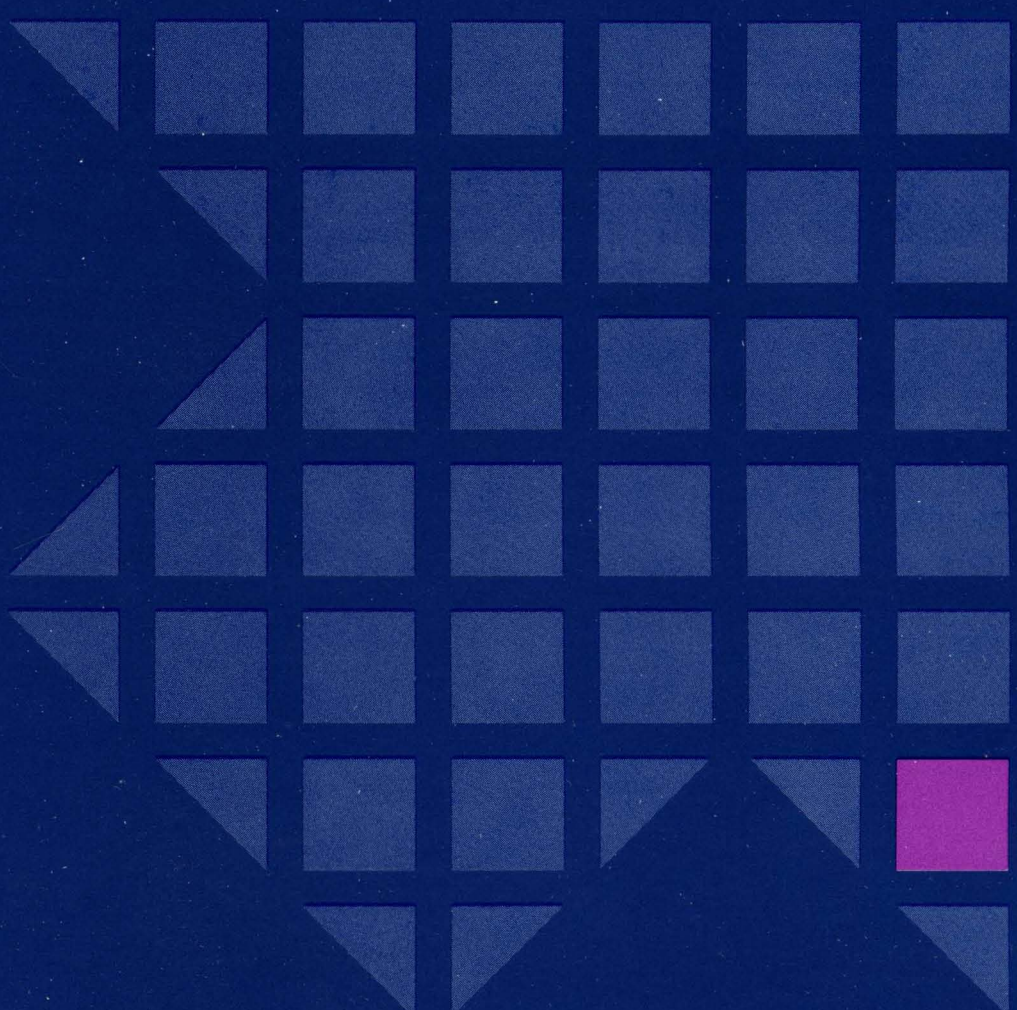
IBM

Virtual Machine/Extended Architecture™
System Product

LY27-8056-1

Diagnosis Guide

VM/XA™ SP Release 2



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VM/XA™ SP Release 2

Second Edition (November 1988)

This is a major revision of, and obsoletes, LY27-8056-0. See "Summary of Changes" on page 71 for a summary of the changes made to this manual.

This edition applies to Release 2 of the Virtual Machine/Extended Architecture System Product (VM/XA SP) Licensed Program 5664-308. Changes are made periodically to the information herein; before using this publication in connection with the operation of IBM systems, consult the latest *IBM System/370, 30xx, 4300, and 9370 Processors Bibliography*, GC20-0001, for the editions that are applicable and current.

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Preface

Purpose

This publication shows you how to locate the problems with, and collect documentation on, the control program (CP) component of the Virtual Machine/Extended Architecture System Product (VM/XA SP). It is intended to explain how to set traces, how to filter out the kinds of information you need from traces, where to look for pertinent information in major CP control blocks, and which software tools to use for capturing trace tables, data flow, I/O problems, and problems with guest virtual machines.

Audience

This publication can be used by those who have little or no previous Virtual Machine (VM) experience. It presents a generic approach to diagnosing problems in CP.

Related Publications

See the Bibliography at the back of this publication.

