VMHPO


 CHPID            = 2222 2222 2222 2222
                    0123 4567 89AB CDEF
                                                              LEGEND
 PARTITION #      = 2222 2222 1111 1133                       R = YES
 RECONFIGURABLE   = RRRR RRRR RRRR RRRR                       . = NO
                                                              * = NOT DEFINED


COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                      L. P. PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 9-29. Logical Partition Channel Assignments (LPCHNA) Frame

Changing S/370 Channel Definitions

Channel paths assigned to an S/370 logical partition must be reconfigurable and should be defined as S/370 channels on the Logical Partition S/370 Channel Definition (LPCHND) frame. After the S/370 channels (logical entities) are defined as equivalent to channel paths (physical hardware) in a logical partition, the operator may move (reassign) the channel paths in and out of the logical partition while the logical partition remains active (see "Changing Channel Path Assignments" on page 9-37).

Two channel sets (0 and 1) may be defined for an S/370 logical partition. Each channel set provides up to 32 channels. Channel set 0 must be defined on the LPCHND frame before activation of an S/370 logical partition is allowed. Channel set 1 is optional. If activation fails because channel set 0 is not defined, a message is issued prompting the operator to define at least one S/370 channel for channel set 0.

Channel set 0 is connected to the lowest numbered processor defined for the logical partition. Channel set 1 (if defined) is connected to the higher numbered processor (provided the logical partition is defined as having two processors).

Notes:

1. If an active S/370 logical partition is selected on the LPCHND frame, the display is read only. S/370 logical partitions must be deactivated to define or redefine channels (but not, as discussed above, to reassign defined channel paths between logical partitions).

2. If the operator plans to change an ESA/390 logical partition to an S/370 logical partition, the operator may prepare the channel paths on the LPCHND frame before deactivating the ESA/390 logical partition. LPCHND changes may be made to an active or deactivated ESA/390 logical partition at any time because the changes have no effect until the ESA/390 logical partition is changed to an S/370 logical partition.

Maximum Number of Active Logical Partitions: LPAR mode provides seven channel groups for allocation to the currently-active logical partitions. Channel group requirements for logical partitions are as follows:

- An ESA/390 logical partition requires one channel group.
- An S/370 logical partition with one channel set requires one channel group.
- An S/370 logical partition with two channel sets requires two channel groups.

Each active S/370 logical partition with two channel sets reduces the maximum number of logical partitions that can be activated by one. For example, if three S/370 logical partitions with two channel sets each are activated, a maximum of one more ESA/390 or S/370 (single channel set) logical partition can be activated. If no S/370 logical partitions with two channel sets are activated, the maximum number of active logical partitions is seven. Attempts to activate an additional logical partition when all channel groups are currently allocated will fail with a message informing the operator that the request cannot be satisfied.

Note: Some models have a maximum of four logical partitions.

```
                                                        dd mmm yy  19:47:07
               Logical Partition S/370 Channel Definition           (LPCHND)
 IOCDS: A0/LPARPROD    --------------------CS0/CP1--------------------
          Channel      00 01 02 03 04 05 06 07 08 09 0A
         CHPID(hex)    26 00 01 1D 1E 1F 21 13 2C 07 04


          Channel      10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
         CHPID(hex)    02 03 05

                    CHPIDs not assigned to selected Partition are highlighted
  A= Partition
    1. DOSVSE          B= ACTION
    2. MVSPROD           x1. Update S/370 Channel Definition
 -> 3. MVSTEST            2. Display reconfigurable CHPs for this Partition
    4. VMHPO              3. Select Channel set 1
    5. VMSP1
    6. VMSP2
    7. VMSP3

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                         L. P. PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 9-30. Logical Partition S/370 Channel Definition (LPCHND) Frame

```
                                                          dd mmm yy  19:47:07
               Logical Partition S/370 Channel Definition          (LPCHND)
IOCDS: A0/LPARPROD    --------------------CS1/CP1--------------------
          Channel      00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
         CHPID(hex)    02 1A 06 08 09 0A 29 2A 2B 1C 2D 2E 2F 22 23 24


          Channel      10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
         CHPID(hex)

                   CHPIDs not assigned to selected Partition are highlighted
 A= Partition
   1. DOSVSE           B= ACTION
   2. MVSPROD           x1. Update S/370 Channel Definition
   3. MVSTEST            2. Display reconfigurable CHPs for this Partition
-> 4. VMHPO              3. Select Channel set 0
   5. VMSP1
   6. VMSP2
   7. VMSP3

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                          L. P. PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure 9-31. Logical Partition S/370 Channel Definition (LPCHND) Frame

The operator should use the following procedure to define or redefine S/370 channels:

1. Go to the system console.
2. Enter **F LPCHND** to display the Logical Partition S/370 Channel Definition frame. See Figure 9-32 on page 9-42.
3. Enter **An**, where n is the number of the desired S/370 logical partition. Highlighted CHPIDs indicate channel paths that are assigned to logical partitions other than the selected logical partition. See "Changing Channel Path Assignments" on page 9-37 to reassign channel paths between logical partitions.

   Note: On the LPCHND frame, the *selected Partition* refers to the logical partition selected in the A= Partition field, *not* the target logical partition named on line 24.

4. Enter **B3** if necessary to select the desired channel set. The CSx/CPx field on line 3 of the LPCHND frame identify the the channel set displayed and the processor to which the channel set is currently connected.

   Note: The processor identifier (CPx) does not appear when:

   - The channel set is disconnected.
   - No channels in the channel set are online.
   - The logical partition is not activated in S/370 mode.

5. Enter **B2** to display the reconfigurable channel paths that are available to the selected logical partition.
6. If the selected logical partition is active, go to the operator console, shut down the SCP and deactivate the logical partition. See "Deactivating a Logical Partition" on page 9-33.

7. Enter **B1**. Underscored update fields are displayed below the CHPID fields. See Figure 9-33 on page 9-43. Update the necessary fields and press the Enter key. Enter **X1** to confirm or **B1** to cancel. The definitions are written to the processor controller DASD.
8. Activate the logical partition. See "Activating Logical Partitions" on page 9-31.
9. IPL the SCP.

```
                                                   dd mmm yy  19:47:07
              Logical Partition S/370 Channel Definition          (LPCHND)
 IOCDS: A0/LPARPROD   ----------------------CS0----------------------
          Channel     00 01 02 03 04 05 06 07 08 09 0A 0B
         CHPID(hex)   26 00 01 1D 1E 1F 21 13 2C 07 04 20
                      __ __ __ __ __ __ __ __ __ __ 0C 0D    5A __ __

          Channel     10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
         CHPID(hex)   02 03 05
                      __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
                   CHPIDs not assigned to selected Partition are highlighted
  A= Partition
    1. DOSVSE         B= ACTION
    2. MVSPROD       -> 1. Update S/370 Channel Definition
    3. MVSTEST          2. Display reconfigurable CHPs for this Partition
 -> 4. VMHPO            3. Select Channel set 1
    5. VMSP1
    6. VMSP2
    7. VMSP3

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                        L. P. PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure 9-32. Logical Partition S/370 Channel Definition (LPCHND) Frame

```
                                                     dd mmm yy  19:47:07
              Logical Partition S/370 Channel Definition          (LPCHND)
IOCDS: A0/LPARPROD   ----------------------CS0----------------------
         Channel      00 01 02 03 04 05 06 07 08 09 0A 0B
        CHPID(hex)    26 00 01 1D 1E 1F 21 13 2C 07 04 20

         Channel      10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
        CHPID(hex)    02 03 05

                   CHPIDs not assigned to selected Partition are highlighted
 A= Partition
-> 1. DOSVSE          B= ACTION
   2. MVSPROD           1. Update S/370 Channel Definition
   3. MVSTEST        -> 2. Display reconfigurable CHPs for this Partition
   4. VMHPO             3. Select Channel set 1
   5. VMSP1
   6. VMSP2           Byte  00 01 02 03 04 05 06 07 40 41 42 43 44 45 46 47
   7. VMSP3           Block  .  .  .  .  .  .  .  . 08 09 0A 0B 0C 0D 0E 0F
                            10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
                            20 21 22 23 24  .  .  .  .  . 2A 2B 2C  .  .  .