Contents

Chapter 1. Introduction

The Virtual Machine/Extended Architecture™ System Product (VM/XA™ SP) is a flexible operating system that can grow. You get all the benefits of the IBM System/370 Extended Architecture (370-XA), which removes storage constraints and allows you to use IBM's largest 370-XA processors. You get a high capacity interactive environment—CMS—that supports System/370 and 370-XA programs as well as SNA capabilities with the GCS component and supported networking licensed programs.

The flexibility of the product comes from its virtual machine facility. You can run IBM's major operating systems on VM/XA SP for production, test, maintenance and migration work. When problems are encountered in any operating system running on VM/XA SP, the question then becomes which system caused the problem and where to look for information about the problem. This book gives you some background for locating problems with VM/XA SP and examples of what types of information you should have when you report these problems to IBM Support Centers.

Note: This manual will be most helpful when used in conjunction with IBM Support Center publications. Refer to the *Programming System General Information Manual*, G229-2228, for a list of Support Center manuals.

Diagnosing Problems

When you encounter what you think is a software problem, you must first gather enough information to begin an initial search for the problem. This is done by viewing abend dumps and error messages, and referring to VM/XA SP publications, such as the *VM/XA SP System Messages and Codes Reference* manual. Once you have a general description of the problem, you can then begin to gather a list of more detailed documentation of the problem. This list is called a keyword string.

Keyword strings are a means by which you can describe the specific symptoms of your problem to an IBM Support Center. The Support Center personnel use your keyword string to locate any similar problems on their data base. Keyword strings can include information such as:

- The failing component
- The module issuing the abend or error message
- The module in control at the time of the problem
- The system action—wait, loop, abend, and others
- The service and release level of the CP component
- The service and release level of other components.

By including as many symptoms as possible in your keyword string, you can narrow significantly the search for your problem. By having as much documentation about the problem as you can, the process of isolating the error becomes much easier. The next chapter discusses how you can gather this documentation and build keyword strings.

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Chapter 2. Identifying Problems

To report a problem to IBM Support Centers, you first must be able to describe it. Your description of the problem determines how IBM Support Centers search their data bases for a known cause and solution. To accurately describe the problem, you need to isolate the error and gather documentation. These steps, problem determination and problem source identification, are explained below.

Problem Determination

Problem determination is identifying whether the source of a problem is hardware or software. It ends as soon as that identification has been made. For example, you are using problem determination if you decide that a problem is associated with VM/XA SP rather than with a machine failure.

If you conclude that the cause of the problem is hardware, you do not proceed to problem source identification. However, if you conclude that software caused the problem, you then move on to conducting problem source identification.

Given this sequence of procedures—problem determination, then problem source identification (if applicable)—you perform problem determination before searching for possible causes of the problem in VM/XA SP. Then, if necessary, you can gather data about the problem.

Problem Source Identification

Problem source identification begins once you have completed problem determination and have identified the problem as software. In doing problem source identification, you assess where in the software the problem resides. In this case, it is done to locate an error in the VM/XA SP control program.

For additional information on hardware and software errors as well as conducting problem determination and problem source identification, see "Chapter 1. Identifying Problems" of the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual.

Diagnosing Problems in General

In general, there are a few steps you can take immediately when a problem arises:

- Gather significant information displayed at the operator's console, such as error messages or abend codes.
- Determine that these messages were issued as the result of a problem in VM/XA SP.
- If the problem produces a dump, use the dump viewing facility to examine the dump for symptom record information. See the description of the SYMPTOM subcommand in the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* for details on how to do so.

- Obtain the console log for other messages that might indicate what happened prior to the problem.

For example, assume the following message is displayed at the operator's console:

```
HCPDMP908I  SYSTEM FAILURE; CODE - ATL002
```

You now have several keywords:

- *HCP* indicates that VM/XA SP has detected a problem.
- The module issuing the message is *HCPDMP*.
- An abend code, *ATL002*, has been issued.

A description of the abend, provided in the *VM/XA SP System Messages and Codes Reference* manual states:

```
HCPATLDV was entered on the system VMDBK.
```

The response for this message tells you to check the save area pointed to by register 13 and to locate the calling module by the return address in this save area. This caller did not provide the address of the currently dispatched user.

After gathering this preliminary data, you can begin to expand your search for the problem. A description of how to obtain essential data for diagnosis is in the next section.

See Appendix C for an overview of what to do when you need to diagnose a problem.

Chapter 3. Using Diagnostic Aids

Once you recognize that a problem with VM/XA SP CP exists, gather enough documentation to report the problem to IBM Support Centers. If you are running in multiprocessor (MP) mode, collect information on the nonabending processor as well as the abending processor. Narrow your search as you go. One way to do this is to know and understand some areas of CP where clues to problems often reside.

This section discusses the following:

- Tracing
- The symptom record
- Program status words
- Registers
- The dump viewing facility.

Tracing is discussed extensively, since it is one of the most helpful tools for determining what system activity occurred at the time of the problem. The other topics listed are discussed briefly.

Tracing

When CP tracing is active in VM/XA SP, system events are recorded as trace entries in trace tables in real storage. The number of trace table pages available to a processor is determined by the SYSSTORE macro at the time the system is generated. Trace entries are created for each processor in a configuration as long as tracing is enabled. Trace tables provide a valuable diagnostic tool, as they contain a detailed history of system activity.

Trace Tables

To find the address where trace tables begin, check the value in PFXTTPNT in the prefix page. For additional information on the prefix page, see page 17.

To find the most recent trace entries of the table, first check control register 12 to find the address of the location where the next trace entry will be placed.

Note: Ignore bit 31 of control register 12. It is a flag indicating whether or not tracing is currently active.

Next, subtract hex 20 from the address in control register 12 to find the address of the trace entry entered just before the dump was created.

Figure 1 illustrates the concept that each processor in a configuration has its own allotment of trace table pages, that PFXTTPNT points to the beginning of the trace table, and that control register 12 points to the next trace entry.

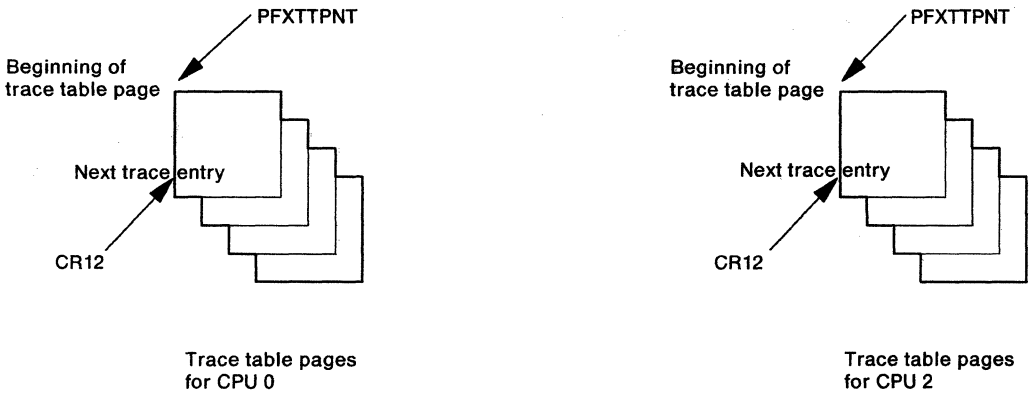


Figure 1. Trace Table Pages for Each Processor

Trace Entries

All VM/XA SP trace entries include the following:

- Two constant fields (7400 and 0000)
- A trace event code that defines the event being traced
- A time-of-day clock value that indicates when the entry was made
- A maximum of 20 bytes of information about the specific event traced.

Figure 2 shows the format of a trace entry as it would appear in a dump.

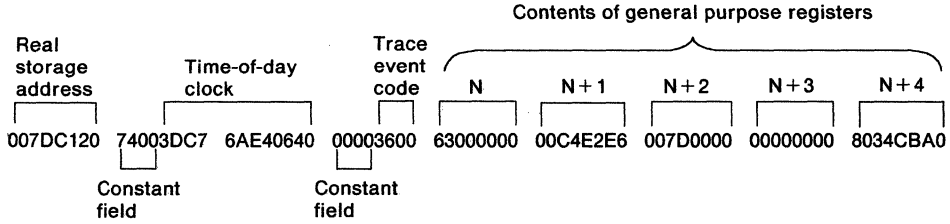
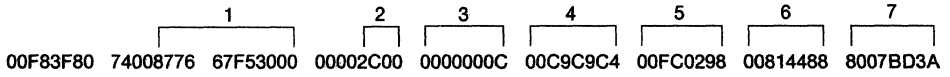


Figure 2. Format of a Trace Entry

Each trace entry contains information on a specific system event. Consider the following sample trace entry at address 00F83F80 in a CP abend dump:



This trace entry at address hex 00F83F80 tells you the following:

1. The time-of-day (TOD), bits 16 through 63, was set to hex 877667F53000 when this trace entry was created (from hex 02 to hex 07 into the trace entry).
2. The trace event code was hex 2C00, a RETURN WITH SAVE AREA (at hex 0A in the trace entry).
3. The value returned in register 15 was hex 0000000C (at hex 0C in the trace entry).
4. The condition code was 0, and the returning module identifier was 'IID' (at hex 10 in the trace entry).
5. The returned SAVBK address in register 13 was hex FC0298 (at hex 14 in the trace entry).
6. The real address of the calling module from register 14 was hex 814488 (at hex 18 in the trace entry).
7. The real exit address of the called module from register 14 was hex 7BD3A (at hex 1C in the trace entry).

In this example, CP stored the contents of the general purpose registers at hex FC0298 with a return code of 12.

For a complete listing of trace table entries and their field values, refer to the *VM/XA SP CP Diagnosis Reference* manual.

Limiting the Trace Entries Recorded

Normally, CP tracing is active during system operation. However, new trace entries are added continually to trace tables and eventually are written over older trace entries. This process is called wrapping.