COMMAND ==>
SYSTEM 1 MVSPROD  1 .. 2 ..                  L. P. PSW0 Operating

        A:a MODE
```

Figure 9-33. Logical Partition S/370 Channel Definition (LPCHND) Frame

Chapter 10. Recovery Actions in LPAR Mode

This chapter discusses the following topics:

Recovery Procedures in LPAR Mode

Installation management should establish specific recovery procedures for each logical partition that reflect the relative importance of the various applications and the range of options available for various system resources.

If the Configuration frame indicates POWER ON RESET Required, consider the possibility or necessity of recovering the processor unit as if in one of the basic modes (Part 1 of this publication). LPAR mode is again established when power-on reset is performed with B5 selected.

Processor and Vector Facility Recovery Actions in LPAR Mode

This topic discusses recovery actions for processor (CP) and vector facility (VE) failures when the processor unit is in LPAR mode.

For processor problem determination, see "Processor in Check-Stop State" on page 9-14. Use the system console log to examine cleared priority messages. The CPSTAT frame, PA facility, or a reference code also indicate the ID of a failed physical processor or vector facility.

See "Processor Recovery Actions" on page 5-4 or "Vector Facility Recovery Actions" on page 5-6 for reference code information and recovery actions in one of the basic modes.

Notes:

1. Hardware in the check-stop state cannot be recovered without performing a power-on reset as described in Part 1.

   If a power-on reset returns hardware in the check-stop state to the configuration before the hardware is repaired and the operator brings it online, processing involves risk because the hardware may fail again.

2. Remember that in LPAR mode the IDs of logical processors (line 24) and those of physical processors (on CPSTAT or CONFIG frames) do not necessarily correspond, even when processors are dedicated to the logical partition.

3. If the SCP is MVS/370 or VM/SP HPO, the channel set is associated with the lowest-numbered logical processor. If the corresponding physical processor fails, it is taken offline by the SCP, the channel set is switched to the next higher-numbered logical processor, and processing continues. If another physical processor is available so that the logical processor may be brought back online, the channel set remains with the higher-numbered logical processor.

4. MVS/ESA may take a logical processor offline for reasons other than a failure in the physical processor.

5. If a processor fails, the vector facility associated with the processor also fails. If MVS/ESA takes a logical processor offline, an associated vector facility is also taken offline.

6. If the vector facility that fails is the last available vector facility, all logical partitions that share the vector facility are notified. Each SCP takes the logical vector facility offline in its logical partition.

Recovery from processor or vector facility failures in LPAR mode require the following considerations:

- The ability of the SCP that was operating on the processor when it failed to handle the failure.
- The number of processors or vector facilities that are configured.
- The number of processors or vector facilities that may be shared.
- The number of processors or vector facilities that are defined to the logical partition that was using the processor or vector facilities when the failure occurred.

Processor Recovery When MVS/ESA Is Active in a Logical Partition

When active, MVS/ESA automatically handles the recovery from processor and related failures in logical partitions (if more than one processor is available in the logical partition.

Spin Loops

Spin loop recovery generally operates in LPAR mode as it does in one of the basic modes. See "Spin Loops" on page 5-2.

Warning: In one of the basic modes, a spin loop time-out occurs after about 40 seconds for MVS/XA and about 20 seconds for MVS/370. In LPAR mode, a spin loop time-out may take considerably longer. For example, if a logical partition is dispatched on shared processors about 20% of the time, the 40-second time-out interval could take as long as 3 minutes and 20 seconds; a logical partition with a lower relative processing weight could take even longer.

Because the time-out interval is lengthened (even for those spin loops that are resolved before the time-out occurs), the operator may think that a logical partition is not operating normally and may unnecessarily perform a disruptive recovery action. To avoid such mistakes, operators should understand that *apparent hangs* may occur in MVS logical partitions that share processors, especially those that have a low relative processing weight.

MVS/ESA: MVS/ESA is enhanced to provide recovery from excessive spin loop conditions without any intervention from the operator. MVS/ESA has also shortened the time-out interval to 10 seconds and now uses the TOD clock to measure the time-out interval.

A problem opposite to that of MVS/XA and MVS/370 logical partitions may occur in MVS/ESA logical partitions because the TOD clock is used to measure the time-out interval. If a 10-second interval is allowed for a spin loop time-out, the time-out may occur before the logical partition has had 10 seconds of processing time. Because of this, MVS/ESA automatically uses a 40-second interval in logical partitions that share processors to prevent false excessive spin loop time-outs and unnecessary recovery actions. If a logical partition uses dedicated processors, MVS/ESA automatically uses the 10-second interval.

MVS/ESA also allows the operator to change the spin loop time-out interval with the MVS SET command.

Alternate Processor Recovery

Alternate processor recovery (ACR) for MVS/ESA operates in LPAR mode as it does in one of the basic modes. See "Alternate Processor Recovery" on page 5-2.

Strategies for Processor Recovery

The strategies for processor recovery differ, depending on whether one or more than one physical processor is configured.

One Physical Processor Configured

If one physical processor is configured and it is in the check-stop state, all logical partitions fail (single point of failure). Allow the service representative to repair the processor unit or attempt to recover the processor by performing a power-on reset. (If a check-stopped processor is reset by a power-on reset, continued processing involves risk because the processor may fail again.)

If only the logical processor fails, the outage is confined to the SCP in that logical partition. IPL the SCP.

More Than One Physical Processor Configured

When more than one physical processor is configured, and especially when a logical partition has more than one logical processor defined, the options to consider are increased in the event of a processor failure. See "Processor in Check-Stop State" on page 9-14. Consider the following options if a processor fails:

- If a logical processor is in the check-stop state but not because a physical processor is in the check-stop state, the failure is confined to the logical partition. It may be possible to enter the SCP configuration command for processors (in MVS/ESA, for example, CF CPU) to reset the logical processor by taking it offline and bringing it online. If that does not work and the logical partition *requires* the processor (the processor is critical to the work that is done in the logical partition), shut down the SCP and perform an IPL. If the IPL fails, deactivate the logical partition, activate the logical partition, and perform an IPL. This example is also described in "Processor in Check-Stop State" on page 9-14.

  Note: If the processor is not critical, leave it offline (do nothing).

- Installation management should establish a priority for each logical partition relative to the others if a processor failure in one logical partition might require that logical partitions be redefined to maintain the necessary degree of processing capability in any individual logical partition. For example, what should the operator do if logical partitions that use shared processors and logical partitions that use dedicated processors are defined and a physical processor fails? If a shared processor fails, must a dedicated processor be given up to maintain the shared processors? If a dedicated processor fails, must a shared processor be given up to replace the dedicated one? The operator cannot decide a course of action without knowing the value of the each logical partition in relationship to the others and the intentions of installation management.

See the examples provided in Figures 10-2, 10-3, and 10-4. An introduction to these examples is provided in Figure 10-1.

Note: Before bringing (or leaving) logical processors online in a logical partition without at least as many physical processors being available to support them, consider the possible effect on system throughput. For example, if two physical processors are configured and two shared processors are defined to a logical partition and one physical processor fails, the operator may bring the logical processor back online with an SCP configuration command or an IPL of the SCP. Both processors in the logical partition then operate on one physical processor and performance may be less than optimum
(but the operator can do this and may wish to do so).

Examples: In the following examples, the physical and logical configuration at the time of failure is shown at the top; the resulting configuration after recovery is shown at the bottom, below an arrow. The Physical Processor Summary Status indicator (PX) is shown near the failed physical processor (reflected from its position on line 24). The Logical Processor Summary Status indicator (L. or LX) is shown near the logical processors (reflected from its position on line 24). Note that the summary status indicators may actually be other than L., LX, or PX (see "Processor Unit Status (Line 24)" on page 9-12 and "Processor in Check-Stop State" on page 9-14). Also note that the message insert in the PSW field for the failed processor may not indicate *check-stopped* if an automatic recovery action (for example, ACR with an SCP of MVS) has taken place.

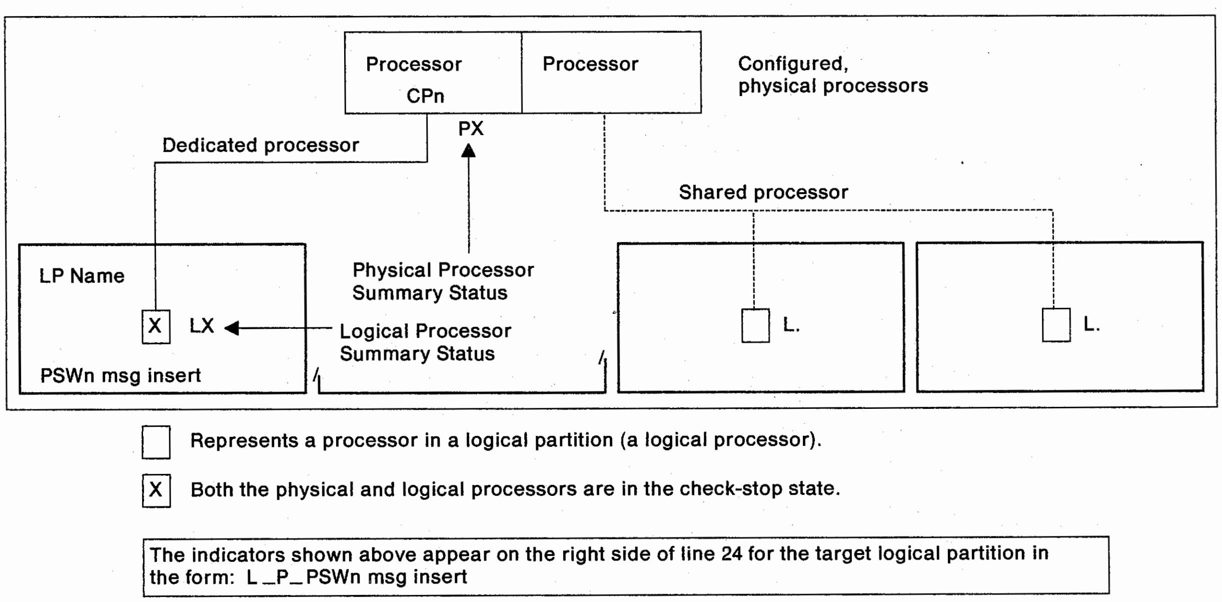


Figure 10-1. Conventions Used in the Failure Examples

Example 1: Physical processor fails, but the SCP in MVSPROD remains active. MVS/ESA (the SCP in MVSPROD) automatically deconfigures the logical processor that was dispatched on physical processor CP2 when CP2 entered the check-stop state. To prevent performance degradation, the operator deconfigures (from the operator console) a logical processor in MVSTEST so that the logical configuration in MVSTEST does not exceed the available physical configuration.

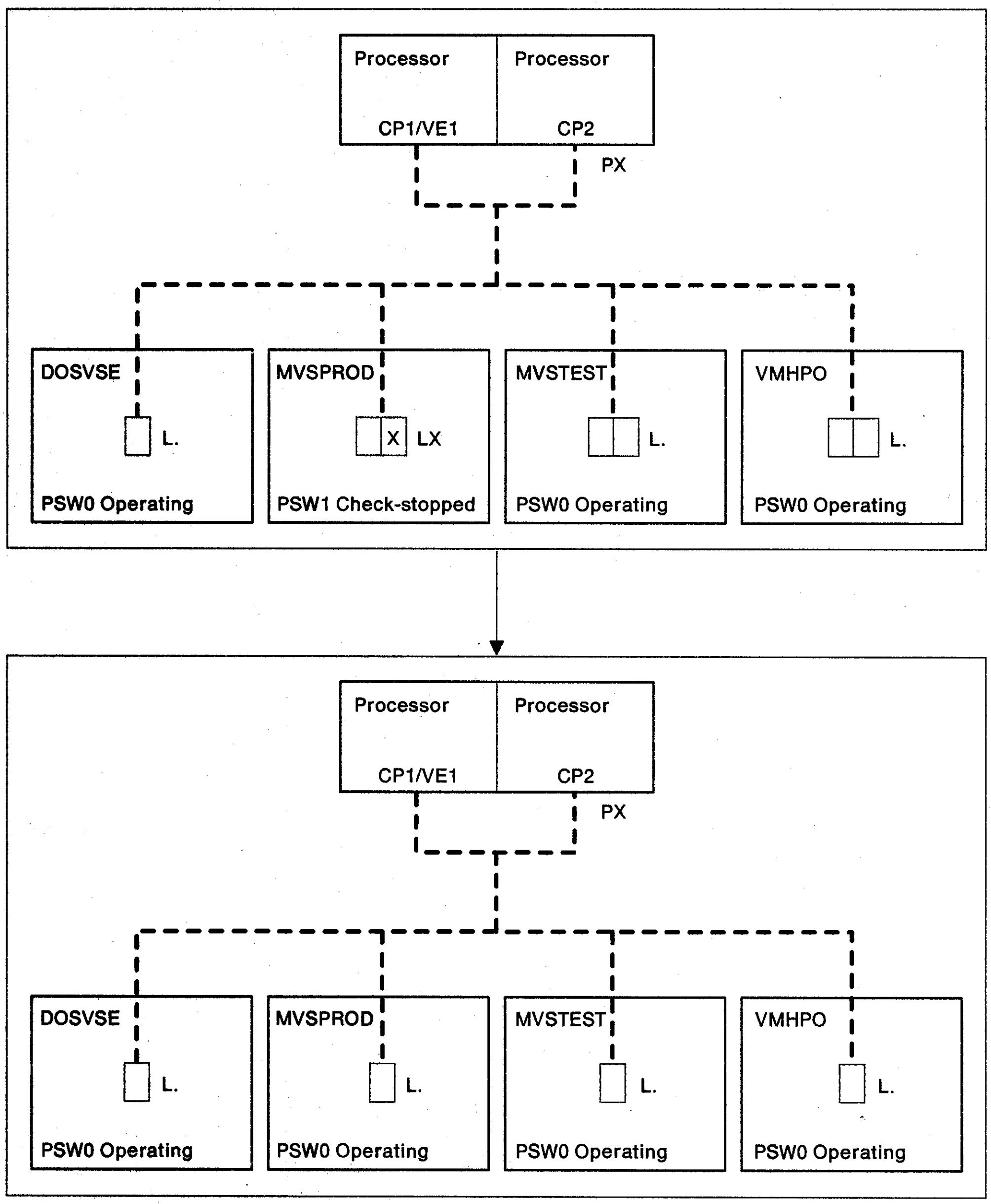


Figure 10-2. Example 1: Failure in a Shared Physical Processor

Example 2: Physical processor fails, causing an immediate outage of the SCP in logical partition DOSVSE because the logical processor in DOSVSE was dispatched on CP2 when CP2 entered the check-stop state. The operator performs an IPL in DOSVSE to recover the logical processor for the logical partition. To prevent performance degradation, the operator deconfigures (from the operator console) a logical processor in MVSPROD and a logical processor in MVSTEST so that the logical configuration in these logical partitions does not exceed the available physical configuration.

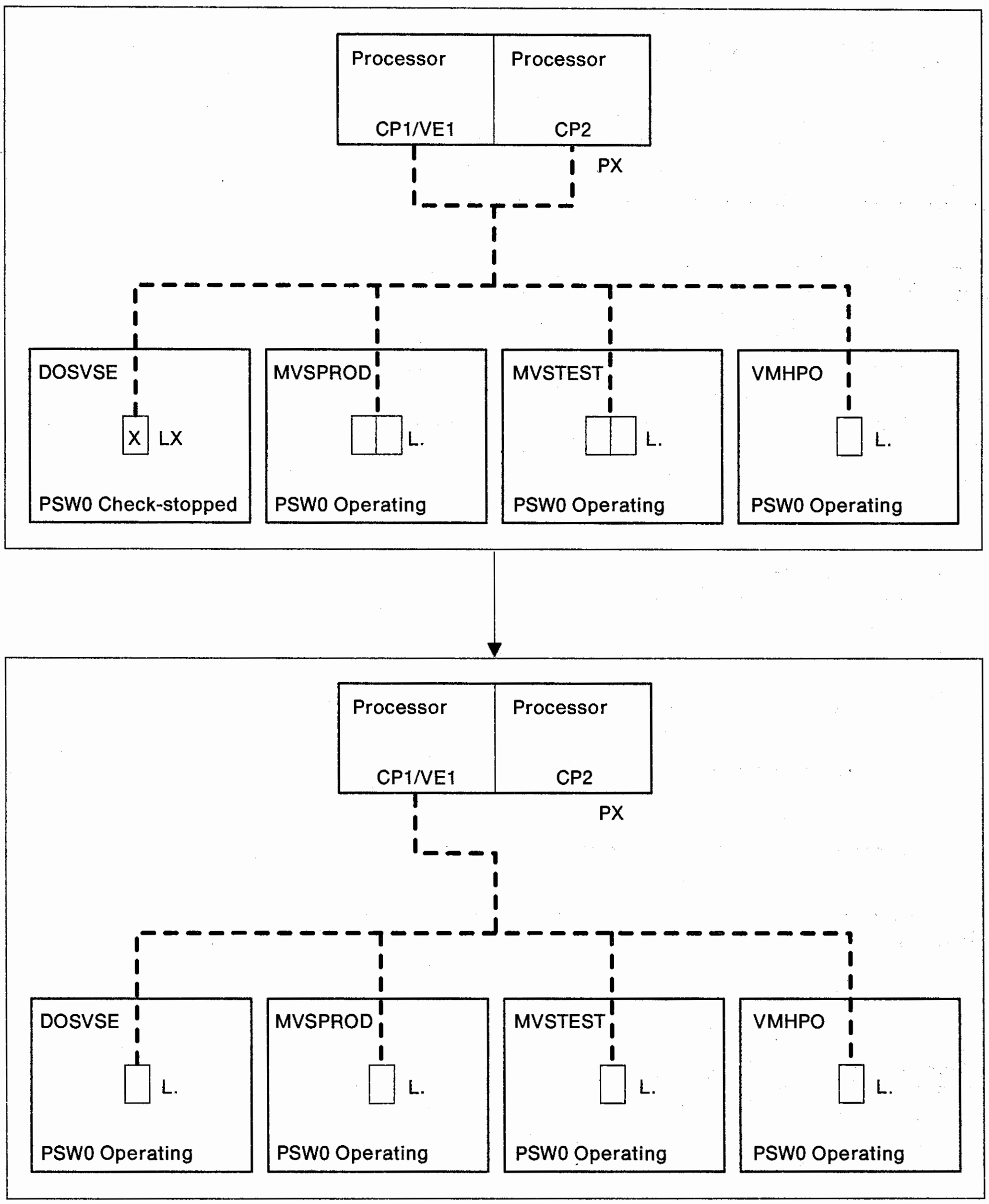


Figure 10-3. Example 2: Failure in a Shared Physical Processor

Example 3: Physical processor CP1 fails, causing an immediate outage of the SCP in logical partition DOSVSE. The operator deactivates DOSVSE, redefines it as using shared processors (by entering a numerical value in place of DED on the LPCTL frame), activates DOSVSE, and performs an IPL. DOSVSE then shares the remaining physical processors (CP1) with the other logical partitions.

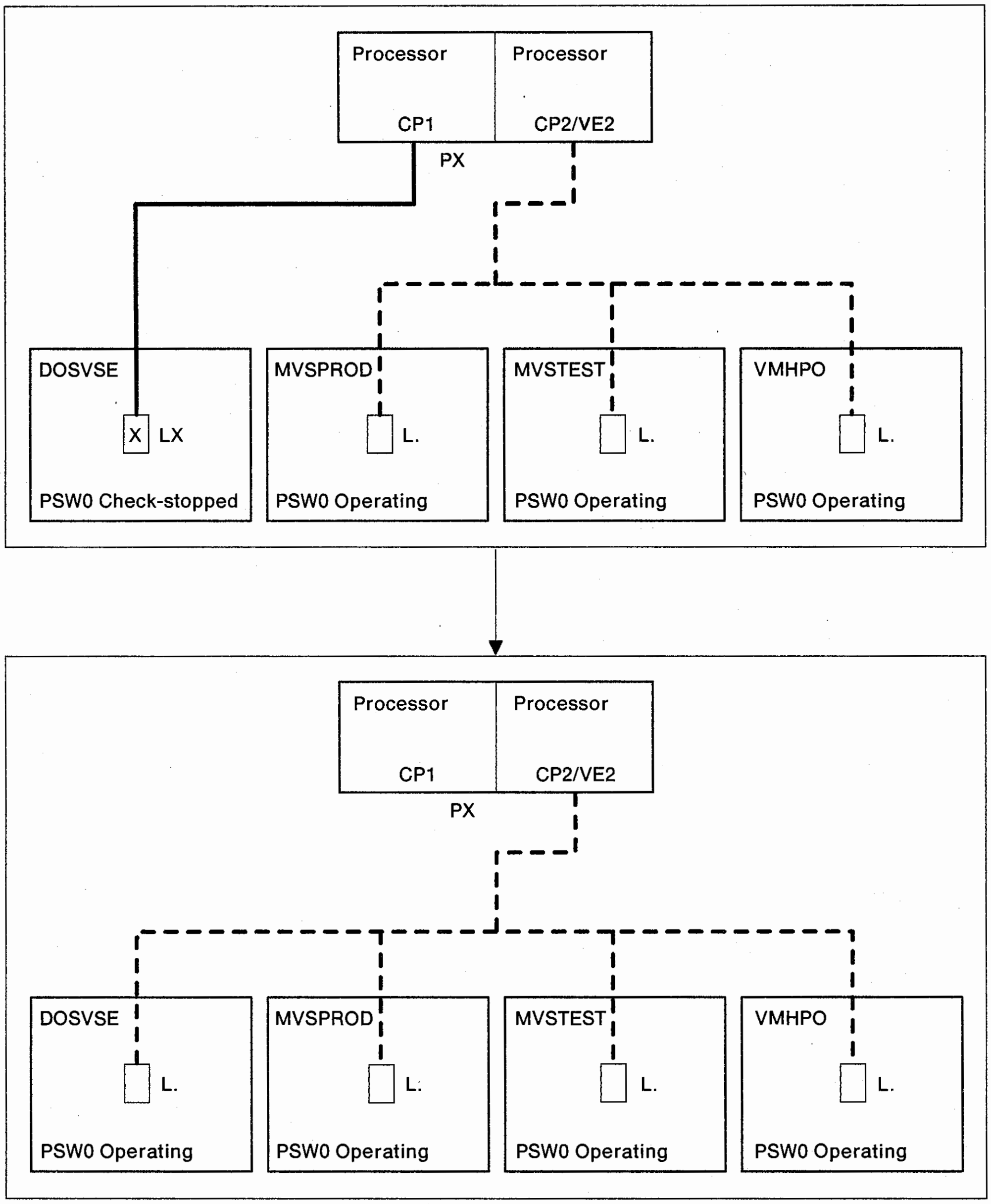


Figure 10-4. Example 3: Failure in a Dedicated Physical Processor

Strategies for Vector Facility Recovery

The strategies for vector facility recovery differ, depending on whether one or two physical vector facilities are configured.

Note: A vector facility cannot be defined as dedicated to a logical partition. To dedicate a vector facility to a logical partition, a physical processor with an associated vector facility installed must be dedicated to a logical partition. In the following topics, where vector facilities may be mentioned as dedicated to a logical partition, it should be understood that the associated processor is the resource that is dedicated to the logical partition.

One Physical Vector Facility Configured

If one physical vector facility is configured and it is in the check-stop state, all jobs that require the vector facility do not start, abnormally end (abend), or go into a vector facility wait until canceled by the operator. Each logical partition is notified of the failure when the logical partition attempts to use the vector facility.

The operator should attempt one or more of the following:

- Continue without the vector facility and schedule a repair.
- Use an SCP configuration command to configure offline and online the logical vector facility in an attempt to reset the associated physical processor. For example, in MVS/ESA, enter CF VF(n),OFFLINE and CF VF(n),ONLINE at the MVS master console. Or, IPL the SCP.
- Attempt to reset the vector facility by using the LPAR command or by performing a power-on reset. (These actions are disruptive to all logical partitions.)

If two physical vector facilities are configured and one physical vector facility is in the check-stop state, only the logical partition that is using the vector facility at the time of failure is notified of the failure (very similar to the way processor failures are handled).

Two Physical Vector Facilities Configured

If it is necessary at this time to run vector facility jobs in the affected logical partition and the other physical vector facility is available, the operator should attempt to recover the vector facility resource. The physical processor with which the available vector facility is associated must be operational and online.

Vector facilities are recovered much the same way as processors. If the logical vector facility is in the check-stop state but the physical vector facility is operational, the physical resource remains available. Attempt to bring the logical vector facility back online with the SCP configuration command for the vector facility, shut down down the SCP and IPL, or continue without the vector facility.

If the physical vector facility is in the check-stop state, consider the following options:

- If the failed vector facility is dedicated to the logical partition, is necessary, and the other is available, consider the following:
  - Deactivate one or more logical partitions that use the vector facility to release the vector facility. Then deactivate and activate the logical partition that is affected by the vector facility failure. The failed vector facility is replaced by the free vector facility.

- Deactivate the affected logical partition. Redefine the logical partition as using shared processors (by entering a numerical value in place of DED on the LPCTL frame). Activate the logical partition and IPL the SCP. The affected logical partition now shares the vector facility with the other logical partitions.

- If the failed vector facility is shared (its associated processor is shared by two or more logical partitions), and another shared vector facility is available, consider the following:

  - Use an SCP configuration command to configure offline and online the logical vector facility in an attempt to reset the associated physical processor. For example, in MVS/ESA, enter CF VF(n),OFFLINE and CF VF(n),ONLINE at the master console.

  - Shut down the SCP and IPL to recover the logical vector facility.

  - Continue without the vector facility if no vector facility jobs are waiting.

If the only remaining physical vector facility is dedicated, the dedicated logical partition must be deactivated to provide a vector facility for the logical partitions that share processors. If it is also necessary to operate the vector facility in the logical partitions with dedicated processors, the logical partitions that use dedicated processors must be changed from dedicated to shared.

When a vector facility enters the check-stop state, the job that is running on the vector facility at the time of failure is abnormally ended (abended). If other jobs were running on the vector facility (but not when the vector facility failed) and only one vector facility is configured, each job goes into a vector facility wait where it remains until the operator cancels it. Jobs that have not started on the vector facility are informed that the vector facility is not available when the SCP attempts to start the job (and may also enter a vector facility wait until canceled).

If more than one vector facility is available to the SCP (more than one vector facility is dedicated to the logical partition or the logical partition shares vector facilities with other logical partitions) when a vector facility fails, all vector facility jobs automatically go to the operational vector facility.

See the examples provided in Figures 10-5 and 10-6. An introduction to these examples is provided in Figure 10-1. For examples of shared vector facilities, look at the examples of shared processors provided in Figures 10-2 and 10-3.

Note: Before bringing (or leaving) logical vector facilities online in a logical partition without at least as many physical vector facilities being available to support them, consider the possible impact on system throughput. For example, if two physical vector facilities are configured and two shared vector facilities are defined to a logical partition and one physical vector facility fails, the operator may bring the logical vector facility back online with an IPL of the SCP. Both vector facilities in the logical partition then operate on one physical vector facility and performance degradation may result (but the operator can do this and may wish to do so).

Example 5: Physical vector facility fails. The operator deactivates MVSTEST, redefines it as using shared processors (by entering a numeric value in place of DED on the LPCTL frame), activates MVSTEST, and performs an IPL. MVSTEST then shares the remaining physical vector facility with the other logical partitions.

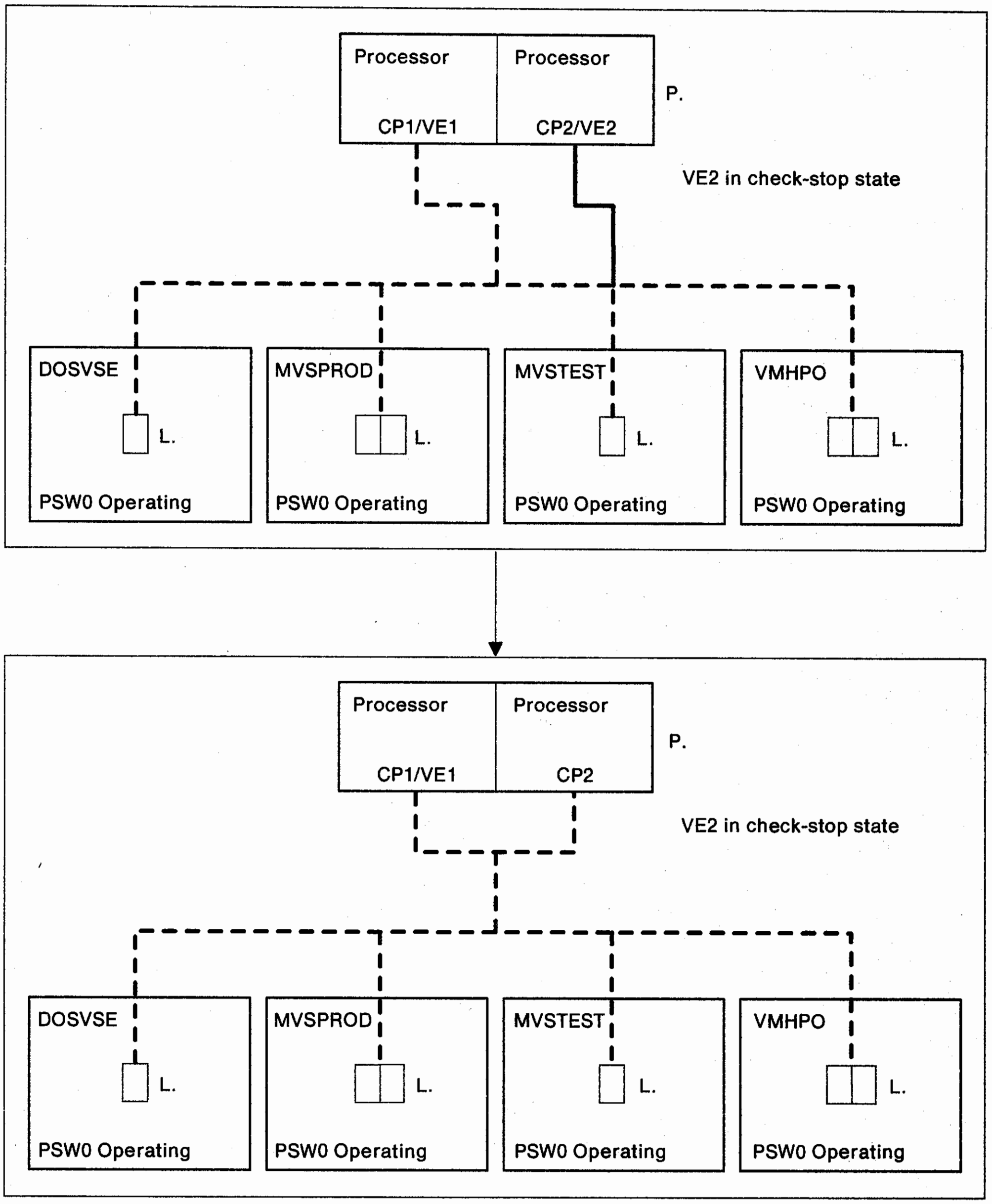


Figure 10-5. Example 4: Failure in a Dedicated Physical Vector Facility

Example 6: Physical vector facility fails. The operator shuts down all SCPs and deactivates all logical partitions. The operator activates VMHPO and performs an IPL. VMHPO takes the available physical vector facility (VE0 in this example) as a dedicated vector facility (dedicated processor CP1). The operator activates the other logical partitions and performs an IPL in each.

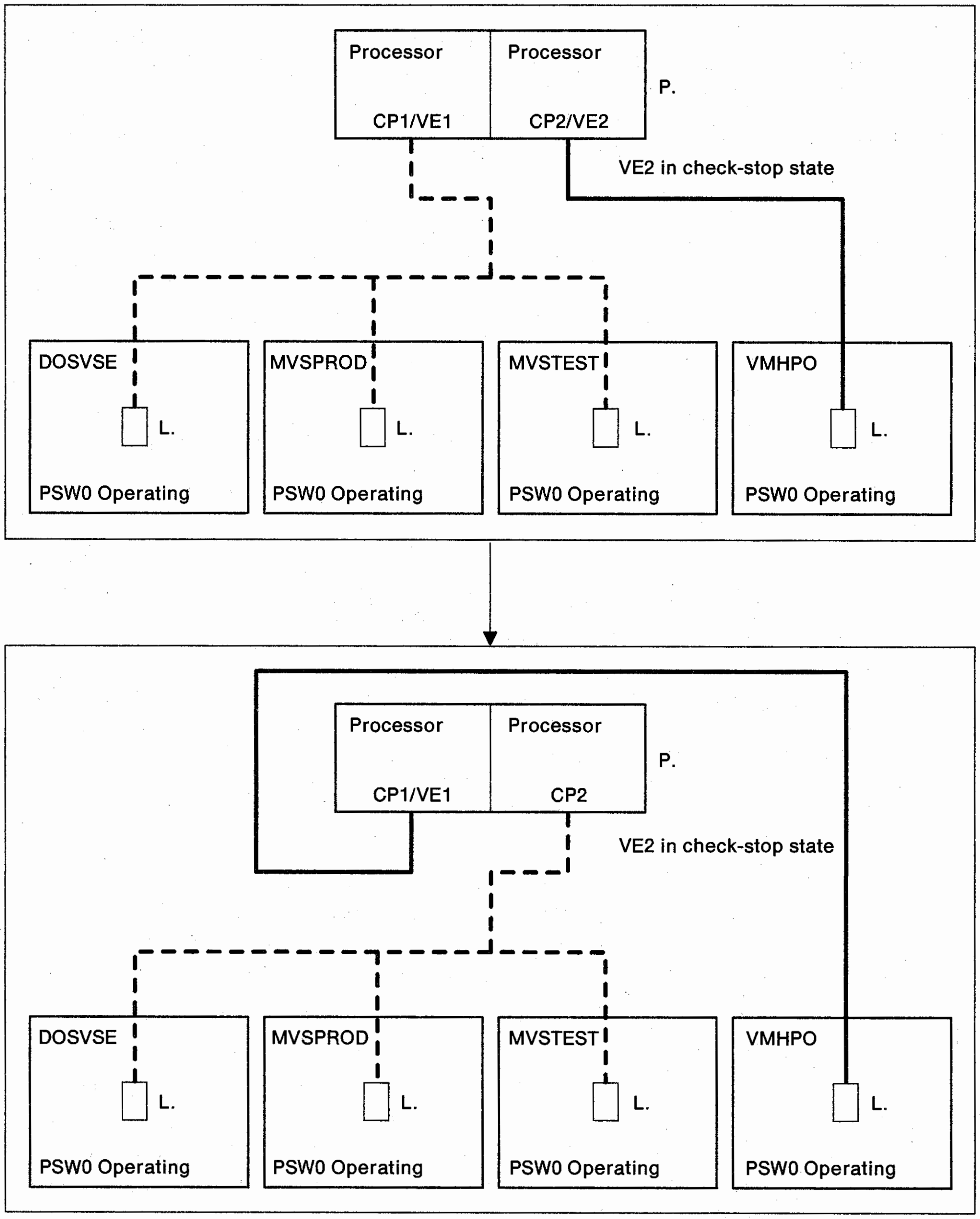


Figure 10-6. Example 5: Failure in a Dedicated Physical Vector Facility

Processor Storage Recovery Actions in LPAR Mode

The following topics provide recovery actions for uncorrectable errors (UEs) in central and expanded storage.

Central and Expanded Storage Recovery Actions

Uncorrectable errors (UEs) in the hardware system area (HSA) and central storage controller failures are handled in LPAR mode as they are handled in one of the basic modes (see "Central and Expanded Storage" on page 6-2). UEs in main storage cause the SCP in the logical partition that owns the storage to check-stop.

If the SCP check-stops because of an uncorrectable error in main storage deactivate the logical partition, activate the logical partition, and IPL the SCP. This validates the low-order increments of central storage that are assigned to the logical partition.

Channel Path Recovery in LPAR Mode

If a critical I/O device is attached to only one channel path in a logical partition and the channel path fails, the operator should perform one of the following:

- If another logical partition has a path to the device and the channel path can be reconfigured, consider the possibility of taking the operational channel path and moving it (perhaps the operational path is not critical to its current logical partition, or the logical partition with the operational path is less critical to the overall operation of the processor unit). See "Changing Channel Path Assignments" on page 9-37.