On stressed systems, wrapping may occur in well under one second. As a result, an abend dump that includes the trace table for each processor may convey little or no information about the problem. VM/XA SP overcomes this limitation by allowing class A and C users to do the following:

- Limit tracing to certain userids or event codes
- Filter out data for certain userids or event codes
- Save entries on tape or in system data files
- Refine captured information with the dump viewing facility
- Trace and display real I/O devices
- Trace and display the execution of most code paths in CP.

For tracing activities, you mainly use eight CP commands:

- SET CPTRACE
- QUERY CPTRACE
- TRSOURCE
- QUERY TRSOURCE
- TRSAVE

- QUERY TRSAVE
- QUERY TAPES
- QUERY TRFILES.

See the *VM/XA SP CP Command Reference* manual for the format of, and information about, using these commands.

For viewing the trace tables saved, you use one dump viewing facility command:

- TRACERED.

See the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual for detailed information about using the TRACERED command.

Designating Entries to Be Captured or Filtered

Although trace tables can be saved on tape or in system trace files by the CP command TRSAVE, the rate at which trace entries are generated may exceed I/O capabilities. In such situations, you can filter out certain entries. The goal is to filter out unnecessary entries while allowing the required information to be saved on tape.

Use the SET CPTRACE command to disable as many trace codes as possible, while still maintaining the necessary history of system events.

To designate which entries are either captured and written to a trace table or filtered out and not written to a trace table, specify the following:

1. Trace codes
2. Userid or SYSTEM.

   Note: SYSTEM represents the trace entries CP creates while doing work for the system. This includes all work dispatched on the SYSTEM VMDBK for serialization.

Capturing or Filtering Data by Trace Code: If you want to capture or filter data for certain trace codes, use the SET CPTRACE command to trace individual codes or named categories of codes.

Capturing or Filtering Data by Userid or SYSTEM: In addition to designating trace codes for capturing or filtering, you can further limit the trace entries written to trace tables by designating other tracing criteria. These additional tracing criteria include userid, SYSTEM, or certain groupings of these. Use the SET CPTRACE command with the SPECIFIC option to designate certain userids be traced, each with its own set of tracing criteria. Use the SET CPTRACE command with the NONSPECIFIC option to designate certain userids be traced, all sharing the same tracing criteria.

Figure 3 illustrates the concept that you can request tracing according to separate tracing criteria for individual userids or shared tracing criteria for a group of userids.

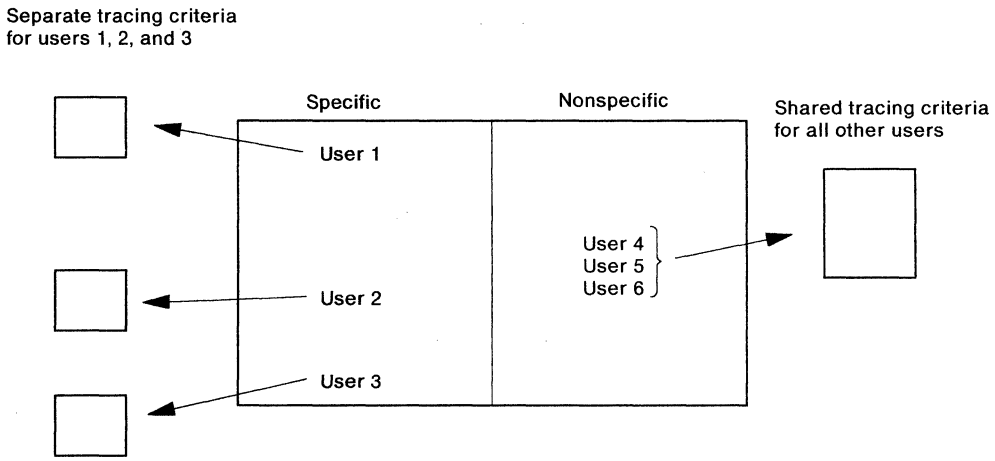


Figure 3. Tracing Events for Specific and Nonspecific Users

For additional information about the SET CPTRACE command, see the *VM/XA SP CP Command Reference.*

More Information on Filtering

The following system events are some of the most common entries in a trace table. If you do not need them for diagnosing problems in a particular circumstance, filter them out to reduce the number of trace entries generated.

System Event	Entry Code
CALL WITH SAVE AREA	CODE=2800
RETURN WITH SAVE AREA	CODE=2C00
EXIT TO THE DISPATCHER	CODE=3600
RUN USER	CODE=0A00
STACK CP EXECUTE BLOCK	CODE=3300
UNSTACK CP EXECUTE BLOCK	CODE=3310
OBTAIN FREE STORAGE FRAME	CODE=0600
RETURN FREE STORAGE FRAME	CODE=0700

Tracing I/O, Data Code Paths, and Virtual Machines

The TRSOURCE command allows you to trace I/O paths, data code paths, and virtual machine guests. You can use TRSAVE to save the source data on DASD and the TRACERED command to format the data so that you can read it interactively. The following scenarios give an example of the use of TRSOURCE for tracking I/O, data paths, and virtual machine guests.

I/O Trace Example

The operator gets a system message (COMMAND REJECT) indicating an I/O error on the 3800 printer at real device 411.

Look at the CCWs to this device; then issue the following two commands:

```
TRSOURCE ID PRINTBUG TYPE IO DEV 411
TRSOURCE ENABLE ID PRINTBUG
```

Wait for the error to recur. At that time, issue this command:

```
TRSOURCE DISABLE ID PRINTBUG
```

You can now do a QUERY TRFILES to make sure that one or two trace files were created. The userid that issued the TRSOURCE commands is the owner of these trace files. If you received message 6084 saying that the oldest trace file was purged, then more trace data was generated than could be contained in two 256-page files. You may change the size or number of files that are created when you enable the traceid by specifying: TRSAVE FOR ID PRINTBUG SIZE xx KEEP XXXX. (See the TRSAVE command in *VM/XA SP CP Command Reference* for more information.)

Trace Table Example

Users are reporting that their userids are hung, that is, that they cannot log off. This happens every day between four and five in the afternoon, when they want to go home.

You have taken a restart dump. In further analysis, you find that these userids were hung because a wait flag is being turned on but never turned off for them. The restart dump does not reveal the cause because the trace table had wrapped by the time the dump was taken. There are no events for these users in the dump.

Between 4 and 5 PM tomorrow, obtain the events which occur for these users. Issue this command to turn off tracing for the system or for other users.

```
SET CPTRACE OFF
```

Now issue the following two commands:

```
SET CPTRACE FOR userid ON
TRSAVE FOR CP ON TAPE 181 182 MODE xxxx REWIND
```

At 5 o'clock, issue:

```
TRSAVE OFF
```

To start the tracing for the system or for other users again, issue:

```
SET CPTRACE ON
```

You may now use TRACERED to display the trace data on the tapes.

Data Trace Example

When using an application (PROFS), end users are complaining that they are receiving bad data. You know that PROFS uses IUCV to transmit data. There are three possible points at which the bad data may be originating:

1. The sending (SOURCE) virtual machine
2. The CP send/receive mechanism (IUCV)
3. The receiving (SINK) virtual machine.

Step A: Understand what data is supposed to be sent from the SOURCE virtual machine.

Step B: Find out what data is actually being sent. (If this data does not match what is supposed to be sent, the SOURCE virtual machine is the origin of these problems.

At offset X'1B2' in module HCPMOD, register 5 points to the user data; register 6 points to the control block describing the data. The instruction at this location is LR R1,R5 (hex 1815).

Set up a data trace to trace the general registers, the storage pointed to by register 5 for 200 bytes, and the storage pointed to by register 6 for 100 bytes. Issue the following command:

```
TRSOURCE ID SEND TYPE DATA LOC HCPMOD + 1B2 1815 DL G0:F G5.200 G6.100
```

Step C: Find out what data is being received by the receiving virtual machine. If the data is the same as what was being sent, then IUCV is not the origin of the bad data. Otherwise, IUCV is the problem source.

At address 2B200, data is passed to the SINK virtual machine. The instruction at this location is SLR R5,R5 (hex 1F55). Register 4 points to the user data. Register 7 contains the pointer to the control block that describes the data. Set up a data trace to trace the storage pointed to by register 4 for 200 bytes and the storage pointed to by register 7 for 100 bytes. Enter:

```
TRSOURCE ID SINK TYPE DATA LOC 2B2000 1F55 DL G4.200 G7.100
```

Step D: Collect the data. You are planning on analyzing the data from a different userid (USERB) than the one issuing the TRSOURCE commands. Therefore, use TRSAVE to change the userid which will own (receive) the files when the trace is completed. Issue the following three commands:

```
TRSAVE FOR ID SEND TO USERB
TRSAVE FOR ID SINK TO USERB
TRSOURCE ENABLE ID SEND SINK
```

Now wait for the problem to recur. When it does, issue:

```
TRSOURCE DISABLE ID SEND SINK
```

USERB may now use TRACERED to view the trace data.

Saving Trace Tables on Tape or DASD

As a class A or C user, you can use the TRSAVE command to save trace entries on tape or on DASD. Trace entries collected by CPTRACE can be saved on both DASD and tape. If you choose to use TRSOURCE to trace code paths, I/O paths, or a guest virtual machine, TRSAVE saves this information on DASD only. This command causes entries to be sorted across processors into buffer pages according to the time-of-day field.

Factors That Affect Saving Trace Table Pages

Number of Trace Table Pages: CP's ability to save trace table pages before they wrap is directly dependent on the number of trace table pages available and the speed at which the entries are generated.

The number of trace table pages available to each processor is determined in one of two ways:

- By the real storage size of the system (that is, by default)
- By being specifically generated in the system during installation.