- Notify the service representative and have the failed channel path swapped with a spare channel path (see "Channel Path Swap Procedure" on page 7-8); schedule service for the failed channel path.
- Allow the service representative to repair the processor unit.

Notes:

1. In S/370 logical partitions, the operator must first define a moved channel path on the LPCHND frame before it can be used (see "Changing S/370 Channel Definitions" on page 9-39). Therefore, in an S/370 logical partition the operator must shut down the SCP and deactivate the logical partition to assign a previously undefined channel path.
2. If a reconfigurable channel path is moved among logical partitions, the move is associated with the active IOCDS and is recorded on the processor controller DASD. (The IOCDS itself is not changed.) If an IOCDS is rewritten, channel path reassignments are erased (the next time the IOCDS is selected and a power-on reset is performed).

Releasing a Shared I/O Device in LPAR Mode

If two or more SCPs share an I/O device and a failure occurs so that the shared I/O device is reserved to the failed SCP (the SCP that was directly affected by the failure), the device may not be available to the sharing systems until it is released. The device remains reserved to the failed SCP because the SCP had issued a Reserve command to the device before the failure or because the device was moving data for the failed SCP at the time of failure.

Warning: The LPAR command, system reset (SYSRESET), initial program load (IPL), and power-on reset (POR) functions attempt to reset channel paths. The reset clears any existing reserves. Because a reserve establishes exclusive access to an I/O device, a data integrity problem may result from clearing a reserve in a shared DASD environment.

The most common indicator that a failed SCP holds a reserve for a shared I/O device is an I/O error message (for example, MVS/ESA message IOS071I, START PENDING) appearing at the master consoles of the sharing SCPs.

The sharing SCPs may fail if the reserved device is not released as quickly as possible. Try to release the reserved device first and recover the failed SCP later because the reserved device may be required by the sharing SCPs before the failed SCP is recovered.

The operator should consider the following procedure and the corresponding flowchart, Figure 10-7:

1. Go to the system console of the processor unit that includes the failed SCP.
2. Enter **F CONFIG** to display the Configuration frame:
   a. If POWER ON RESET Complete is indicated, make the logical partition of the failed SCP the target logical partition and enter **SYSRESET**.

      The SYSRESET command resets the channel paths in the logical partition and should release the device; if it does not, shut down the SCPs for all logical partitions (in the affected processor unit), and enter **LPAR** to initialize LPAR mode. If the LPAR command does not release the device, enter **F CONFIG** to display the CONFIG frame, enter **A1** to release the configuration, and enter **IFRST ALL** to reset the channel paths for all logical partitions in the affected processor complex.

   b. If POWER ON RESET Required is indicated, enter **IFRST ALL**.

      The IFRST ALL command resets all channel paths and should release the device; if it does not, go to step 3.
3. If the IFRST ALL command does not release the device, power off and power on the processor unit that includes the failed SCP.

   Note: Depending on the extent and location of the failure, it may not be possible to complete the power-on sequence. The only purpose of the power-on sequence in this situation is to release the shared device. Follow local procedures for reporting problems.

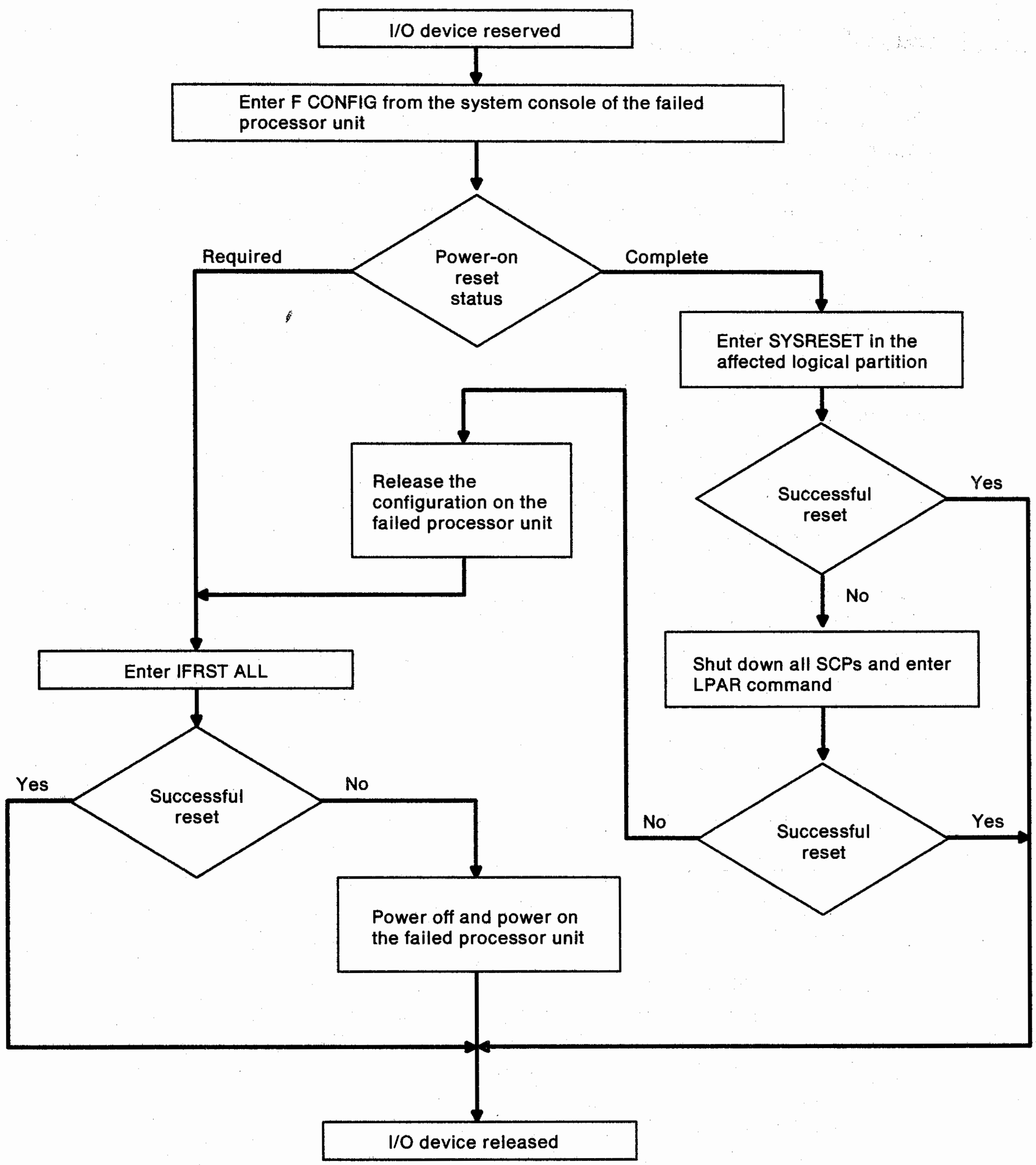


Figure 10-7. Releasing a Shared Device in LPAR Mode

Single Points of Failure in LPAR Mode

The following topics discuss hardware failures that may be single points of failure in LPAR mode, depending on the extent and location of the failure, and depending on the model and configuration of the processor unit.

PR/SM Hardware

If a system console message indicates *LPAR failure*, an outage of the SCPs in all logical partitions is possible. Perform one or more of the following:

- Allow the service representative to repair the processor unit.
- Go to "Recovering a Logical Partition or LPAR Mode" on page 10-17 and initialize LPAR mode by means of the LPAR command or a power-on reset in LPAR mode.
- Consider a power-on reset in one of the basic modes (if possible) and restart processing on the most critical application.

Processor Controller

A processor controller failure is not a single point of failure because it does not cause an immediate outage of the SCP. But the most conservative course requires the operator to perform an orderly shutdown of all SCPs. See "Stall Detection" on page 1-18 and "Stall Detected" on page 8-29. As in one of the basic modes, if the processor controller fails, shut down the SCPs and use the telephone to call the service representative (RSF may not be available).

Power and Logic

In LPAR mode, power and logic failures are handled as in one of the basic modes:

- Power boundary failure, see "Power Recovery Actions" on page 4-6.
- Logic service adapter (LSA) failure, see "Logic Service Adapter Recovery Actions" on page 4-10.
- Logic support station (LSS) failure, see "Logic Support Station Recovery Actions" on page 4-11.

System Control Element

Failure of the system control element results in an outage of the SCP in each logical partition. Perform one of the following:

- Allow the service representative to repair the processor unit.
- Perform a power-on reset in LPAR mode in an attempt to reset the system control element. Continued processing involves risk because the system control element may fail again.

Channel Control Element

Failure of the channel control element results in a channel subsystem damage (CK) machine check and an outage of the SCP in each logical partition. Perform one of the following:

- Allow the service representative to repair the processor unit.
- Initialize LPAR mode by means of the LPAR command, activate the logical partitions, and IPL the SCPs. If the LPAR command fails or the IPL fails, perform a power-on reset in LPAR mode in an attempt to reset the channel control element. Continued processing involves risk because the channel control element may fail again.

Recovering a Logical Partition or LPAR Mode

When a failure occurs in LPAR mode, one of the following has failed:

- Software (the SCP or an application program running in a logical partition). The software failure affects only the logical partition in which it was loaded. The operator should perform software problem determination and recovery according to local procedures.
- Hardware (including that which supports LPAR mode). The hardware failure affects one or more logical partitions and the effect would vary depending on the extent and location of the failure.

  If any of the critical logical partitions are performing work, consider the recovery actions in Part 2. If all of the logical partitions are shutdown (none are performing work), the operator should perform problem determination and recovery according to Part 1.

If the operator sees no indication that a software, processor unit hardware, or I/O device failure has occurred, Figure 10-8 provides a general procedure for recovering either a logical partition or LPAR mode. The operator should enter the LOGLP command for a single logical partition (naming the affected logical partition), perform a stand-alone dump, and IPL the SCP in the affected logical partition. If the LOGLP command and IPL does not recover the logical partition, the operator should deactivate the logical partition, activate the logical partition, and IPL the SCP.

If recovery is not successful but the logical partition is not critical, leave the logical partition activated but idle and follow local procedures for reporting problems. If recovery is not successful and the logical partition is critical, regard the failure as a failure of all logical partitions. Shut down all SCPs, enter the LPAR RESTART LOG command, activate the logical partitions, and IPL the SCPs. If the LPAR RESTART command does not recover LPAR mode, perform a power-on reset in LPAR mode.

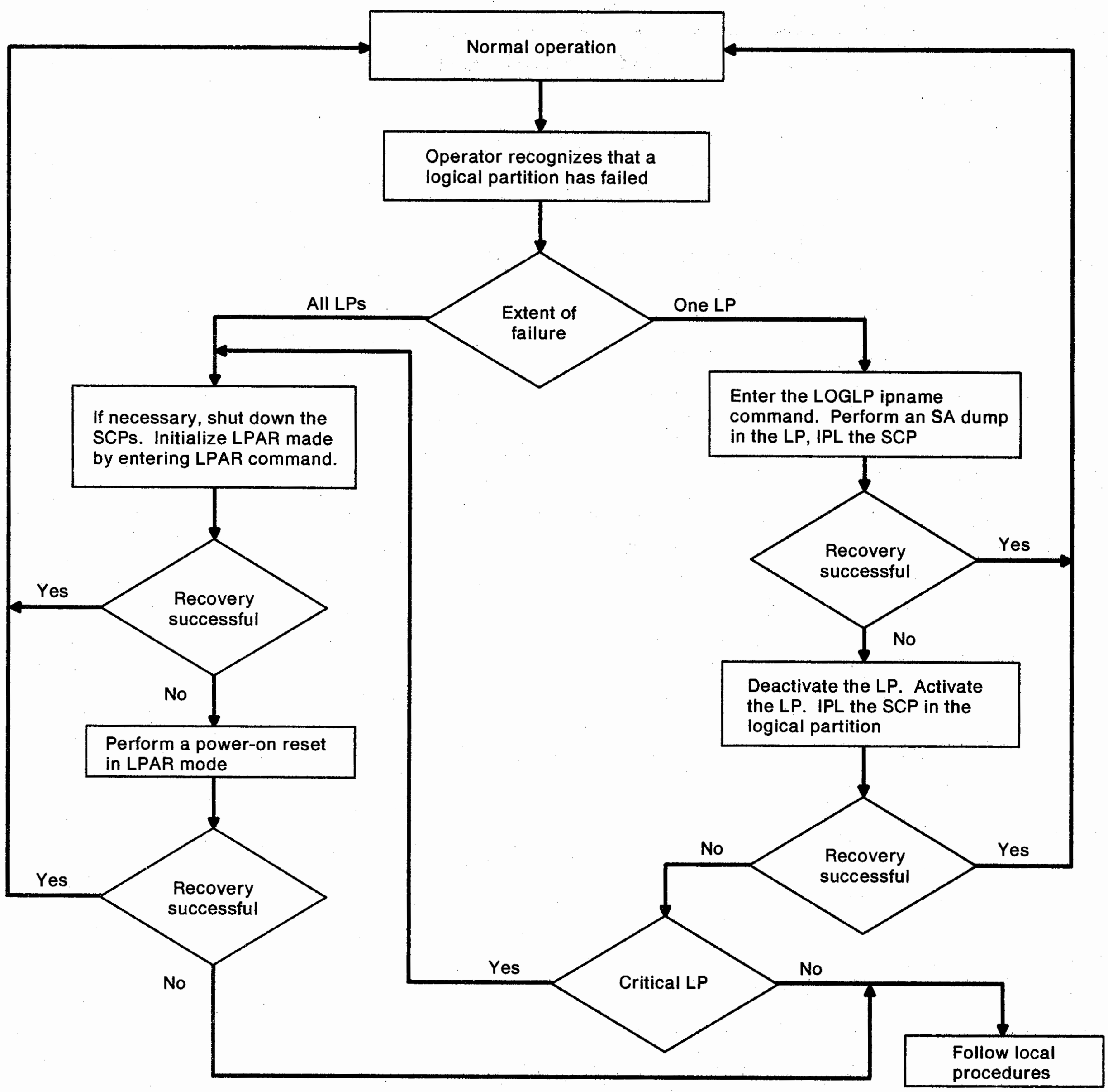


Figure 10-8. Recovering a Logical Partition or LPAR Mode

Appendix A. Recovery Guide Overview

This appendix discusses the following topics:

Planning Checklist

Familiarization

☐ Are the operators familiar with the basic hardware configuration? See "Processor Unit Hardware Overview" on page 1-2.

In LPAR Mode, also see "Overview of Logical Partitions" on page 9-3.

☐ Are the operators familiar with the terminology used in the Recovery Guide? See "Terminology Used in This Publication" on page xvi, "Display Compared with Console" on page 8-22, and "Glossary" on page X-1.

In LPAR mode, also see "Overview of LPAR Mode" on page 9-2.

☐ Are the operators familiar with the conventions used in the Recovery Guide? See "Conventions Used in This Publication" on page xvii.

In LPAR mode, also see "Conventions in Part 2" on page 8-39.

☐ Do the operators know how to use the PA facility? Have recovery action frames been tailored to address identified potential problems (procedural, hardware, or software). See "Problem Analysis Facility" on page 1-5 and "Tailoring the PA Facility" on page 1-7.

In LPAR mode, the PA facility operates as it does in one of the basic modes.

☐ Do the operators know how to find and use a reference code? See "Using a Reference Code" on page 2-20. This topic includes "Directory of Recovery Actions by Reference Code" on page 2-21.

In LPAR mode, reference codes are found and used as in one of the basic modes.

☐ Do the operators recognize the various types of system messages? See "Error Messages" on page 2-6.

In LPAR mode, system messages are similar to those in one of the basic modes.

☐ Do the operators recognize and know how to handle the SCP message facility? See "SCP Message Facility" on page 2-12.

In LPAR mode, see "SCP Message Facility in LPAR Mode" on page 9-20.

☐ Are the operators familiar with the following procedures from the SYSCTL frame? See "Procedures from the SYSCTL Frame" on page 3-10 for these procedures in one of the basic modes:

- Program restart
- Instruction trace

- Stand-alone (SA) dump
- IPL of the SCP

In LPAR mode, these procedures are similar to those in one of the basic modes. See "Procedures from the SYSCTL Frame in LPAR Mode" on page 9-24.

☐ Are the operators familiar with the following procedures from the CONFIG frame? See "Procedure for Power-On Reset or Deselecting Hardware" on page 3-14 for these procedures in one of the basic modes:

- Deselecting hardware
- Power-on reset

In LPAR mode, these procedures are similar to those in one of the basic modes. See "Procedures from the CONFIG Frame in LPAR Mode" on page 9-25.

☐ Are the operators familiar with the recovery strategy for the installation? Do the operators know the location of the recovery plan? See "Strategy" on page A-4.

In LPAR mode, also see "More Than One Physical Processor Configured" on page 10-4.

Initialization

☐ If the SCP can handle service processor damage (SP) machine checks, is stall detection enabled on the OPRCTL frame? See "Stall Detection" on page 1-18.

In LPAR mode, stall detection is separately enabled or disabled for each logical partition. See "Stall Detection in LPAR Mode" on page 9-7.

☐ Are two or more paths provided to each critical I/O device so that each path shares little or no common hardware (optimal I/O configuration)? See "Channel Paths and I/O Devices" on page 1-20.

In LPAR mode, the requirements are the same as in one of the basic modes, but they apply to each logical partition. See "Channel Paths and I/O Devices in LPAR Mode" on page 9-7.

☐ Has at least one spare channel path been defined in the IOCDS so that a channel path swap may be performed if necessary? Note that an active channel path to devices that are *not critical* may be considered a spare channel path. See "Channel Path Swap Procedure" on page 7-8.

In LPAR mode, if the spare channel path is not assigned to the necessary logical partition, it is not necessary to move the channel path to the necessary logical partition to perform a channel path swap. Also, it is not necessary to define the spare channel path as reconfigurable in the IOCDS to perform a channel path swap. But it may be desirable for the spare channel path to be reconfigurable so that it may be moved into the necessary logical partition.

- [ ] Are the operator consoles configured for maximum availability? See "Master Console Configuration" on page 1-21 for the guidelines that govern the configuration of MVS/ESA consoles.

  In LPAR mode, the requirements are the same as in one of the basic modes, but they apply to each logical partition.

- [ ] Do the operators have access to a current copy of the IOCP reports for each IOCDS? See "IOCP Reports" on page 1-22.

  In LPAR mode, IOCP reports provide IOCDS information for each logical partition.

Reconfiguration

- [ ] In LPAR mode, the ACTIVE IOCDS field operates as it does in one of the basic modes.

Strategy

- [ ] Does the installation have a written strategy for I/O problem determination (IOPD) that is unique to the installation and that serves the recovery objectives of the installation?

  In LPAR mode, IOPD may be somewhat more involved and critical than in one of the basic modes. This makes a written strategy for IOPD more important.

- [ ] Does the installation have a written strategy for the various uses of RSF (outbound calls, inbound calls, service updates, and so on) and the maintenance of RSF (customer access code, configuration changes, and so on). See "Remote Support Facility" on page 1-10.

  In LPAR mode, RSF operates as it does in one of the basic modes.

- [ ] Does the installation have a written recovery strategy that covers *at least* the single points of failure. See "Recovery Strategy" on page 1-3 and "Single Points of Failure" on page 1-19.

  In LPAR Mode, see "Recovery Strategy in LPAR Mode" on page 9-5 and "Single Points of Failure in LPAR Mode" on page 9-7.

- [ ] Does the installation have a written recovery strategy that identifies the critical components (I/O devices, application programs, and so on) of the system? If a failure may result in contention for resources, have the relative values of similar components been weighed and identified?

  In LPAR Mode, have priorities been established for each logical partition relative to the others? See "More Than One Physical Processor Configured" on page 10-4.

- [ ] Does the installation have a written recovery plan? A recovery plan includes, for a specific installation, the objective of recovery, the strategy by which recovery is to be achieved, and the tactics by which the strategy is implemented.

Example

The mission of a data processing installation is availability and throughput. The mission is accomplished by achieving written, specific, and measurable objectives. The tactics of the strategy include a written procedure for the operator (how to determine that an SCE failed and which SCE failed, how to perform the partitioning, who should do it (perhaps), who should be contacted (perhaps) during certain shifts, and so on.

Recovery Actions Overview

The ability to recover depends on the extent and location of the failure. To address a current problem, see "Directory of Recovery Actions by Hardware Area" on page 2-19.

Appendix B. Service Language Commands

This appendix discusses the following topics:

This appendix discusses briefly the service language commands that are used in recovery. All the service language commands are discussed further in the *Operator Tasks for the System Console* manual.

In LPAR Mode: Each service language command is also described in regard to the operation of the command in LPAR mode: some are unique to LPAR mode, some operate differently in LPAR mode, some are not supported in LPAR mode, and some are not affected by LPAR mode.

ACTLP

In LPAR mode only, the ACTLP command activates a specified logical partition.

Example

ACTLP MVSPROD

activates the logical partition named MVSPROD.

CHPID

The CHPID command takes a channel path (CHP) offline, brings a channel path online, or releases a channel path from an isolated logical partition. If a channel path is in the check-stop state, the CHPID command attempts to reset the channel path. When the CHPID command is entered from the Channel Configuration (CHNCFA) frame, the information on the frame is immediately updated (refreshed).

The CHPID and SCS commands require that the CONFIG frame indicate POWER ON RESET Complete.

A power-on reset may return an offline channel path to online status, even if the channel path has failed. To prevent this, enter the SCS command immediately after the CHPID OFF command to put the offline channel path into single-channel service (SCS) mode.

Example

CHPID 06 OFF

SCS 06 IN

takes channel path 06 offline and puts it into single-channel service mode.

The CHPID command is executed if the CONFIG frame indicates POWER ON RESET Complete and if all of the following conditions are met. The channel path:

- Must be online.
- Must be defined in the active IOCDS.
- Must not be in single-channel service mode.
- Must not be the last online channel path.

The opposite of CHPID OFF is CHPID ON:

Example

SCS 06 OUT

CHPID 06 ON

takes channel path 06 out of single-channel service and brings it online.

In LPAR Mode: The operator may also use the CHPID command to reassign channel paths among logical partitions. See "Changing Channel Path Assignments" on page 9-37 for a description of the CHPID OFF RELEASE command.

DEACTLP

In LPAR mode only, the DEACTLP command deactivates a specified logical partition. If the SCP is currently active in the logical partition, perform an orderly shutdown of the SCP or use the FORCE parameter to abruptly shut down the SCP and deactivate the logical partition.

Example

DEACTLP MVSPROD

deactivates the logical partition named MVSPROD.

DEACTLP MVSPROD FORCE

deactivates the logical partition named MVSPROD even if the processors in MVSPROD are not in the manual state (for example, if the SCP is still active).

FREECONS

FREECONS interrupts the processor unit when all console input appears to be locked out. This command is recognized only from the Console Assignment frame.

Warning: This is a disruptive procedure and should be used only if the operator cannot issue any commands or receive recognition of any function keys for an extended period. To ensure the console is truly locked out, press the Reset key and then the Enter key, then retry the console entry before resorting to the disruptive FREECONS command.

FREECONS CHECKSTOP: FREECONS should be used when access to the system console is required and the operator is locked out. For example, the operator may want to use FREECONS if pressing Reset, then pressing Enter, does not clear the lockout and the console still appears locked out for extended periods.

To use FREECONS when the system console is locked:

1. Press the Assgn Cons key to display the Console Assignment frame (Figure 8-5 on page 8-24)
2. Enter **FREECONS CHECKSTOP** to place the processor unit in the check-stopped state.
3. Press the End key.

FREECONS RESTART: FREECONS also may be used to perform a processor controller restart from any display, not just the display connected to ports A and B.

To use FREECONS to perform a processor controller restart:

1. Press the Assgn Cons key to display the Console Assignment frame (Figure 8-5 on page 8-24)
2. Enter **FREECONS RESTART**
3. Press the End key.

Notes:

1. Because of the highly disruptive nature of this command, no truncations or abbreviations are recognized.
2. Do not use FREECONS to interrupt system logging, which occurs as a result of some system error and is accompanied by message 25901, on the system console. Message 25901 indicates logging has started and keyboard entries should be suspended until message 25902 is displayed. System logging must be complete before the console is available for input.

In LPAR Mode: The FREECONS command operates the same as it does when the processor unit is in one of the basic modes.

IFCCRST

The IFCCRST command resets the interface control check (IFCC) counter in a specified channel path, or in all channel paths if no CHPID is specified. IFCCRST is available at access level 1.

Example

IFCCRST 06

resets the IFCC counter for channel path 06.