For more information, see the SYSSTORE macro in the *VM/XA SP Installation and Service* manual.

Contention with Other Users or Functions: Trace tables are saved on tape at a lower rate of speed if other users or functions are on the same control unit as the tape drive you selected to save the trace tables.

Options Selected on the TRSAVE Command: If you are tracing a problem that takes a long time to recreate, certain options on the TRSAVE command allow continued recording of the trace tables or data from traces defined by the TRSOURCE command, even as the tape reels fill.

Selecting two tape drives on the TRSAVE command enables CP to switch automatically from the first to the second tape drive when the end-of-tape is encountered on the first tape drive.

In addition to specifying two tape drives, choosing either the RUN (rewind and unload) or the REWIND option further defines how the process of saving trace entries to tape proceeds. If you select RUN (the default), the tape reels can be mounted continually to provide an indefinite history. If you select REWIND, the reels won't be changed, and they will wrap over themselves as they fill.

Viewing the Trace Tables

The dump viewing facility enables you to format further the trace entries saved onto tape and then view the information in a CMS file or print file from system trace files as well. The TRACERED command of the dump viewing facility allows you to select options and format the output. You can send the output to a CMS file for viewing on your virtual machine or for printing. See the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual for more information on the TRACERED command.

Factors That Affect Collecting and Viewing Trace Table Pages

CMS Storage: You may encounter disk storage constraints if you select a CMS file for the output from the TRACERED command. The more trace entries that meet the selection criteria, the larger are the storage requirements. One way to alleviate storage constraints is to designate more stringent selection criteria.

The table that follows shows the total number of trace entries TRACERED can process onto a single cylinder of the specified type:

	Approximate Number of Trace Entries per Cylinder	
CMS Minidisk Device Type	**Formatted**	**Unformatted**
3330	766	2300
3340	320	960
3350	1666	5000
3375	1066	3200
3380	2083	6250

You should also beware of creating CMS files too large for the CMS editor to accommodate. Should this occur and you still want to view the entries created, either use the COPYFILE command to break the file into manageable pieces or increase the virtual machine storage size to the editor's limitation. The alternative is to erase the CMS file and rerun the TRACERED command with more stringent selection criteria.

Symptom Record

VM/XA SP produces a symptom record for each CP dump. The symptom record contains information about general characteristics of the problem. Some of the important data in the symptom record is as follows:

- The value of the time-of-day (TOD) clock when the abend dump was issued
- The unique module identifier for the issuer of the abend and the reason code for the abend
- The name of the failing module
- The value for the PSW/register offset.

To process symptom records in dumps, use the DUMPSCAN SYMPTOM subcommand or PRTDUMP command for the dump viewing facility. For more information on how to use the SYMPTOM subcommand of the dump viewing facility, see the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual. For an example of interpreting a symptom record output screen, you should also consult the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual.

PSWs

There are six different types of system PSWs (program status words) that provide diagnostic information in VM/XA SP. Each PSW has an old and new value. The PSWs are as follows:

- External (EXT)
- Supervisor call (SVC)
- Program (PGM)
- Machine-check (MCH)
- Input/output (I/O)
- Restart.

Registers

You can find significant diagnostic information from the control and general purpose registers in VM/XA SP. The register values in a CP abend dump reflect the last values in the registers as the dump was issued. With these values, you will be able to locate executing modules, control blocks, and trace entries.

The following list gives the typical contents of some of the general purpose registers:

Note: The contents of GPR1 through GPR10 in this list are examples that would apply to certain modules in certain subsystems. The contents of GPR11 through GPR15 in this list apply to a wider range of instances.

GPR1	The virtual address to be translated
GPR2	The real address or parameter
GPR6	The address of the VDEV
GPR7	The address of the SEGTE
GPR8	The address of the RDEV
GPR10	The address of the IORBK
GPR11	The address of the active VMDBK
GPR12	The base register for the module executing
GPR13	The address of the current save area if the call was made with a dynamic save area
GPR14, GPR15	External branching linkage.

To find an exact description of the registers' contents for an abend dump, see the *VM/XA SP System Messages and Codes Reference*. To find out what the registers are used for in a particular module, refer to the prologs of source listings.

Dump Viewing Facility

The dump viewing facility gives you the ability to interactively view CP, standalone, and virtual machine dumps. It is a component of VM/XA SP and runs under CMS in System/370 mode.

To use the dump viewing facility for diagnosing CP problems, you need the following:

- The dump viewing facility installed on your system.
- A copy of the dump you want to examine.
- A copy of the CMS DUMPLOAD module.

  You use this to load the dump into a CMS file.
- A copy of the load map that describes the system from which your dump was taken.

  Usually, this applies to VM dumps only, since the DUMPSCAN and PRTDUMP commands of the dump viewing facility create a module map dynamically and append it to a specified dump. However, there are two instances in which you need a copy of the CP load map if you are working with a CP hard abend dump:

  1. You want to see certain data areas; for example, HCPSYSCM.
  2. You want to see what modules existed at system generation time but were paged out when the dump was taken.

Once you receive an abend, the dump is sent to the reader of the userid designated as the dump receiver in HCPSYS if the dump is set to go to disk. For information on the CP command SET DUMP, see the *VM/XA SP CP Command Reference* manual. For information on setting up the system abend dump environment, see the *VM/XA SP Real System Operation* manual. To use the dump with the dump viewing facility, you must first log on to the dump receiver's userid and then load the dump into a CMS file. Do this with the CMS DUMPLOAD command.

The DUMPLOAD command loads the dump from the virtual reader into a CMS file and gives it a file name of PRB*xxxxx* DUMP A, where *xxxxx* is a 1- to 5-character alphanumeric string (the characters "@," "#," and "$" are also valid).

Once you have the abend dump in a CMS file, you can then prepare it for use with the dump viewing facility manual. Refer to the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual for more information on preparing the dump for processing. See the *VM/XA SP CMS Command Reference* manual for additional information on the DUMPLOAD command.

Dump Viewing Facility Use

The dump viewing facility shortens the time you need to gather information about a CP problem. Some of the tasks that the dump viewing facility performs quickly are:

- Locating the addresses of certain modules or entry points in a CP dump, or identifying which modules or entry points reside at a specific address in a CP dump.

- Finding RDEVs and VDEVs. The RIOBLOK and VIOBLOK subcommands of DUMPSCAN enable you to locate RDEVs and VDEVs by going through the radix tree very rapidly. These subcommands display the data on your terminal screen.
- Finding information about any control block.
- Formatting trace entries. By using the TRACE subcommand of DUMPSCAN with the FORMAT option, you can format the trace entry so that each field of a trace entry is displayed with its description.
- Displaying symptom record information. By using the SYMPTOM subcommand of DUMPSCAN, you can easily check the symptom record issued with the abend dump.
- Viewing the contents of all registers and all PSW values at the time of the dump. The REGS subcommand of DUMPSCAN enables you to view the contents of general purpose, control, and floating-point registers, and all the PSW values at the time of the dump.
- Processing trace table entries that have been saved to tape on system trace files by using the TRACERED command.

Printing Dump Information from the Dump Viewing Facility

Once you have processed the dump so that the dump viewing facility can use it, you can print information from the dump. If you need to print only a small part of the dump, perhaps only information about an RDEV, you can use the PRINT subcommand of DUMPSCAN. If, however, you wish to print the entire dump, you can use the dump viewing facility DUMPLOAD command.

The dump viewing facility PRTDUMP command prints summary information about major VM/XA SP control blocks and data areas. The following are included in the listing created by the PRTDUMP command:

- Symptom record information.
- General processor information, giving register and PSW values.
- Frame table summary reports, showing the status of each frame of real storage at the time of the dump. The summary contains the real storage frame, the address of the frame entry, contents of the frame table entry, and the frame use.
- Information about each real device in the system at the time of the dump.
- Trace tables. If there is more than one processor defined in the dump, then the trace entries are merged according to the time-of-day (TOD) clock values.
- A VMDBK list with status indicators of each user who was logged on at the time of the dump.
- User summary information.
- A map of all modules and entry points in the dump.

For information on how to use all dump viewing facility commands and subcommands, refer to the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual.

Chapter 4. Looking at Key Control Blocks

VM/XA SP CP uses control blocks to hold information about many aspects of the entire system. System processing is dependent on this information, so that if incorrect data is placed in these control blocks, errors occur.

When errors occur, control blocks often provide the best information about the causes. By examining the fields within the control blocks and the source listings, you can obtain valuable diagnostic information for problems with VM/XA SP. For a diagram of the major CP control blocks, see "Appendix A. The Relationship of Some Major CP Control Blocks" on page 33.

Descriptions of the major control blocks of VM/XA SP follow. While they have proven to be especially helpful in the diagnosis process, they are not the only ones you should use in diagnosing problems.

For each control block, a brief explanation of its purpose is given, followed by pointers or other methods for locating the control block, and then by specific fields that will prove helpful in gathering data.

If you wish to list all the control blocks, follow the procedure outlined in the beginning of the *VM/XA SP CP Data Areas and Control Blocks* manual.

Consult the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* manual for information on the BLOCK subcommand of DUMPSCAN. You can use this subcommand to format control blocks within a dump. You can format the entire block or only selected fields, and you can request that a predefined subset of high interest fields be formatted.

HCPPFXPG: Prefix Page

The prefix page (HCPPFXPG) is page zero for each processor running in VM/XA SP. It contains both hardware and software information for each processor. At system generation, HCPLOD defines the prefix page location. Or, if an alternate processor is either brought online during IPL processing or varied online after the IPL is complete, the prefix page is acquired dynamically and its location is defined by HCPMPS.