In LPAR Mode: The IFCCRST command operates as it does when the processor unit is in one of the basic modes.

IFRST

The IFRST command resets the specified channel path or all channel paths if IFRST ALL is entered.

Example

IFRST 08

resets channel path 08.

In LPAR Mode: See "Releasing a Shared I/O Device in LPAR Mode" on page 10-14. The IFRST command is supported only when power-on reset is required; all channel paths are reset for all logical partitions in the processor unit.

IRPT

The IRPT command provides an external interruption to the specified processor or the target processor if no processor is specified.

> **Example**
>
> **IRPT CP1**
>
> interrupts processor CP1.

The Irpt key does the same job as the IRPT command with no processor specified (interrupts the target processor).

In LPAR Mode: The IRPT command and the Irpt key operate on the logical processors in the target logical partition.

LOAD

The LOAD CPn command causes an IPL of the SCP to begin on the specified processor. This publication recommends the "Procedure for IPL of the SCP" on page 3-13.

Warning: Do not load the stand-alone dump program by entering LOAD CLEAR because it clears central storage. Use the "Procedure for IPL of the SCP" on page 3-13 to load the stand-alone dump program.

In LPAR Mode: The LOAD command operates on the logical processors in the target logical partition. See "Procedures from the SYSCTL Frame in LPAR Mode" on page 9-24.

LOCKLP

In LPAR mode only, the LOCKLP command prevents the operator from entering commands that may accidentally disrupt logical partitions.

> **Examples**
>
> **LOCKLP**
>
> displays a list of all locked logical partitions.
>
> **LOCKLP ALL**
>
> locks all logical partitions.
>
> **LOCKLP MVSPROD**
>
> locks the logical partition named MVSPROD.

LOGFRAME

The LOGFRAME command copies the current console frame to the appropriate console log (system or service). Frames may be copied in which the input fields have been changed, but not entered. Enter **LOGFRAME** on the command line of the screen to be logged.

In LPAR Mode: The LOGFRAME command operates as it does when the processor unit is in one of the basic modes.

LOGLP

In LPAR mode only, if power-on reset is complete, the LOGLP command operates as described below. The intent of the LOGLP command is to provide a logout of LPAR data for active logical partitions suspected of having a problem.

Notes:

1. To initialize LPAR mode for all logical partitions, see "LPAR" on page B-7.
2. For a discussion of LPAR logouts, see "LPAR Mode Logouts" on page 9-18.

Examples

This command is not disruptive, but the processors in the named logical partitions should first be in the manual or check-stop state. Some SCPs may not tolerate remaining in the manual (stopped) state for the duration of the LPAR logout.

LOGLP ALL

Writes an LPAR log to the processor controller DASD for all logical partitions. It is not necessary that all logical partitions be active prior to entering the LOGLP ALL command.

LOGLP lpname

Writes an LPAR log to the processor controller DASD for the named (lpname) logical partition. If the named logical partition is deactivated, the LOGLP command is rejected.

Consider the following typical applications of this command:

- The SCP is active in a logical partition, but for an unknown reason appears to have a performance problem. At the direction of the next level of support, the operator goes to the system console, enters the SETLP command to select the desired logical partition, presses the Stop key, and enters the LOGLP lpname command. When the LPAR logout is completed, the operator presses the Start key and continues processing.
- The SCP appears to be in a hang in a logical partition. The operator (if possible) shuts down the SCP from the operator console, goes to the system console, enters the SETLP command to select the desired logical partition, presses the Stop key, and enters the LOGLP lpname command. When the LPAR logout is completed, the operator performs a stand-alone dump in the logical partition and performs an IPL.

Note: In each example, the operator should follow local procedures for reporting problems.

LPAR

In LPAR mode only, if power-on reset is complete, the LPAR command operates as described below. The LPAR command is available at access level 1.

Notes:

1. To create an LPAR log for a logical partition, see "LOGLP" on page B-6.
2. For a discussion of LPAR logouts, see "LPAR Mode Logouts" on page 9-18.

Examples

This command is disruptive to all logical partitions.

LPAR RESTART LOG

Writes an LPAR log to the processor controller DASD and automatically initializes LPAR mode. In a typical application of this command, all SCPs are not active. When the LPAR logout is completed, the operator may activate the logical partitions, IPL the SCPs, and restart processing.

LPAR RESTART NOLOG

Initializes LPAR mode, but does not create an LPAR log.

LPAR RELEASE LOG

Creates an LPAR log, but does not initialize LPAR mode. The configuration is released, resulting in a power-on reset required state.

PSW

The PSW command causes the program status word for a specified processor in the manual (stopped) state to be displayed in the PSW field on line 24.

Example

STOP CP1

PSW CP1

stops processor CP1 and displays the current PSW.

In LPAR Mode: The PSW command operates on the logical processors in the target logical partition. See “Processor in Check-Stop State” on page 9-14.

RESTART

The RESTART command restarts the program that was running on a specified processor. The program restart allows recovery from some wait states and program loops. This publication recommends performing program restarts from the SYSCTL frame. See “Procedure for Program Restart” on page 3-10.

In LPAR Mode: The RESTART command operates on the logical processors in the target logical partition. See “Procedures from the SYSCTL Frame in LPAR Mode” on page 9-24.

SCS

The SCS command puts a channel path (CHP) into single-channel service (SCS) mode or takes a channel path out of single-channel service mode. The channel path must be installed and offline.

> **Example**
>
> **CHPID 06 OFF**
>
> **SCS 06 IN**
>
> takes channel path 06 offline and puts it into single-channel service.

The CHPID and SCS commands require that the CONFIG frame indicate POWER ON RESET Complete.

Channel paths in single-channel service mode are written to the processor controller DASD and are not brought online until taken out of single-channel service mode. Several channel paths may be in single-channel service mode at one time.

The opposite of SCS IN is SCS OUT.

> **Example**
>
> **SCS 06 OUT**
>
> **CHPID 06 ON**
>
> takes channel path 06 out of single-channel service and brings it online.

In LPAR Mode: The SCS command operates the same as it does when the processor unit is operating in one of the basic modes.

SERVMODE

The SERVMODE command changes ownership of the configuration from the system console to the service console (SERVMODE ON) or from the service console to the system console (SERVMODE OFF). See "When SERVMODE ON Is Indicated" on page 3-9.

In LPAR Mode: The SERVMODE command operates the same as it does when the processor unit is in one of the basic modes.

SETLP

In LPAR mode only, the SETLP command allows the operator to specify a logical partition as the target logical partition.

> **Example**
>
> **SETLP MVSPROD**
>
> makes the logical partition named MVSPROD the target logical partition.

START

The START command starts the specified processor or all processors if no ID is specified. If a configured vector facility is associated with the processor, the vector facility also starts.

> **Example**
>
> **START CP1**
>
> starts processor CP1 (and, if configured, vector facility VE1).

The Start key does the same job as the START command with no processor specified (starts all processors).

In LPAR Mode: The START command and the Start key operate on the logical processors in the target logical partition.

STOP

The STOP command stops the specified processor or all processors if no ID is specified. If a configured vector facility is associated with the processor, the vector facility also stops.

> **Example**
>
> **STOP CP1**
>
> stops processor CP1 (and, if configured, vector facility VE1).

The Stop key does the same job as the STOP command with no processor specified (stops all processors).

In LPAR Mode: The STOP command and the Stop key operate on the logical processors in the target logical partition.

STORSTAT

The STORSTAT command stores the status of a specified processor in assigned central storage locations. The store-status information is subsequently read by the stand-alone dump program. Store status includes the control registers, the general registers, the current PSW, and other data. See "Procedure for Stand-Alone Dump" on page 3-12.

In LPAR Mode: The STORSTAT command operates on the logical processors in the target logical partition.

SYSIML

The SYSIML command performs a reset of the processor unit hardware. See "System IML (SYSIML)" on page 3-7. This publication generally recommends a power-on reset instead of SYSIML. A power-on reset is a more thorough reset than a SYSIML, includes a SYSIML reset, and is executed in about the same amount of time. See "Procedure for Power-On Reset or Deselecting Hardware" on page 3-14.

In LPAR Mode: The SYSIML command is not available.

SYSRESET

The SYSRESET command resets all channel paths, interruptions, and processors. See "System Reset (SYSRESET)" on page 3-7. MVS/ESA performs a SYSRESET during the IPL process.

In LPAR Mode: The SYSRESET command operates on the logical processors and the channel paths in the target logical partition. SYSRESET stops all activity in a logical partition. A SYSRESET is automatically performed when a logical partition is deactivated.

TAKECONS

If a display fails, any console assigned to the display is no longer operational. This condition is serious if the system console or the service console is assigned to the failed display. The operator must use the Take Console (TAKECONS) command to take the system or service console from the failed display and move it to a working display.

1. Go to an operational display that may be used as a backup to the failed display.
2. Press the Assgn Cons key to display the Console Assignment frame (Figure 8-5 on page 8-24).
3. Enter **TAKECONS xxx**, where xxx is SYS (system console) or SER (service console).
4. Press the End key to activate the console that is taken.

Examples

TAKECONS SYS

transfers the system console from the failed display to the display from which the TAKECONS command is entered.

TAKECONS SER

transfers the service console from the failed display to the display from which the TAKECONS command is entered.

The TAKECONS command is also useful for transferring consoles between operational displays during normal operation. However, when TAKECONS is used to transfer console assignment from an operational display, verify first that the console being moved is not being used.

In LPAR Mode: The TAKECONS command operates the same as it does when the processor unit is in one of the basic modes.

UNLOCKLP

In LPAR mode only, the UNLOCKLP command enables the operator to enter commands to a logical partition that is protected by the LOCKLP command.

Examples

UNLOCKLP

displays a list of all unlocked logical partitions.

UNLOCKLP ALL

unlocks all logical partitions.

UNLOCKLP MVSPROD

unlocks the logical partition named MVSPROD.

Appendix C. MVS/ESA (SCP) Commands

This appendix discusses the following topics:

This topic discusses briefly the system control program (SCP) commands that are related to recovery in an MVS/ESA system. All of the MVS/ESA commands are discussed further in *MVS/ESA Operations: System Commands*, GC28-1826.

In LPAR Mode: In LPAR mode, MVS/ESA configuration commands are supported only for *logical* processor, *logical* vector facility, and channel path reconfiguration.

Processor

If MVS/ESA is active, the operator can take a processor offline by using the following procedure:

1. Go to the master console.
2. Enter **CF CPU(n),OFFLINE**, where n is the ID of a processor (for example, CP**1**).

Examples

CF CPU(1),OFFLINE

takes processor CP1 offline. Vector facility VE1, if configured, is also taken offline.

CF CPU(1),ONLINE

brings processor CP1 online. Vector facility VE1, if configured, is also put online if VE1 was online when CP1 was taken offline and VE1 was not subsequently taken offline.

In LPAR Mode: The operator may use MVS/ESA configuration commands to *logically* change the configuration of logical processors and logical vector facilities. The hardware configuration is not changed.

Vector Facility

When a vector facility fails, it notifies the processor with which it is associated (the same ID). MVS/ESA then begins automatic recovery of the vector facility. If MVS/ESA cannot recover the vector facility, MVS/ESA takes it offline and notifies the operator at the master console.

If MVS/ESA is active, the operator can deconfigure a vector facility by using the following procedure:

1. Go to the master console.
2. Enter **CF VF(n),OFFLINE**, where n is the ID of a vector facility (for example, VE1).

Examples

CF VF(1),OFFLINE

takes vector facility VE1 offline.

CF VF(1),ONLINE

brings vector facility VE1 online (if processor CP1 is online).

In LPAR Mode: The operator may use MVS/ESA configuration commands to *logically* change the configuration of logical processors and logical vector facilities. The hardware configuration is not changed.

Central Storage

MVS/ESA tests all central storage frames during an IPL of the SCP and only frames that are indicated as good are brought online. If a 4K-byte frame of central storage fails, MVS/ESA automatically deallocates the frame (takes it offline). Frames that MVS/ESA finds damaged are not used until the storage is repaired by the service representative. The damaged frame is kept offline regardless of power sequencing, power-on reset, or IPL of the SCP.

If MVS/ESA is active, the operator can deconfigure increments of central storage by using the following procedure:

1. Go to the master console.
2. Enter **CF STOR(nnM-nnM),OFFLINE/ONLINE**, where nnM-nnM is the desired range of central storage, expressed in multiples of the storage increment size. See "Processor Storage Increment Size" on page 6-2.

Example

CF STOR(4M),OFFLINE

takes central storage between 4M bytes and 8M bytes offline.

MVS/ESA also provides the ability to deconfigure storage arrays. The operator should use the following procedure:

1. Go to the master console.
2. Enter **CF STOR(E = n),OFFLINE**, where n is the ID of the desired central storage array.

> **Example**
>
> **CF STOR(E = 2),OFFLINE**
>
> takes central storage array PMA2 offline.

In LPAR Mode: The CF STOR command is not available.

Expanded Storage

MVS/ESA checks the status of all expanded storage frames during an IPL of the SCP and only frames that are indicated as good are brought online. If a 4K-byte frame of expanded storage fails after the IPL, MVS/ESA automatically deallocates the frame.

If MVS/ESA is active, the operator can deconfigure expanded storage arrays by using the following procedure:

1. Go to the master console.
2. Enter **CF ESTOR(E = n),OFFLINE**, where n is the ID of the desired expanded storage array.

> **Example**
>
> **CF ESTOR(E = 2),OFFLINE**
>
> takes expanded storage array ESA2 offline.

In LPAR Mode: The CF ESTOR command is not available.

Channel Path

If MVS/ESA is active, the operator can deconfigure a channel path (CHP) by using the following procedure:

1. Go to the master console.
2. Enter **CF CHP(nn-nn),OFFLINE <,UNCOND/FORCE>**, where nn is a channel path ID (CHPID). If this command is entered from the CHNCFA frame, press the Refresh key after execution.

   UNCOND deconfigures the last path to an unallocated online device.

   FORCE deconfigures the channel path whether or not it is the last path to the device (including allocated devices). FORCE puts the device in boxed status. No further I/O requests for this device are accepted.

Example

CF CHP(12),OFFLINE

takes channel path 12 offline.

In LPAR Mode: The operator may use the CF CHP command to take channel paths offline in a logical partition or to reassign channel paths among logical partitions. See "Changing Channel Path Assignments" on page 9-37.

Path

The operator can deconfigure a path to a device by using the following procedure:

1. Go to the master console.
2. Enter **V PATH((ddd-ddd),nn),OFFLINE <,UNCOND>**, where ddd is the device number and nn is a channel path ID (CHPID).

   Note: UNCOND deconfigures the last path to an unallocated, online device.

Example

V PATH((250-257),12),OFFLINE

takes the paths to devices 250 through 257 that use channel path 12 offline.

In LPAR Mode: The VARY PATH command operates the same as it does when the processor unit is in one of the basic modes.

I/O Device

When MVS/ESA is notified of an I/O device failure, MVS/ESA attempts to *box* the device. If MVS/ESA is successful, the *boxed* device is no longer available. Any I/O operation to a boxed device results in an I/O error.

A boxed I/O device is not available to the system control program (SCP), but is not offline to the processor unit. The box applies only to the system that does the boxing; the device is not boxed to sharing systems.

Warning: Use the VARY device,OFFLINE,FORCE command only when the system may fail if the device is not taken offline. Even if a specified device is pending offline, the VARY command with the FORCE parameter immediately terminates all I/O in progress on the device; additional I/O requests to the device are rejected as permanent I/O errors. The VARY command may, therefore, cause a data integrity problem if the command prematurely releases a reserved device or deassigns an assigned device.

The operator can change the state of an I/O device from boxed to offline, or deconfigure an online I/O device by using the following procedure:

1. Go to the master console.
2. Enter **V (ddd-ddd),OFFLINE <,FORCE>**, where ddd is the number of the I/O device. FORCE boxes the I/O device.

Example

V 250-253,OFFLINE

takes devices 250 through 253 offline.

In LPAR Mode: The VARY DEVICE command operates the same as it does when the processor unit is in one of the basic modes.

Appendix D. Channel Subsystem Display Frames

This appendix discusses the following topics:

The channel subsystem display frames include the following:

- IOCDS frames, which provide information about I/O devices, control units, and channel paths defined during IOCP execution.
- IOPD frames, which provide status information about individual channel paths and I/O devices. The I/O Problem Determination (IOPD) frames provide information from the subchannels regarding the progress and status of I/O operations.

This publication recommends providing for the operator a copy of the IOCP configuration report for use during I/O problem determination. See "IOCP Reports" on page 1-22.

For the description of any field not discussed in this publication, see the *Operator Tasks for the System Console* manual.

I/O Configuration Data Set (IOCDS) Frames

The IOCDS frames are used to view specific portions of the I/O configuration data sets to determine:

- Whether a specific I/O device is defined
- Which control unit a device is defined as attached to
- Which channel paths are defined as having access to a device
- What devices are defined on a specific channel
- What devices are defined as being on a specific control unit

The data can be used with the IOPD frames, to display information about a specific I/O device.

IOCDS Control Unit Data Frame

See Figure D-1 for the information provided by the IOCDS Control Unit Data frame. To view the IOCDS for a specific control unit, the operator should perform the following steps:

1. Go to the system console.
2. Enter **A1** to position the cursor.
3. Enter the desired IOCDS number.
4. Enter **B1** to position the cursor.
5. Enter the desired channel path ID (CHPID).
6. Enter **C1** to display the selected device data.

Note: The data streaming capability of each control unit is indicated under the field labeled *DS Mode*.

IOCDS Device Data Frame

Select C1 on the IOCDS Control Unit Data frame to display the IOCDS Device Data frame (Figure D-2) which shows information for the channel path identified in the IOCDS Control Unit frame. The A1 and B1 field values are retained from the IOCDS Control Unit data frame and may be changed if desired. Selecting D1 returns the operator to the IOCDS Control Unit Data frame.

```
                                                      dd mmm yy  19:47:07
                        IOCDS Control Unit Data                  (IOCDS)

   A= SELECT DATA BY          B= SELECT HARDWARE BY         C= DISPLAY
  ->1. IOCDS(Hex) : A0      ->1. CHPID(Hex) : 02            1. Device data

  Mach   ---------CU---------  -IOCDS-  -DS-  ---------Port----------
  Type   No. Type  Attached    Logical  Mode         Addresses
                    CHPIDs       CU
  3803   0002  1  02            00D9    none         80-84
  3803   0022  1  02            00DA    none         88-8B
  3880   00C2  2  02            00E5    3.0          40-47
  3880   00E2  2  02            00E6    4.5          70-77
  3880   0102  2  02            00E7    3.0          D0-D7






COMMAND ==>
SYSTEM 1         1 .... 2 ....                              PSW0 Operating
_____________________________________________________________________________
        A:a MODE
```

Figure D-1. IOCDS Control Unit Data Frame (IOCDS)

```
                                                      dd mmm yy  19:47:07
                            IOCDS Device Data                 (IOCDS)-10

 A= SELECT DATA BY   UNIT ADDR 0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
->1. IOCDS(Hex) : A1   00 - 0F .  .  .  .  .  .  .  .  .  .  .  .  .  .  IT .
                       10 - 1F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
 B= SELECT HARDWARE BY 20 - 2F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
->1. CHPID(Hex) : 08   30 - 3F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
                       40 - 4F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
 D= DISPLAY            50 - 5F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
  1. Control unit data 60 - 6F T  T  T  T  T  T  T  T  .  .  .  .  .  .  .  .
                       70 - 7F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
 LEGEND:               80 - 8F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
*  = Device present    90 - 9F .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
     and no option     A0 - AF .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
I  = Illegal sequence  B0 - BF .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
     detect option     C0 - CF .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
T  = Time out option   D0 - DF .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
NP = Device not        E0 - EF .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
     present           F0 - FF T  T  T  T  .  .  .  .  NP NP .  .  *  *  *  *
.  = Device not defined

COMMAND ==>
SYSTEM 1         1 .... 2 ....                              PSW0 Operating
_____________________________________________________________________________
        A:a MODE
```

Figure D-2. IOCDS Device Data Frame, (IOCDS)-10

I/O Problem Determination (IOPD) Frames

The I/O Problem Determination frame, (IOPD)-00 is the menu frame from which the operator requests I/O information. See Figure D-3 on page D-5. The (IOPD)-00 frame may be selected by entering F IOPD or from the PA facility. Press the End key to return to (IOPD)-00 from any IOPD frame. All IOPD frames are display-only, the operator cannot make changes. The operator may display the following types of information:

- Channel Summary Status displays the status of all installed channel paths.
- Device Status requires the operator to enter a channel path ID (CHPID) for a channel path to which the desired device is attached.
- Subchannel Status requires the operator to enter one of the following for a desired subchannel:
  - **Device Number** The four-digit hexadecimal number that IOCP assigned to an I/O device.
  - **CH and UA** The channel number and unit address for an I/O device. This field is displayed only if one of the following is true:
    - The processor unit is in LPAR mode and the target logical partition is an active S/370 logical partition.
    - The processor unit is in 370 mode and power-on reset is complete.
  - **CHPID and UA** The operator enters a channel path ID and unit address for an I/O device (two-digit hex values).
  - **Subchannel Number** The operator enters the number of the subchannel (four-digit hex value). The subchannel number can be determined from the IOPD Device Configuration Display frame.
  - **Absolute Address** The operator should ignore this field.
- Control Unit Header Status requires the same information as the subchannel status selection.
- Device Configuration requires the same information as the subchannel status selection.
- Channel Path Status requires the operator to enter a channel path ID (CHPID) for a 9034-mode channel.

  Note: A 9034-mode channel is an ES Connection channel attached to a 9034.
- ES Connection Link Status requires the operator to enter a link address and a control unit address.

```
                                                          dd mmm yy  19:47:07
              I/O Problem Determination (ESA/390 Mode)          (IOPD)-00

  A= DISPLAY                           Enter one of the following(Hex):
    1. Channel Summary Status            Device Number      => ____
    2. Device Status                     CHPID and UA       => __ __
    3. Subchannel Status                    Link Address    => ____
 -> 4. Control Unit Header Status           CUADD           => _
    5. Device Configuration              Subchannel Number => ____
    6. Channel Path Status               Absolute Address  => _____
    7. ES Connection Link Status




 COMMAND ==>
 SYSTEM 1          1 .... 2 ....                                PSW0 Operating
 ______________________________________________________________________________
          A:a MODE
```

Figure D-3. I/O Problem Determination Frame, (IOPD)-00

Channel Summary Status Frame

The Channel Summary Status frame displays the status of all installed channel paths. A maximum of 16 channel paths are displayed on each frame. Scroll the frames with the Fwd or Bkwd keys.

CHPID Displays the channel path identifier for all physically installed channel paths. For a multiprocessor operating in physically partitioned configuration, each side shows only its channel paths.

PHY ADR Displays the physical channel number associated with a specific CHPID.

CH TYP Displays the channel type definition as byte (BYT), block (BLK), ES Connection (CNC), 9034-mode (CVC), or ES Connection channel to channel (CTC).

The following fields show the device specified for the I/O operation. The fields are only filled in for active CHPIDs.

SW This field displays the logical switch number of the switch to which this channel is attached, if any.

LINK This field displays the link address, if any, of the control unit, as specified in the IOCDS which the channel is currently active in.

UA This field displays the device unit address the channel is currently active with.

STATE This field indicates the architected state of the channel path. Those channel paths that are in the 'NOT RECOGNIZED' state (channel not installed) are not shown on this frame. A channel path is always in one and only one state.

The state field can have the following values:

RESERVED The channel path is physically installed and recognized, but is not currently in the operating partition, nor is it available to be placed in the operating partition. The channel path is therefore not physically available. The channel path can only be removed from the reserved state by operator action.

Examples of channel paths in the RESERVED state are channels in Single Channel Service, and installed channels that are not defined in the active IOCDS.

STANDBY The STANDBY, or offline, state indicates that the channel is recognized, but is not currently in the operating partition, and therefore not available. However, the channel path is available to be placed in the operating partition by means of the CHPID SLC, or the Configure SCLP command from an operating system.

.... The ONLINE state is the normal state and is displayed by a series of leader dots. Online or configured, indicates that the channel path is installed, defined in the active IOCDS, in the operating partition, and available for use.

STATUS This field displays status information about the channel path. It is possible for a channel path to have more than one status that applies to it. The status descriptions below are listed in order, with the first status listed having precedence over any that follow.

SERVICE The channel path is in Single Channel Service mode, and is not part of the current configuration.

UNDEFINED The channel path is not defined in the active IOCDS.

DEF ERROR The channel path was specified when the active IOCDS was created, but the specification does not agree with the characteristics of the installed channel.

CHECK STOP The channel path is physically unavailable for any I/O function because of a permanent machine error affecting the channel.

PERM ERROR The channel path is physically unavailable for any I/O function because of a permanent outboard error. This can occur when a RCHP function fails to reset the interface. Any error on a 9034 ES Connection Converter or on the link between a channel and a 9034 ES Connection Converter causes a permanent error on the channel path.

LOST SIGNL The channel has detected a link-signal error; the level of the signal on the link is below the value specified for reliable communication.

LOST SYNC The channel has detected a link-signal error; the bit synchronization or the 10-bit transmission code synchronization with the signal has been lost.

NOS RECOG The channel has detected a link failure due to a not-operational sequence.

SEQ T/O The channel has detected a link failure because of a sequence time out.

ILLEGAL SQ The channel has detected a link failure because of an illegal sequence for a link.

TERM ERROR The channel path is not available for any I/O function because of an interface-hung condition. This can occur after an interface or channel error and the control unit or device fails to disconnect from the interface when requested by the channel.

RECVRY T/O During a connection recovery procedure, the channel timed out before it received a response.

OLS RECOG The channel has detected an offline sequence, indicating that the sender has gone into offline mode, and that subsequent link-signal errors detected by the channel should not be reported.

LOG The channel path is in test mode, and a trace log has been stored.

TEST The channel path is in test mode.

BERR LIMIT The channel path has reached the bit error threshold limit.

IFCC The channel path's interface control check threshold has been reached.

```
                                                       dd mmm yy 19:49:10
                   Channel Summary Status (ESA/390 Mode) (1 of 4)  (IOPD)-11

    CHP  PHY  CHN
    ID   ADR  TYP  SW  LINK  CUADD  UA   STATE     STATUS
    00   ..   BYT  ..   ..     .    12   ........  ..........
    01   ..   BYT  ..   ..     .    03   ........  LOG
    02   03   BLK  ..   ..     .    45   ........  ..........
    03   02   BLK  ..   ..     .    ..   ........  ..........
    04   ..   BYT  ..   ..     .    ..   ........  PERM ERROR
    05   ..   BYT  ..   ..     .    ..   ........  ..........
    06   ..   BLK  ..   ..     .    ..   ........  CHECK STOP
    07   ..   BLK  ..   ..     .    ..   RESERVED  SERVICE
    08   ..   BLK  ..   ..     .    1B   ........  ..........
    09   ..   BLK  ..   ..     .    ..   ........  TEST
    0A   ..   BLK  ..   ..     .    ..   STANDBY   ..........
    0B   ..   BLK  ..   ..     .    ..   ........  ..........
    0C   ..   BLK  ..   ..     .    ..   RESERVED  UNDEFINED
    0D   ..   BLK  ..   ..     .    ..   ........  ..........
    0E   ..   BLK  ..   ..     .    ..   ........  ..........
    0F   ..   BLK  ..   ..     .    67   ........  IFCC


COMMAND ==>
SYSTEM 1         1 .... 2 ....                          PSW0 Operating
________________________________________________________________________
        A:a MODE
```

Figure D-4. Channel Summary Status Frame, (IOPD)-11

Device Status Display Frame

The Device Status Display frame displays the current status of each subchannel associated with the CHPID specified on the I/O Problem Determination frame. The status of 256 devices may be displayed, as follows:

A Subchannel is either subchannel and device active or device active.

AD Subchannel is device active only.

AP Subchannel is either subchannel and device active or device active, and status pending.

F Subchannel is function pending.

FA Subchannel is function pending, and either subchannel and device active or device active.

FB Subchannel is function pending and busy.

FP Subchannel is function pending and status pending.

FS Subchannel is function pending and suspended.

I Subchannel is idle (not active).

P Subchannel is status pending.

S Subchannel is suspended.

SP Subchannel is suspended and status pending.

***** Control unit is defined in the IOCDS, but the device is not defined.

• Both control unit and device are not defined in the IOCDS.

```
                                                                dd mmm yy  19:47:07
                  Device Status Display (ESA/390 Mode)                   (IOPD)-20
                                  CHPID 17   LINK 3F  CUADD 2
                      UNIT ADDR  0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
A  = ACTIVE            00 - 0F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
AD = ACT (DEV ONLY)    10 - 1F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
AP = ACT & ST PND      20 - 2F   .  .  I  .  I  .  .  I  .  .  .  .  .  .  .  .
F  = F PND             30 - 3F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
FA = F PND & ACTIVE    40 - 4F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
FB = F PND & BUSY      50 - 5F   .  .  .  .  .  I  .  .  .  I  .  .  .  .  .  .
FP = F PND & ST PND    60 - 6F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
FS = F PND & SUSP      70 - 7F   .  .  P  .  .  .  .  .  .  .  .  .  .  .  .  .
I  = IDLE              80 - 8F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
P  = ST PND            90 - 9F   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
S  = SUSP              A0 - AF   .  .  .  A  .  .  .  .  .  .  .  .  .  .  .  .
SP = SUSP & ST PND     B0 - BF   I  .  .  I  .  .  .  .  .  .  .  .  .  .  .  .
*  = CU DEF'D &        C0 - CF   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
     SUBCH NOT DEF'D   D0 - DF   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
.  = CU NOT DEF'D &    E0 - EF   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
     SUBCH NOT DEF'D   F0 - FF   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .


COMMAND ==>
SYSTEM 1            1 .... 2 ....                                PSW0 Operating
-------------------------------------------------------------------------------
        A:a MODE
```

Figure D-5. Device Status Display Frame, (IOPD)-20

Display Subchannel Frames

The first Display Subchannel frame displays the CP/IOP half of the subchannel (processors and the IOP in the channel subsystem read and write in the first half of the subchannel). The second Display Subchannel frame, Figure D-7 on page D-11, displays the IOP/CHE half of the subchannel (the IOP in the channel subsystem and the channel paths read and write in the second half of the subchannel, see "Channel Subsystem Operation" on page 7-4). Scroll the frames with the Fwd and Bkwd keys.

Note: The LPM, PNOM, LPUM, PIM, POM, PAM, and IPNOM fields are bit masks that identify channel paths. The first 4 bits of each field correspond to CHPID0 through CHPID3 at the top of the third column in the Display Subchannel (1 of 2) frame (Figure D-6). The remaining 4 bits of these fields are not used.

Enabled If 1, the subchannel is enabled for all I/O functions.

D No. Val If 1, the device number is valid.

LPM Logical path mask. If 1, the channel path is logically available for all I/O operations.

PNOM Path not-operational mask. If 1, the channel path was not operational during an I/O operation when the POM bit was 1.

LPUM Last path used mask. If 1, the indicated channel path was the last one used for an I/O operation to the device.

PIM Path installed mask. If 1, the channel path is installed.

POM Path operational mask. If 1, the channel path was operational during the previous I/O operation.

PAM Path available mask. If 1, the channel path is not offline, in the check-stop state, or in test mode.

IPNOM Internal path-not-operational mask. Same as the PNOM field.

Function Ctl Function in control of the subchannel:

- **1xx** Start
- **x1x** Halt
- **xx1** Clear

Activity Ctl Current activity in the subchannel:

- **1000000** Resume pending
- **0100000** Start pending
- **0010000** Halt pending
- **0001000** Clear pending
- **0000100** Subchannel active
- **0000010** Device active
- **0000001** Suspended

Status Cntl Status control information:

- **10000** Alert status pending
- **01000** Intermediate status pending
- **00100** Primary status
- **00010** Secondary status
- **00001** Status pending

```
                                   CP/IOP Data
  Absolute Addr     Irpt Parm    hhhhhhhh  CHPID0       hh  CU-Header Ptr  hhhhhhhh
          hhhhhhhh  ISC         Rh         CHPID1       hh  SCH Chain Ptr  hhhhhhhh
  Subch  No.  hhhh                         CHPID2       hh  Ch Pgm Addr   Rhhhhhhhh
  Device No.  hhhh  Enabled      b         CHPID3       hh  Start T/S      hhhhhh
  Unit Addr   hh    Limit Mode   bb                         Candidates     bbbbbbbb
  SCB Format  b     Meas Mode    bb                         Dev Busy Mask  bbbbbbbb
  Intf CNC          Multipath    b                          Key            h
  Dev No. Valid   b Timing       b                          S,L,DCC,F      bbbbb
  CU Def'd        b LPM          bbbbbbbb  Ded Alleg    b   ILSM           b
  Subch Def'd     b PNOM         bbbbbbbb  CU Type      bb  P,I,A,U,Z,E,N  bbbbbbb
                    LPUM         bbbbbbbb  T/S Valid    b   Function Cntl  bbb
  Path              PIM          bbbbbbbb                   Activity Cntl  bbbbbbb
   Pref Def'd     b POM          bbbbbbbb                   Status Cntl    bbbbb
   Pref Path     Rh PAM          bbbbbbbb                   Dev Busy Time  hhhhhhhh
   Next Path     Rh Meas Index   hhhh                       CU Busy Time   hhhhhhhh
                    On Q         bbbb                       SW Busy Time   hhhhhhhh
                    Work Q No   Rh                          Busy Timestmp  hhhhhh


 COMMAND ==>
 SYSTEM 1           1 .... 2 ....                                PSW0 Operating
 ------------------------------------------------------------------------------
          A:a MODE
```

Figure D-6. Display Subchannel Frame (1 of 2), (IOPD)-32

Multipath If 1, the channel subsystem allows this device to reconnect over any defined and available channel path for the device.

Subch Enable If 1, the subchannel is enabled for all I/O functions.

Intf Timeout If 1, I/O interface (channel path) time-out is enabled.

Retry Cmnd Addr The address used when the CU indicates a CU retry sequence.

Active CA+8 Next CCW absolute address.

Cmnd/Dev Status Command and device status:

10000000 Attention
01000000 Status modifier
00100000 Control-unit end
00010000 Busy
00001000 Channel end
00000100 Device end
00000010 Unit check
00000001 Unit exception

Flgs/Subch Status Flag or subchannel status:

10000000 Program-controlled interruption
01000000 Incorrect length
00100000 Program check
00010000 Protection check
00001000 Channel data check
00000100 Channel control check
00000010 Interface control check
00000001 Chaining check

Residual Count Bytes not transferred by last channel command word (CCW).

Dev Connect time If the I/O operation ended normally, this field contains the last-path-used mask (LPUM) in byte 1 and the device-connect-time interval (DCTI) in bytes 2 and 3.

```
                              IOP/CHE Data
 Absolute Addr     Storage Key       h              Allegiance          bbbbbbbb
         hhhhhhhh  Status Verify     b              Retry CCW Adr/ERW   hhhhhhhh
 Subch  No.  hhhh  Intf Timeout      b              Active CCW Addr+8  Rhhhhhhhh
 Device No.  hhhh  UA Cmpr Enable    b              Cmnd/Dev Status     hh
 Unit Addr   hh    Concurrent Sense  b              Flgs/Subch Status   hh
 SCB Format  b                                      Residual Count      hhhh
 Intf CNC                                           Dev Con Time/ESW0   hhhhhhhh
 Dev No. Valid  b  Control Field 1   hhhhhhhh       ECW0                hhhhhhhh
 CU Def'd       b  Control Field 2   hhhhhhhh       ECW1                hhhhhhhh
 Subch Def'd    b  Control Field 3   hhhhhhhh       ECW2                hhhhhhhh
 Subch Active   b  Control Field 4   hhhhhhhh       ECW3                hhhhhhhh
                   Control Field 5   hhhhhhhh       ECW4                hhhhhhhh
                   Control Field 6   hhhh           Init/Pri Time Stp   hhhhhh



COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating
________________________________________________________________________________
       A:a MODE
```

Figure D-7. Display Subchannel Frame (2 of 2), (IOPD)-33

Display Control Unit Header Frame

The Display Control Unit Header frame displays a specified control unit header (CU-HDR). The control unit header control block is a 64-byte control block that contains logical control unit (LCU) information.

The Display Control Unit Header frame, with ES Connection I/O installed is displayed in Figure D-8 on page D-12.

Elements on Queue Number of subchannels on logical control unit work queue.

CU Type Defines control unit type:

- **00** Not defined
- **01** Control unit accepts only one I/O operation at a time (not shared).
- **10** Control unit accepts multiple I/O operations at a time (shared).
- **11** Not defined

From SHARED=Y or N on the IOCP CNTLUNIT macroinstruction.

Multipath If 1, the channel subsystem allows devices to reconnect over any defined and available channel path for the device.

CHPID0-3 Channel paths defined to IOCP as attached to the control unit.

LINK Link address channel path is assigned to.

```
                                                          dd mmm yy

                            Display Control Unit Header           (IOPD)-42

   Absolute Addr     CU-HDR No.          hhhh       Sw Busy Mask     bbbbbbbb
          hhhhhhhh   Elements on Queue   hhhh       Ded Alleg Mask   bbbbbbbb
   Subch  No. hhhh   Top of Q Ptr        hhhhhhhh   CU Busy Mask     bbbbbbbb
   Device No. hhhh   Bottom of Q Ptr     hhhhhhhh   Shrd Busy Mask   bbbbbbbb
   Unit Addr  hh     CU Type             bb         Init Incomp      bbbbbbbb
   CUH Format b
   Intf CNC          Control Field 1     hhhhhhhh
   CU Def'd      b   Control Field 2     hhhh
   Subch Def'd   b   Control Field 3     hhhhhhhh
                     Control Field 4     hhhhhhhh


   PATH   CHPID  LINK     STATISTICS
    0       hh    hh     hhhhhhhhhhhhh
    1       hh    hh     hhhhhhhhhhhhh
    2       hh    hh     hhhhhhhhhhhhh
    3       hh    hh     hhhhhhhhhhhhh

COMMAND ==>
 SYSTEM 1          1 .... 2 ....                                PSW0 Operating
--------------------------------------------------------------------------------
         A:a MODE
COMMAND ==>
```

Figure D-8. Display Control Unit Header Frame, (IOPD)-42

Device Configuration Display Frame

Device Configuration Display frame displays addressing information for an I/O device. The displayed information, except for availability, was specified for the device during IOCP execution. See Figure D-9 on page D-13.

INSTALLED PATHS The sequence in which channel paths (CHPID field) are tried to satisfy an I/O request is indicated by the path number (PATH# field). If a preferred channel path is specified, that number is listed first. If the channel path is online and configured (available), a plus (+) is indicated in the AVAIL field. Availability is determined from the PAM bit for the indicated channel path.

In LPAR Mode: A plus (+) in the AVAIL (available) field under INSTALLED PATHS indicates that the channel path is *assigned to the target logical partition and is available to the target logical partition*. The Device Configuration Display frame indicates all installed channel paths associated with a subchannel number. The channel paths are only available to the target logical partition if a plus (+) precedes the CHPID field.

Note: Preferred channel paths are not supported in LPAR mode. The order of the path numbers (PATH# field) is not meaningful.

TITLE The title contains a mode indicator which will either be "ESA/390 Mode" as shown or "LPAR Mode".

The logical path number is obtained from the control unit header, The paths are displayed in the order in which the paths are selected to satisfy an I/O request to the device.

The Path Installed Mask (PIM) within the subchannel control block is used to determine which CHPID entries in the CU-HDR are attached to the specified device. The Path Available Mask (PAM) within the subchannel control block is used to determine which CHPID entries in the CU-HDR are currently available. The preferred path, if any, is displayed first. The paths continue on from that entry in the CU-Header CHPID entries, to the next path specified in the PIM. This process continues to the last entry in the PIM, then returning to the first entry. This process continues until the entry preceding the entry that was used to specify the preferred path is reached. If no preferred path is specified, the path numbers specified are the order of the CHPIDs in the Control Unit Header as indexed by the path specifications in the PIM.

```
                                                          dd mmm yy  19:47:07
             Device Configuration Display (ESA/390 Mode)           (IOPD)-50
                                  -------------- INSTALLED PATHS --------------
   SUBCHANNEL  DEVICE   UNIT   LOGICAL              DYNAMIC
     NUMBER    NUMBER   ADDR    PATH    AVAIL  CHPID  CONNECT  SW   LINK  CUADD

      00FE      0123     DF       3       +      02      +     01    29     0
                                  0       +      20            01    30     3
                                  1              1F      +     02    31     1









COMMAND ==>
SYSTEM 1          1 .... 2 ....                                PSW0 Operating
________________________________________________________________________________
          A:a MODE
```

Figure D-9. Device Configuration Display Frame, (IOPD)-50

Channel Path Status Display Frame

The Channel Path Status Display frame displays Status, State, and Bit Error counts for 9034-mode (CVC) and ES Connection channels (CNC).

CHPID This field identifies the channel path ID. It is a 2 character hexadecimal field.

CHID This field identifies the channel ID. It is a 2 character hexadecimal field.

TYPE This field identifies the channel type.

STATE This field indicates the architected state of the channel path.

STATUS This field displays status information about the channel path. This field will be blank if the channel path is not in one of those statuses.

BIT ERROR COUNTS

Inbound (9034-mode and ES Connection)

— Inbound bit error count in decimal. The I/O subsystem will reset the counter on regular intervals if the channel bit error threshold has not been reached. If the bit error threshold has been reached during an interval, the counter will not be reset, but will continue to accumulate errors up to the limit of the counter. A system reset will also reset the counter.

Outbound (9034-mode)

— Outbound bit error count in decimal. The I/O subsystem will reset the counter on regular intervals if the channel bit error threshold has not been reached. If the bit error threshold has been reached during an interval, the counter will not be reset, but will continue to accumulate errors up to the limit of the counter. A system reset will also reset the counter.

DEFINITION ERROR REASON: This field will be displayed when the CHPID has a status of ″DEF ERROR″. It will contain one of the following:

- ES Connection channel is connected to a control unit defined switch port.
- ES Connection channel is connected to another ES Connection channel.
- CTC channel is connected to another CTC channel.
- CHPID is defined as CTC but 9034-mode hardware is installed.
- CHPID is defined as ES Connection but 9034-mode hardware is installed.
- CHPID is defined as block multiplex but ES Connection hardware is installed.
- CHPID is defined as 9034-mode but parallel hardware is installed.
- CHPID is defined as CTC but CTC feature is not installed on this side.
- ES Connection channel is connected to a 9034 ES Connection Converter.
- 9034-mode channel is not connected to a 9034 ES Connection Converter.
- ES Connection channel has multiple links defined but is not connected to a dynamic switch port.
- ES Connection channel is connected to a dynamic switch port but a link address was not defined.
- CHPID is defined as CTC but parallel hardware is installed.
- CHPID is defined as ES Connection but parallel hardware is installed.
- CHPID is defined as byte multiplex but ES Connection hardware is installed.

```
                                                               dd mmm yy
                  Channel Path Status Display (ESA/390 Mode)     (IOPD)-60


                                                 Bit Error Counts(Dec)
  CHPID   CHID   Type   State      Status      Inbound    Outbound
  2C      2C     CNC    RESERVED   DEF ERROR     11          0


  Control Field 0  0FE16600
  Control Field 1  01040000
  Control Field 2  00000000
  Control Field 3  00000000
  Control Field 4  00004500
  Control Field 5  0D004078
  Control Field 6  0000A200

  Definition Error Reason:
   ES Connection channel has multiple links defined but is not connected
   to a dynamic switch port.

COMMAND ==>
SYSTEM 1          1 .... 2 ....                            PSW0 Operating
____________________________________________________________________________
        A:a MODE
```

Figure D-10. Channel Path Status Display Frame

ES Connection Link Status Display Frame

The ES Connection Link Status frame displays information on a specific ES Connection channel path. It includes the destination link addresses, the control unit logical addresses of the control units attached to the channel path and the control unit statuses. If the channel is point-to-point connected, or has a static connection through a switch, the link address displayed may have been assigned by the channel subsystem. If a control unit logical address was not specified in the IOCDS it will also contain a value assigned by the channel subsystem.

TITLE The title contains a mode indicator, which will either be "ESA/390 Mode" as shown or "LPAR Mode".

CHPID This field displays the CHPID that the frame was requested for.

Logical Switch Number This is the logical switch number of the switch to which the channel is attached.

.. means that a valid switch number was not specified in the IOCDS.

Channel Link Address This is the link address assigned to the channel by the switch if the logical switch number is valid, or by the channel itself otherwise.

.. means that a valid link address has not been assigned.

LINK This field contains the destination link address.

CUADD This field contains the control unit logical address.

STATUS This field contains the control unit status. It will be one of the following:

- **Initialization Complete - CU Busy**

  A logical path has been established with the control unit. The last device level function encountered a control unit busy condition.

- **Initialization Complete - Dynamic Switch Port Busy**

  A logical path has been established with the control unit. The last device level function encountered a destination port busy condition.

- **Initialization Pending**

  Link level initialization is not possible or needed due to the configuration, the state of the channel, or the state of the link.

- **Initialization in Progress**

  Link level initialization is currently in progress.

- **Initialization Complete**

  A logical path has been established with the control unit.

- **CU Reset in Progress**

  A system reset at the control unit is currently in progress.

- **Remove Logical Path in Progress**

  Removal of the logical path at the control unit is currently in progress.

- **Link Config Problem - Port Reject - Addr Not Valid**

  Frames sent by the channel contain a source link address that does not correspond to the switch port that received the frames.

  Verify that the IOCDS is correct and agrees with the physical cabling and the switch configuration for this link. For example, the link may contain two dynamic connections.

- **Switch Port Not Defined - Port Reject - Undefined Dest Addr**

  The channel is sending frames to this destination link address, but the switch does not have a switch port defined for this link address.

  Verify that the switch configuration matches the expected IOCDS configuration. For example, the IOCDS may contain an incorrect link address specification, or the IOCDS may refer to switch ports that are not installed.

- **Switch Port Malfunction - Port Reject - Dest Port Malfunction**

  A failure has been detected by the switch port attached to this link. No connections to the switch port can be made.

  Service is required for this switch port or the link attached to it.

- **Switch Port Not Avail - Port Reject - Port Intervention Required**

  The channel cannot communicate with the switch port attached to this link because the switch port is either partitioned, blocked, or dedicated.

  Verify that the switch configuration matches the expected IOCDS configuration. This port may be incorrectly blocked or dedicated, or the switch may be incorrectly partitioned.

- **Link Config Problem - Link Reject - Unrecognized Device Level**

  The channel is sending frames to this link, but the attached control unit is not the right type for this channel.

  Verify that this channel is connected to ES Connection-capable devices. For example, a protocol converter may be connected to this channel.

- **Link Config Problem - Link Reject - Uninstalled Link Control Func**

  The channel is sending frames containing commands that are not recognized by the attached control unit or device.

  Verify that this channel is connected to ES Connection-capable devices. For example, a protocol converter or another ES Connection channel may be connected to this channel.

- **Link Level Error - Link Reject - Transmission Error**

  The dynamic switch port is receiving frames that contain errors from this channel. A failure may have caused the channel to transmit frames improperly, or a failure may be preventing the switch port from properly receiving frames.

  Service is required for this channel or the switch port it is attached to.

- **Link Level Error - Link Reject - Protocol Error**

  The frames sent by this channel violate correct protocols.

  Service is required for this channel.

- **Link Level Error - Link Reject - Reserved Field Error**

  The channel is sending frames that contain information in fields that should not be used.

  Service is required for this channel.

- **Link Level Error - Link Reject - Destination Addr Not Valid**

  The control unit is receiving frames from the channel, but the frames contain a destination link address that does not match the control unit link address. The channel may be generating incorrect addresses, or the dynamic switch or control unit may be malfunctioning.

  Service is required for this channel or the unit attached to it.

- **Link Level Error - Link Reject - Acquire Link Addr Error**

  The control unit has received frames from the channel before the control unit has had its link address assigned. Either the channel or the control unit did not complete initialization properly.

  Service is required for this channel or the control unit attached to it.

- **Link Config Problem - Init Failure - Channel/CU Mismatch**

  Verify that the control unit and channel types are correctly matched. For example, ensure that the control unit and channel are both ES Connection-capable and support the same data rate and distance.

- **CU Resources Exceeded - Init Failure - No Resource Available**

  The channel has attempted to establish communication with the control unit, but the control unit cannot accept any more logical paths.

  Verify that the control unit configuration matches the expected IOCDS configuration, and that the control unit is not being shared by more channels that it can support.

- **Link Level Error - Channel Detected Error**

  Verify that the control unit is properly configured and that the control unit configuration matches the IOCDS configuration. For example, verify that link addresses are specified correctly and that control unit logical addressing, if supported by the control unit, is specified correctly.

A= DISPLAY

Selecting **A1** enables the user to directly invoke the Device Status Display frame.

The selection applies to the CHPID that was specified when invoking the current ES Connection Link Status frame.

If there is single link address and control unit logical address defined, then the link address and CUADD fields will not be displayed. The A1 selection alone will be sufficient to display the Device Status frame.

If there are multiple link addresses defined and all of them have the same control unit logical address, the CUADD input field will not be displayed. A link address in the in the range 01 to FE must be specified.

If there is a single link address defined which has multiple control unit logical addresses, the link address input field will not be displayed. A CUADD in the range of 0 to F must be specified.

If there are no links addresses and control unit addresses defined, the A1 selection will not be available.

```
                                                        dd mmm yy
        ES Connection Link Status Display (ESA/390 Mode) (1 of 1) (IOPD)-70

 A= DISPLAY                                  CHPID                 2F
   1. Device Status                          Logical Switch Number 02
      Link Address(Hex) : __                 Channel Link Address  01
      CUADD(Hex)        : _

LINK CUADD STATUS    ('@' = Initialization Complete)
 01    2   Initialization Complete - CU Busy
 02    1   @
 03    2   @
 04    3   @
 05    1   @
 06    0   CU Reset in Progress
 07    0   Remove Logical Path in Progress
 08    0   @
 0A    1   @
 0C    1   @
 10    0   Link Level Error - Channel Detected Error

 More data below: Press FWD.                                        ( 148)

COMMAND ==>
SYSTEM 1         1 .... 2 ....                                PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure D-11. ES Connection Link Status Display Frame

Appendix E. Problem Analysis Display Frames

This appendix discusses the following topics:

The problem analysis (PA) facility can be useful in locating and recovering from system problems. This appendix discusses the various PA facility frames and their function. For information on setting up and using the PA facility see "Problem Analysis Facility" on page 1-5.

Processor Complex Condition(s) Frame

The PA Processor Complex Condition(s) frame (Figure E-1) appears when the PA facility is called and a power problem is present. One of the following messages is displayed in the power status message area:

- Power status not complete
- Power-on reset required
- SYSIML required

R= CALL OR RETURN TO

R1 Power Problem Resolution
Depending on which of the above messages is displayed, selecting R1 displays the PA Power Status Not Complete frame, the CONFIG frame, or the OPRCTL frame.

Note: The following **R2** selection is not displayed for "Power Status Not Complete" messages.

R2 Service Request (RSF; Exit PA)
Enter **R2** to issue an RSF service request.

```
                                                   dd mmm yy  19:47:07
              PROBLEM ANALYSIS - Processor Complex Condition(s)   (PA)-00


  ****************************************************************************
  *                                                                          *
  *                          <POWER-STATUS-MESSAGE>                          *
  * Use the R1 selection to resolve condition(s) before proceeding with PA.  *
  *                                                                          *
  ****************************************************************************

      R= CALL OR RETURN TO
        1. Power Problem Resolution
        2. Service Request (RSF; Exit PA)






COMMAND ==>
SYSTEM 1         1 .... 2 ....                           PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure E-1. PROBLEM ANALYSIS — Processor Complex Condition(s) Frame, (PA)-00

Power Status Not Complete Frame

The PA Power Status Not Complete frame (Figure E-2) is displayed by selecting R1 on the PA Processor Complex Condition(s) frame when processor unit power status is not complete. A list of the power boundaries that are not complete is displayed.

A= ACTION

A1 Display Service Actions

Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 Service Request (RSF; Exit PA)

Enter **R1** to issue an RSF service request.

R2 INDEX0 (Exit PA)

Enter **R2** to return to the INDEX0 frame.

```
                                                   dd mmm yy  19:47:07
                PROBLEM ANALYSIS - Power Status Not Complete        (PA)-01

   PROBLEM  Power Status Not Complete

   STATUS  The following Power Boundaries are incomplete:
   <POWER-BDY-LIST>


   RECOVERY ACTIONS
   <PAPOWR-RECOVERY-ACTIONS>

      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. Service Request (RSF; Exit PA)
        2. INDEX0 (Exit PA)


COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating
------------------------------------------------------------------------------
        A:a MODE
```

Figure E-2. PROBLEM ANALYSIS — Power Status Not Complete Frame, (PA)-01

Status Frame

The PA Status frame (Figure E-3) appears when the PA facility is called and a power problem is not present. A list of installed hardware and corresponding status is displayed. In addition, interface control check (IFCC), channel path, and LPAR status may be displayed.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

```
                                                    dd mmm yy  19:47:07
                              PROBLEM ANALYSIS - Status            (PA)-03


    <CP-STATUS-LIST>
    <VE-STATUS-LIST>

    <HARDWARE-STATUS>                <LPAR STATUS>
    <IFCC-STATUS>

    <CHPID-CHECKSTOPPED>
    <CHPID-SERVICE-MODE>

    <LPAR STATUS>


    R= CALL OR RETURN TO
      1. PA Status Selection


 COMMAND ==>
 SYSTEM 1          1 .... 2 ....                            PSW0 Operating
 ____________________________________________________________________________
         A:a MODE
```

Figure E-3. PROBLEM ANALYSIS – Status Frame, (PA)-03

Status Selection Frame

The PA Status Selection frame (Figure E-4) is displayed by selecting R1 on the PA Status frame. The operator makes a selection on this frame based on the problem category indicated on the PA Status frame. An x is displayed next to categories that do not apply to the current problem.

A= PROBLEM CONDITION

Problem conditions are listed in the order of severity. The operator should select the first category without an x displayed next to it.

A1 Hardware Errors (non-I/O)
Enter **A1** if hardware errors exist. The PA Hardware Errors (Non I/O) frame is displayed.

A2 Can not IPL
Enter **A2** if an IPL error exists. One of the following frames is displayed depending upon system conditions:

- PA IPL Reset frame

- PA IPL Load frame
- PA System Initialization frame

A3 Wait State (enabled or disabled)
Enter **A3** if a wait state is indicated. Depending upon system conditions, either the PA Disabled Wait State frame or the PA Enabled Wait State frame is displayed.

A4 Interface Control Check (IFCC)
Enter **A4** to display the PA Interface Control Check frame.

A5 I/O (Device Error)
Enter **A5** to display the PA I/O (Device Error) frame.

A6 Console lockout (on the operator's console)
Enter **A6** to display the PA Operator Console Lockout frame.

R= CALL OR RETURN TO

R1 PA Status
Enter **R1** to display the PA Status frame.

R2 Service Request (RSF; Exit PA)
Enter **R2** to issue an RSF service request.

```
                                              dd mmm yy  13:15:20
                        PROBLEM ANALYSIS - Status Selection         (PA)-09


     A= PROBLEM CONDITION
      x1. Hardware Errors (non-I/O)
       2. Can not IPL
      x3. Wait State (enabled or disabled)
      x4. Interface Control Check (IFCC)
       5. I/O (Device Error)
       6. Console lockout (on the operator's console)



     R= CALL OR RETURN TO
       1. PA Status
       2. Service Request (RSF; Exit PA)


COMMAND ==>
SYSTEM 1         1 .... 2 ....                                PSW0 Operating
______________________________________________________________________________
        A:a MODE
```

Figure E-4. PROBLEM ANALYSIS — Status Selection Frame, (PA)-09

Hardware Errors (Non I/O)

The PA Hardware Errors (Non I/O) frame (Figure E-5) is displayed by selecting A1 on the PA Status Selection frame. Information describing the hardware error is presented in the STATUS field.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 OPRCTL frame (Exit PA)
Enter **R2** to display the OPRCTL frame.

R3 Service Request (RSF; Exit PA)
Enter **R3** to issue an RSF service request.

```
                                                               dd mmm yy  13:15:20
                    PROBLEM ANALYSIS - Hardware Errors (Non I/O)     (PA)-10

   STATUS
   <HARDWARE-ERROR-STATUS-DESCR>




   RECOVERY ACTIONS
   <HARDWARE-RECOVERY-ACTIONS>


      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. PA Status Selection                    3. Service Request (RSF; Exit PA)
        2. OPRCTL frame (Exit PA)

COMMAND ==>
SYSTEM 1          1 .... 2 ....                               PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure E-5. PROBLEM ANALYSIS — Hardware Errors (Non I/O) Frame, (PA)-10

IPL Reset Frame

The PA IPL Reset frame (Figure E-6) is displayed by selecting A2 on the PA Status Selection frame when a functional element (FEID) is in the reset state. The PROBLEM field identifies the FEID in the reset state and the STATUS field identifies the condition that caused this frame to be selected.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 CONFIG frame (Exit PA)
Enter **R2** to display the CONFIG frame.

R3 Service Request (RSF; Exit PA)
Enter **R3** to issue an RSF service request.

```
                                                       dd mmm yy  17:15:20
                         PROBLEM ANALYSIS - IPL Reset                (PA)-20

   PROBLEM  Can not get through IPL process.  FEID <FEID> in the RESET state.

   STATUS   Hardware Error occurred during RESET.

   RECOVERY ACTIONS
   <PAIPL1-RECOVERY-ACTION>


      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. PA Status Selection                3. Service Request (RSF; Exit PA)
        2. CONFIG frame (Exit PA)


COMMAND ==>
SYSTEM 1        1 .... 2 ....                                PSW0 Operating
---------------------------------------------------------------------------
        A:a MODE
```

Figure E-6. PROBLEM ANALYSIS — IPL Reset frame, (PA)-20

IPL Load Frame

The PA IPL Load frame (Figure E-7) is displayed by selecting A2 on the PA Status Selection frame when the target processor is in the load state. The PROBLEM field identifies the processor that is in the load state. The STATUS field contains the CP mode and IPL device address.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 CONFIG frame (Exit PA)
Enter **R2** to display the CONFIG frame.

R3 CHNCFA frame (Exit PA)
Enter **R3** to display the CHNCFA frame for the current CP mode.

R4 PA Interface Control Check
Enter **R4** to display the PA Interface Control Check frame.

R5 IOPD frame (Exit PA)
Enter **R5** to display the I/O Problem Determination frame for the current CP mode.

R6 Service Request (RSF; Exit PA)
Enter **R6** to issue an RSF service request.

```
                                                         dd mmm yy  13:15:20
                         PROBLEM ANALYSIS - IPL Load                 (PA)-23

   PROBLEM  Can not get through IPL process. <CP-ID> remains in the LOAD state.

   STATUS  Mode=<MODE> IPL Device=<ADDR>
   <IPL Failure message text>

   RECOVERY ACTIONS
   <PAIPL2-RECOVERY-ACTION-LIST>

      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. PA Status Selection                  4. PA Interface Control Check
        2. CONFIG frame (Exit PA)               5. IOPD frame (Exit PA)
        3. CHNCFA frame (Exit PA)               6. Service Request (RSF; Exit PA)


 COMMAND ==>
 SYSTEM 1          1 .... 2 ....                             PSW0 Operating
 ___________________________________________________________________________
         A:a MODE
```

Figure E-7. PROBLEM ANALYSIS — IPL Load frame, (PA)-23

System Initialization Frame

The PA System Initialization frame (Figure E-8) is displayed by selecting A2 on the PA Status Selection frame when the target processor is running or is in the wait state. The PROBLEM field identifies the processor. The STATUS field contains the CP mode and the IPL device address.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 PA I/O (Device Error)
Enter **R2** to display the PA I/O (Device Error) frame.

R3 PA Interface Control Check
Enter **R3** to display the PA Interface Control Check frame.

R4 PA Hardware Error (non-I/O)
Enter **R4** to display the PA Hardware Error (non-I/O) frame.

R5 PA Disabled Wait
Enter **R5** to display the PA Disabled Wait State frame.

R6 IOPD frame (Exit PA)
Enter **R6** to display the I/O Problem Determination frame for the current CP mode.

```
                                                  dd mmm yy  13:15:20
                    PROBLEM ANALYSIS - System Initialization      (PA)-26

  PROBLEM  Can not get through IPL process.  <CP-ID> in RUNNING/WAIT state.

  STATUS  Mode =<MODE>  IPL Device =<ADDR> <WAIT-STATE>

  RECOVERY ACTIONS
  <PAIPL3-RECOVERY-ACTIONS>


     A= ACTION
       1. Display Service Actions

     R= CALL OR RETURN TO
       1. PA Status Selection                4. PA Hardware Error (non-I/O)
       2. PA I/O (Device Error)              5. PA Disabled Wait
       3. PA Interface Control Check         6. IOPD frame (Exit PA)


COMMAND ==>
SYSTEM 1          1 .... 2 ....                            PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure E-8. PROBLEM ANALYSIS — System Initialization Frame, (PA)-26

Disabled Wait State Frame

The PA Disabled Wait State frame (Figure E-9) is displayed by selecting A3 on the PA Status Selection frame when a processor is in the disabled wait state. The STATUS field identifies the processor and the wait code.

A= ACTION

A1 Display Service Actions

Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection

Enter **R1** to display the PA Status Selection frame.

R2 Service Request (RSF; Exit PA)

Enter **R2** to issue an RSF service request.

```
                                                    dd mmm yy  13:15:20
                          PROBLEM ANALYSIS - Disabled Wait State      (PA)-30

   PROBLEM  The following CPs are in disabled wait state:

   STATUS
   <DISABLED-CP-LIST>


   RECOVERY ACTIONS
   <PADISW-RECOVERY-ACTIONS>

      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. PA Status Selection
        2. Service Request (RSF; Exit PA)


COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating
________________________________________________________________________________
        A:a MODE
```

Figure E-9. PROBLEM ANALYSIS — Disabled Wait State Frame, (PA)-30

Enabled Wait State Frame

The PA Enabled Wait State frame (Figure E-10) is displayed by selecting A3 on the PA Status Selection frame when a processor is in the enabled wait state. The STATUS field identifies the processor that is in the enabled wait state.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 Service Request (RSF; Exit PA)
Enter **R2** to issue an RSF service request.

```
                                                      dd mmm yy  19:47:20
                       PROBLEM ANALYSIS - Enabled Wait State      (PA)-35

   PROBLEM  The following CPs are in enabled wait state or running:

   STATUS
   <CP-STATUS-LIST>


   RECOVERY ACTIONS
   <PAENAW-RECOVERY-ACTIONS>

      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. PA Status Selection
        2. Service Request (RSF; Exit PA)


COMMAND ==>
SYSTEM 1         1 .... 2 ....                            PSW0 Operating
--------------------------------------------------------------------------
        A:a MODE
```

Figure E-10. PROBLEM ANALYSIS — Enabled Wait State Frame, (PA)-35

Interface Errors Frame

The PA Interface Errors frame (Figure E-11) is displayed by selecting A4 on the PA Status Selection frame. The STATUS field contains the time that the interface error occurred, the CHPID, the unit address, type of channel path, the link address (for fiber extended channels), and the number of occurrences.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 IOPD frame (Exit PA)
Enter **R2** to display the I/O Problem Determination frame for the current CP mode.

```
                                                          dd mmm yy  13:15:20
                     PROBLEM ANALYSIS - Interface Errors            (PA)-40
  STATUS
                 UNIT
  TIME   CHPID   ADDR          TYPE         ERROR             NO. OCC.
  <IFCC-STATUS-LIST>



  RECOVERY ACTIONS
 <IFCC-RECOVERY-ACTIONS>


     A= ACTION
       1. Display Service Actions

     R= CALL OR RETURN TO
       1. PA Status Selection                  2. IOPD frame (Exit PA)


COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating
------------------------------------------------------------------------------
        A:a MODE
```

Figure E-11. PROBLEM ANALYSIS — Interface Errors Frame, (PA)-40

I/O (Device Error) Frame

The PA I/O Device Error frame (Figure E-12) is displayed by selecting A5 on the PA Status Selection frame. The PROBLEM field identifies the problem condition.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 IOPD frame (Exit PA)
Enter **R2** to display the I/O Problem Determination frame for the current CP mode.

```
                                                       dd mmm yy  13:15:20
                      PROBLEM ANALYSIS - I/O (Device Error)       (PA)-50

   PROBLEM  A permanent I/O error condition associated with a particular
             device.  (Not a channel-detected error.)



   RECOVERY ACTIONS
   <IOER-RECOVERY-ACTIONS>


      A= ACTION
        1. Display Service Actions

      R= CALL OR RETURN TO
        1. PA Status Selection
        2. IOPD frame (Exit PA)


COMMAND ==>
SYSTEM 1          1 .... 2 ....                              PSW0 Operating
_____________________________________________________________________________
        A:a MODE
```

Figure E-12. PROBLEM ANALYSIS — I/O (Device Error) Frame, (PA)-50

Operator Console Lockout Frame

The PA Operator Console Lockout frame (Figure E-13) is displayed by selecting A6 on the PA Status Selection frame. The PROBLEM field identifies the problem condition.

A= ACTION

A1 Display Service Actions
Enter **A1** to toggle between service actions and recovery actions.

R= CALL OR RETURN TO

R1 PA Status Selection
Enter **R1** to display the PA Status Selection frame.

R2 IOPD frame (Exit PA)
Enter **R2** to display the I/O Problem Determination frame for the current CP mode.

R3 PA I/O (Device Error)
Enter **R3** to display the PA I/O (Device Error) frame.

```
                                                      dd mmm yy  19:15:20
                        PROBLEM ANALYSIS - Operator Console Lockout     (PA)-60

    PROBLEM  Operator console will not respond to entries.



    RECOVERY ACTIONS
    <PACONL-RECOVERY-ACTIONS>


       A= ACTION
         1. Display Service Actions

       R= CALL OR RETURN TO
         1. PA Status Selection                    3. PA I/O (Device Error)
         2. IOPD frame (Exit PA)



 COMMAND ==>
 SYSTEM 1         1 .... 2 ....                             PSW0 Operating
 ___________________________________________________________________________
         A:a MODE
```

Figure E-13. PROBLEM ANALYSIS — Operator Console Lockout Frame, (PA)-60

Glossary

This glossary includes definitions from:

- The *American National Dictionary for Information Processing Systems*, copyright 1982 by the Computer and Business Equipment Manufacturers Association (CBEMA). Copies may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after definition.
- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Organization for Electrotechnical Committee (ISO/IEC JTC1/SC1). Definitions of published sections of the vocabularies are identified by the symbol (I) after definition; definitions from draft international standards, draft proposals, and working papers in development by the ISO/IEC JTC1/SC1 vocabulary subcommittee are identified by the symbol (T) after definition, indicating final agreement has not yet been reached among participating members.

The following cross-references are used in this glossary:

Compare with. This refers to a term that has an opposed or substantively different meaning.

Deprecated term for. This indicates that the term should not be used. It refers to a preferred term, which is defined in the glossary.

See. This refers the reader to multiple-word terms in which this term appears.

See also. This refers the reader to terms that have a related, but not synonymous, meaning.

Synonym for. This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

Synonymous with. This is a backward reference from a defined term to all other terms that have the same meaning.

A

AA. Absolute address.

abend. Abnormal end of task.

abnormal end of task (abend). Termination of a task before its completion because of an error condition that cannot be resolved by recovery facilities while the task is executing.

absolute address. (1) An address after translation and prefixing, but before configuration. See also *logical address, physical address, real address*, and *virtual address*. (2) An address that, without the need for further evaluation, identifies a storage location or a device. (T) (3) An address that is permanently assigned by the machine designer to a storage location. (A)

ac. Alternating current.

ACR. Alternate processor recovery (MVS).

action queue (AQ). A collection of pending maintenance actions.

action queue entry (AQE). A pending maintenance action in the action queue.

action queue entry identifier (AQEID). A number that names an entry in the action queue.

AQE. Action queue entry.

AQEID. Action queue entry identifier.

ASCII. American National Standard Code for Information Interchange.

B

bit. Either of the binary digits 0 or 1. See also *byte*.

block. A string of data elements recorded or transmitted as a unit. The element may be characters, words, or physical records. (T)

BOC. Battery-operated clock.

bps. Bits per second. In serial transmission, the instantaneous bit speed with which a device or channel transmits a character.

Bps. Bytes per second.

bus. In a processor, a physical facility on which data is transferred to all destinations, but from which only addressed destinations may read in accordance with appropriate conventions. (I)

byte. (1) A binary character operated on as a unit and usually shorter than a computer word. (A) (2) A string consisting of a specific number of bits, usually eight, treated as a unit, and representing a character. (3) A group of eight adjacent binary digits representing one EBCDIC character.

C

CA. (1) Channel address. (2) Communication adapter. (3) Common adapter.

CCC. Channel-control check.

CCE. Channel control element.

CCW. Channel command word.

CE. (1) IBM Customer Engineer. See also *IBM service representative.* (2) Correctable error. (3) Channel end.

central processor. A processor that contains the sequencing and processing facilities for instruction execution, interruption action, timing functions, initial program loading, and other machine-related functions.

central storage. Storage that is an integral part of the processor unit. Central storage includes both main storage and the hardware system area.

CHAD. Channel adapter.

chaining. The fetching of a new channel command word (CCW) immediately following the completion of the previous CCW.

channel (CHN). (1) A path along which signals can be sent, for example, data channel, output channel. (A) (2) In the channel subsystem, each channel controls an I/O interface between the channel control element and the attached control units.

channel adapter (CHAD). An adapter that prioritizes and stages data between the channels and the channel control element. Each channel adapter attaches four channels to the secondary data stager.

channel command word (CCW). A doubleword at the location in main storage specified by the channel address word. One or more CCWs make up the channel program that directs I/O channel operations.

channel-control check. A category of I/O errors affecting channel controls and sensed by the channel to which a device is attached.

channel control element (CCE). An element in the channel subsystem that consists of an I/O processor, a primary data stager, and one or two secondary data stagers.

channel element (CHE). An element in the channel subsystem that consists of four channels and a channel adapter.

channel path identifier (CHPID). (1) A system-unique value assigned to each installed channel path of the system. A CHPID identifies a physical channel path. (2) A two-digit hexadecimal number that identifies a channel path.

channel subsystem (CSS). A collection of subchannels that directs the flow of information between I/O devices and main storage, relieves the processor of communication tasks, and does path management functions.

channel subsystem (CSS) Licensed Internal Code. The IOP Licensed Internal Code and the CHN Licensed Internal Code. See also *IOP Licensed Internal Code* and *CHN Licensed Internal Code*.

CHE. Channel element.

CHN. Channel.

CHPID. Channel path identifier.

config. (1) Configuration. (2) Configurator. (3) Configure.

configuration. The arrangement of a computer system or network as defined by the nature, number, and the chief characteristics of its functional units. More specifically, the term configuration may refer to a hardware configuration or a software configuration. (I) (A)

console. A logical device that is used for communication between the user and the system. See *system console* and *service console*.

control block. A storage area used by a computer program to hold control information. (I)

control panel assembly. The field replaceable unit (FRU) that includes both the system power panel and the service panel.

control program. A computer program designed to schedule and to supervise the execution of programs of a computer system.

control-unit end (CUE). In I/O operations, a signal from a control unit to the channel indicating that the control unit is no longer needed for the operation.

CP. (1) Control program. (2) Central processor.

cps. Characters per second.

CS. (1) Central storage. (2) Cycle steal.

CSS. Channel subsystem.

CU. Control unit.

D

DACB. Device address control block.

DASD. Direct access storage device.

data stager. A part of the channel subsystem that buffers and prioritizes the flow of data (including controls, instructions, and commands) between central storage and the I/O devices.

dc. Direct current.

device address control block (DACB). The subchannel control block for S/370 mode.

direct access storage device (DASD). A device in which access time is effectively independent of the location of the data.

diskette. A flexible magnetic disk enclosed in a protective container.

diskette drive. The mechanism used to seek, read, and write data on diskettes.

display station. (1) A physical device that can be used as multiple logical consoles. See also *console*. (2) An input/output device containing a display screen and an attached keyboard that allows a user to send information to or receive information from the system. See also *terminal* and *workstation*.

E

EC. Engineering change.

EIA. Electronics Industries Association.

element. A major part of a component (for example, the buffer control element) or a major part of the system (for example, the system control element).

EREP. The environmental error record editing and printing program that makes the data contained in the system recorder file available for more analysis.

error. Any deviation from normal operation. Errors are automatically corrected by the hardware and Licensed Internal Code. The operator is seldom aware that an error has occurred or is only notified that an error occurred after automatic correction is complete. Uncorrected errors are failures.

error log. A data set or file in a product or system where error information is stored for later access.

ESA*. Enterprise Systems Architecture.

expanded storage. (1) Optional integrated high-speed storage that transfers 4K-byte pages to and from central storage. (2) Additional (optional) storage that is addressable by the system control program. Expanded storage improves system response and system performance. (3) All storage above 256MB. Storage between 64MB and 256MB can be partitioned between central storage and expanded storage.

F

failure. An uncorrected error. Failures are either recoverable or not recoverable by the software or the operator. The operator is always notified when failures occur. The processor unit is generally recovered from a failure by means of a hardware reconfiguration. If reconfiguration is not possible, recovery requires a repair of the failed hardware.

FEID. Functional element identifier.

fixed disk drive. A direct access storage device that does not have removable disks.

frame. (1) A housing for machine elements. (2) The hardware support structure, covers, and all electrical parts mounted therein that are packaged as one entity for shipping. (3) A formatted display.

functional element identifier (FEID). An alphanumeric character or characters identifying a component or element in service language or other diagnostic application programs.

G

G. Giga.

gate. (1) A combinational circuit that performs an elementary logic operation and usually involves one output. (T) (2) A combinational logic element having at least one input channel. (A)

giga (G). Ten to the ninth power; 1 000 000 000 in decimal notation. When referring to storage size, 2 to the thirtieth power, 1 073 741 824 in decimal notation.

GMT. Greenwich mean time.

H

hardware system area (HSA). A logical area of central storage that is used to store Licensed Internal Code and control information (not addressable by application programs).

hex. Hexadecimal.

hexadecimal (hex). Pertaining to a numbering system with base of 16; valid numbers use the digits 0 through 9 and characters A through F, where *A* represents 10 and *F* represents 15.

high-speed buffer. (1) A 64K-byte cache (one for each central processor). (2) A cache or a set of logically partitioned blocks that provides significantly faster access to instructions and data than provided by central storage.

HSA. Hardware system area.

Hz. Hertz.

I

IBM service representative. An individual in IBM who performs maintenance services for IBM products or systems.

ID. (1) Identifier. (2) Identification.

IFCC. Interface control check.

IML. Initial machine load.

in. Inch.

initialization. Preparation of a system, device, or program for operation.

initialize. To set counters, switches, addresses, or storage contents to zero or other starting values at the beginning of, or at prescribed points in, the operation of a computer routine. (A)

initial machine load (IML). A procedure that prepares a device for use.

initial power controller. Logic in the processor controller that controls the base power of both the primary support processor (PSP) and the input/output support processor (IOSP).

initial program load (IPL). The initialization procedure that causes an operating system to start operation.

input/output. (1) Pertaining to a device whose parts can perform an input process and an output process at the same time. (I) (2) Pertaining to a functional unit or channel involved in an input process, output process, or both, concurrently or not, and to the data involved in such a process.

input/output processor (IOP). Synonym for *I/O processor*.

input/output support processor (IOSP). The hardware unit that provides I/O support functions for the primary support processor (PSP). It also provides maintenance support function for the processor controller element (PCE).

input/output support processor (IOSP) display station. The display station and keyboard that function with the system unit to provide support for the primary support processor (PSP).

input/output support processor (IOSP) system board. The logic board that provides basic processor and I/O functions for the IOSP.

input/output support processor (IOSP) system board memory. The card that plugs into the system board for the IOSP processor function.

input/output support processor (IOSP) tape drive. The tape drive inside the IOSP.

instruction address. (1) The address of an instruction word. (I) (A) (2) The address that must be used to fetch an instruction. (A)

interrupt. (1) A suspension of a process, such as execution of a computer program caused by an external event, and performed in such a way that the process can be resumed. (A) (2) To stop a process in such a way that it can be resumed. (3) In data communication, to take an action at a receiving station that causes the sending station to end a transmission. (4) To temporarily stop a process. (5) Synonymous with *interruption*.

interruption. Synonym for *interrupt*.

I/O. Input/output.

IOCDS. I/O configuration data set.

I/O configuration. The collection of channel paths, control units, and I/O devices that attaches to the processor unit.

I/O configuration data set (IOCDS). The data set, located in the diskette drive files that are associated with the I/O support processor (IOSP), that contains the I/O configuration definition.

I/O configuration program (IOCP). A program that defines to a system all available I/O devices and channel paths.

Note: The configuration program is available in three versions: stand-alone, VM/370, and MVS.

IOCP. I/O configuration program.

I/O interface. The interface that connects channels and control units for the exchange of signals and data.

IOP. I/O processor.

IOPD. Input/output problem determination.

I/O processor (IOP). The processor in the channel control element that detects, initializes, and ends all channel subsystem operations.

IOPS. I/O power sequencing.

IOSP. Input/output support processor.

IPL. Initial program load.

IRPT. Interruption.

K

k. An abbreviation for the prefix kilo; 1000 in decimal notation. (A)

K. When referring to storage capacity, two to the tenth power, 1024 in decimal notation. (A)

KB. Kilobyte; 1024 bytes.

kilo (k). (1) Thousand. (2) Kilogram.

L

logical address. The address found in the instruction address portion of the program status word (PSW). If translation is off, the logical address is the real address. If translation is on, the logical address is the virtual address. See also *absolute address, physical address, real address*, and *virtual address*.

logical control unit (LCU). In ESA/390 mode, a group of contiguous words in the hardware system area that provides all of the information necessary to control I/O operations through a group of paths that are defined in the IOCDS. Logical control units represent to the channel subsystem a set of control units that attach common I/O devices. Whenever an I/O device attaches to more than one control unit, a logical control unit is created during IOCP execution.

logical partition (LPAR). In LPAR mode, a subset of the processor unit resources that is defined to support the operation of a system control program (SCP).

logic support adapter (LSA). The adapter to which logic support stations attach and through which the processor controller monitors and controls the logic support stations.

logic support station (LSS). A station to which processor unit elements attach. The logic support stations include scan control logic and they respond to commands from the processor controller. The processor controller monitors and controls the logic support stations through the logic support adapter.

logout. Log data that has been collected, formatted, and recorded.

LPAR. Logical partition.

LPAR mode. A central processor mode that is available on the Configuration (CONFIG) frame. LPAR mode allows the operator to allocate the hardware resources of the processor unit among several logical partitions.

LSA. Logic support adapter.

LSS. Logic support station.

M

machine check. An error condition that is caused by an equipment failure.

main storage. A logical entity that represents the program addressable portion of central storage. See also *central storage*.

MB. Megabyte; 1 048 576 bytes.

megabyte (MB). (1) A unit of measure for storage size. One megabyte equals 1 048 576 bytes.
(2) Loosely, one million bytes.

modem (modulator/demodulator). A device that converts digital data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer.

multiple preferred guests. A VM/XA facility that, with the Processor Resource/Systems Manager (PR/SM), supports up to six preferred virtual machines. See also *preferred virtual machine*.

multiport adapter. An IOSP adapter that provides attachment capabilities for a modem, display station, or printer.

MVS. Multiple Virtual Storage, consisting of MVS/System Product Version 1 and the MVS/370 Data

Facility Product operating on a System/370* processor. See also *MVS/XA*.

MVS/XA. Multiple Virtual Storage/Extended Architecture, consisting of MVS/System Product Version 2 and the MVS/XA Data Facility Product, operating on a System/370 processor in the System/370 extended architecture mode. MVS/XA allows virtual storage addressing to 2 gigabytes. See also *MVS*.

N

N/A. (1) Not applicable. (2) Not available.

no. Number.

O

offline. (1) Pertaining to resources with which the processor unit has no direct communication or control. (2) Pertaining to the operation of a functional unit when not under the direct control of a computer. (I) (A) (3) Neither controlled by, nor communicating with, a computer. Compare with *online*.

online. (1) Pertaining to resources with which the processor unit has direct communication or control. (2) Pertaining to the operation of a functional unit when under the direct control of a computer. (I) (A) (3) Pertaining to a user's ability to interact with a computer. (A) (4) Pertaining to a user's access to a computer via a terminal. (A) (5) Controlled by, or communicating with, a computer. (6) Compare with *offline*.

operating system (OS). Software that controls the execution of programs. An operating system may provide services such as resource allocation, scheduling, input/output control, and data management. (I) (A)

Note: Although operating systems are predominantly software, partial or complete hardware implementations are possible.

P

PA. Problem analysis.

page. In a virtual storage system, a fixed-length block that has a virtual address and is transferred as a unit between real storage and auxiliary storage. (I) (A)

paging. The transfer of pages between real storage and auxiliary storage. (I) (A)

PCC. Processor controller code.

PCE. Processor controller element.

PD. Problem determination.

PDS. Primary data stager.

PF key. Program function key.

physical address. The absolute address after configuration (the final address). See also *absolute address, logical address, real address*, and *virtual address*.

PMA. Processor memory array.

POR. Power-on reset.

port. (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached.

power-on reset. The state of the machine after a logical power-on before the control program is IPLed.

preferred virtual machine. A virtual machine that runs in the V = R area. The control program gives this virtual machine preferred treatment in the areas of performance, processor assignment, and I/O interrupt handling. See also *multiple preferred guests*.

primary data stager (PDS). The data stager in the channel control element that stages data and controls between central storage, the secondary data stager, and the I/O processor.

primary support processor (PSP). PCE processor hardware that provides primary service support for the processor unit.

primary support processor interface (PSPI). The interface between the primary support processor and the initial power controller.

problem determination (PD). The process of determining the source of a problem; for example, a program component, machine failure, telecommunication facilities, user or contractor-installed programs or equipment, environmental failure such as a power loss, or user error.

processor controller code (PCC). Licensed Internal Code that runs in the processor controller and the primary support processor.

processor controller element (PCE). Hardware that provides support and diagnostic functions for the processor unit. The processor controller communicates with the processor unit through the logic service adapter and the logic support stations, and with the

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power supplies through the power thermal controller. It includes: primary support processor (PSP), initial power controller (IPC), input/output support processor (IOSP), and the control panel assembly.

Processor Resource/Systems Manager (PR/SM). A function that allows the processor unit to operate several system control programs (SCPs) simultaneously in LPAR mode. It provides for logical partitioning of the real machine and support of multiple preferred guests. See also *multiple preferred guests*.

processor unit. The boundaries of a system, exclusive of I/O control units and devices, that can be controlled by a single operating system. A processor unit consists of main storage, one or more central processing units, time-of-day clocks, and channels, which are, or can be, placed in a single configuration. A processor unit also includes channel subsystems, service processors, and expanded storage where installed.

program function (PF) key. On a display device keyboard, a key that passes a signal to a program to call for a particular display operation.

program status word (PSW). An area in storage used to indicate the order in which instructions are executed and to hold and indicate the status of the computer system.

program temporary fix (PTF). A temporary solution or by-pass of a problem diagnosed by IBM as resulting from an error in a current unaltered release of the program.

PR/SM. Processor Resource/Systems Manager.

PSP. Primary support processor.

PSPI. Primary support processor interface.

PSW. Program status word.

PTC. Power/thermal controller.

PTF. Program temporary fix.

PWR. Power.

R

RA. Real address.

real address. (1) An address before prefixing, such as found in the instruction address portion of the channel status word (CSW). If translation is off, the logical address is the real address. See also *absolute address, logical address, physical address*, and *virtual address*. (2) The address of a storage location in real storage. (I)(A) (3) In VM, the address of a location in real storage or the address of a real I/O device.

REFCODE. System reference code.

remote display station. An IBM 3151 Model 31 or 41 or an equal device attached to the IOSP.

RSC. Remote support center.

RSF. Remote support facility.

S

SAD. System activity display.

scalar. (1) A quantity characterized by a single value. (I)(A) (2) A type of program object that contains either string or numeric data. It provides representation and operational characteristics to the byte string to which it is mapped. (3) Pertaining to a single data item as opposed to an array of data items. (4) Compare with *vector*.

SCE. System control element.

SCH. Subchannel.

SCP. System control programming.

SCS. Single channel service.

SCSI adapter. Small computer systems interface adapter

SDS. Secondary data stager.

SEC. System engineering change.

secondary data stager (SDS). The part of the channel control element that stages data and controls between the primary data stager and the channel elements, and converts signals between the thermal conduction module logic and the card-on-board logic.

service console. A logical device used by service representatives to maintain the processor unit and to isolate failing field replaceable units. The service console can be assigned to any of the physical displays attached to the input/output support processor.

service panel. A part of the control panel assembly that is used by service representatives to control the power of both the processor controller element (PCE) and the processor unit during a repair action.

single channel service (SCS). The capability of running diagnostic tests on a single channel while the other channels are being used by the customer.

SLC. Service language command.

small computer systems interface (SCSI) adapter. The IOSP adapter that supports attachment to the fixed disk drives and the tape drive.

storage key. A control field associated with a defined block of storage that protects that block of storage from unauthorized access and change.

subchannel (SCH). In ESA/390 mode, a group of contiguous words in the hardware system area that provides all of the information necessary to initiate, control, and complete an I/O operation.

SYSIML. System initial machine load.

SYSRESET. System reset.

system. The processor unit and all attached and configured I/O and communication devices.

system console. A logical device used for the operation and control of hardware functions (for example, IPL, alter/display, and reconfiguration). The system console can be assigned to any of the physical displays attached to the processor controller.

system control element (SCE). The hardware that handles the transfer of data and control information associated with storage requests between the elements of the processor unit.

system control programming (SCP). IBM-supplied programming that is fundamental to the operation and maintenance of the system. It serves as an interface with licensed programs.

system power panel. The part of the control panel assembly that is used by both customers and service representatives to determine and control the power status of both the processor controller element (PCE) and the processor unit.

system reset (SYSRESET). To reinitialize the execution of a program by repeating the initial program load (IPL) operation.

S/370. System/370 mode.

T

tera. ten to the twelfth power, 1 000 000 000 000 in decimal notation. When referring to storage size, 2 to the fortieth power, 1 009 511 627 776 in decimal notation.

terminal. In data communication, a device, usually equipped with a keyboard and display device, that can send and receive information.

time-of-day (TOD) clock. A System/370 hardware feature with a clock that is incremented once every microsecond to provide a consistent measure of elapsed time suitable for indicating the date and time. The TOD clock runs regardless of whether the processing unit is in a running, wait, or stopped state.

TOD. Time of day. See *time-of-day clock*.

TP. (1) Teleprocessing. (2) Test point.

U

UCW. Unit control word.

unit control word. An identifier that contains the control information necessary for a channel to perform input/output operations to an attached device.

unit support interface (USI). The serial interface used for internal element communication inside the processor controller element.

URSF. Universal remote support facility.

USI. Unit support interface.

V

V. (1) Virtual (as in V = R). (2) Volt.

vector. (1) A quantity usually characterized by an ordered set of numbers. (I)(A) (2) A one-dimensional array. Compare with *scalar*.

virtual address. (1) A symbolic address naming the relative location of data. See also *absolute address, logical address, physical address*, and *real address*. (2) The address of a location in virtual storage. A virtual address must be translated into a real address to process the data in processor storage.

virtual machine (VM*). (1) A functional simulation of a computer and its associated devices. Each virtual machine is controlled by a suitable operating system. VM/370 controls concurrent execution of multiple virtual machines on a single System/370. (2) In VM, a functional simulation of either a System/370 computing system or a System/370-Extended Architecture computing system. Each virtual machine is controlled by an operating system. VM controls concurrent execution of multiple virtual machines on a single system.

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Virtual Machine/System Product (VM/SP). An IBM-licensed program that manages the resources of a single computer so that multiple computing systems appear to exist. Each virtual machine is functionally equal to a "real" machine.

VM. Virtual machine.

VM/SP. Virtual Machine/System Product.

VS. Virtual storage.

W

W. (1) Watt. (2) Write (as in R/W).

workstation. A terminal or microcomputer, usually one that is connected to a mainframe or to a network, at which a user can perform applications.

X

x. (1) Symbol for an unknown value or character. (2) Symbol for a variable alphanumeric character.

X. Hexadecimal (as in X'5F').

XA. Extended architecture.

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Reader's Comments

Enterprise System/9000
Models 190, 210, 260, 320, 440, and 480
Recovery Guide

Publication No. GA23-0376-0

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