If you receive an abend dump, you can find the prefix page by using the PFX VALUE. If you are using the dump viewing facility, you can find the address of the prefix page by using the CPU CREGS or REGS subcommand of DUMPSCAN.

The HCPPFXPG contains information you will find helpful in performing diagnosis. It contains the following:

PSW information:

System PSWs for the processor. They include PGM, MCH, I/O, RESTART, SVC, and EXT.

Linkage save areas:

PFXTMPSV, PFXBALSV, PFXWRKSV, PFXFRESV, PFXPTRSV, PFXLNKSV	A copy of the registers and the work areas when one module calls another
PFXIOSID	The subchannel number of the last active I/O device, always prefixed in the first halfword by 0001
PFXINPRM	The address of the RDEV of the last active I/O device
PFXRNUSR	The address of the last run VMDBK
PFXNXTPF	If multiple processors are defined, a pointer to the next prefix area
PFXTTPNT	A pointer to the beginning of the trace table associated with this prefix page
PFXSYSVM	The address of the system VMDBK that is the starting point of the global cyclic list
PFXSYS	The address of the system common area (SYSCM).

HCPSYSCM: System Common Area

The system common area, or SYSCM, contains pointers, variables, counters, and constants for the entire system. It is created at system generation as part of HCPSYS. SYSCM is located by the pointer PFXSYS from any prefix page.

Diagnosis information found in HCPSYSCM includes:

SYSPRFIX	The prefix area for the IPLed processor
SYSTOD	The first half of the time-of-day (TOD) clock at IPL time
SYSRDEV	The address of the first RDEV block in the radix tree
SYSVMVR	The address of the preferred virtual machine VMDBK when one is logged on
SYSTORS	Real machine storage size.

HCPVMDBK: Virtual Machine Descriptor Block

The HCPVMDBK, or VMDBK, is a control block containing information about each virtual machine logged on. It is created by HCPBVM when a user does any of the following:

- Logs on to VM/XA SP
- Defines an additional virtual processor
- Issues a SIE (start interpretive-execution) instruction.

Each user has one VMDBK per virtual processor and one additional V/SIE VMDBK for each virtual processor from which the SIE instruction was issued.

A preferred virtual machine is one whose real storage is equivalent to host real storage. A preferred virtual machine is either the V=R machine or a V=F machine. A V=V machine is a virtual machine whose data is paged in dynamically to host storage by CP as needed. CP allocates space for the VMDBKs of V=R, V=F, and V=V machines as follows.

The V=R machine's base VMDBK resides in the V=R recovery area. Space is also reserved in the V=R recovery area for additional VMDBKs, should the user define additional processors. If the user of the V=R machine defines additional processors, CP creates one VMDBK for each added processor. These are V=R VMDBKs and they remain in the V=R recovery area. As a result of the preallocation of VMDBK space, the V=R guest can recover if a system incident (for example, a CP abend) occurs.

The user of the V=R machine can define more virtual processors than can be represented in the space reserved for VMDBKs in the V=R recovery area. If no reserved space is available in the V=R recovery area, CP allocates space for these additional VMDBKs from the dynamic paging area. If these extra VMDBKs are present during a system incident, V=R machine recovery is suppressed.

CP allocates space for the VMDBKs of V=F and V=V machines from the dynamic paging area. Because no preallocation for VMDBKs or for any other control blocks occurs, V=F and V=V guests cannot recover from a system incident.

Since you can have one V=R machine on VM/XA SP, there is at least one VMDBK in the V=R recovery area for that virtual machine as long as the virtual machine is logged on. There is also at least one VMDBK in the dynamic paging area for each logged-on V=F and V=V machine.

VMDBKs can be located in several ways from fields in different control blocks:

VDEVUSER of HCPVDEV	A pointer to a user's VMDBK from a virtual device accessed by that user
RDEVUSER of HCPRDEV	A pointer to a user's VMDBK from the real device owned by that user
SYSVMVR of HCPSYSCM	A pointer to the origin VMDBK of the preferred virtual machine (V=R) logged on at the time of the dump
PFXSYSVM of HCPPFXPG	A pointer to the system VMDBK from the prefix page.

You can also locate VMDBKs by chains called the global and local cyclic lists. A global cyclic list is a chain of all origin VMDBKs for users logged on in either V=R or V=V storage. The VMDCYCLE field in the system VMDBK control block points to the first VMDBK in the list of logged-on users. Then the VMDCYCLE field of each user's VMDBK points to the next VMDBK in the global cyclic list, and so on, until the last VMDBK in the chain. The last VMDBK does not point back to the system VMDBK control block, but to the first VMDBK in the list, the same one to which the system VMDBK points.

A local cyclic list is a chain of all VMDBKs with the anchor at a VMDBK in the global cyclic list. The VMDLCYCL field points to the next VMDBK on a local cyclic list. The last VMDBK on a local cyclic list points back to the origin VMDBK – the VMDBK on the global cyclic list.

The following fields are generally useful in gathering diagnostic information about a VMDBK:

VMDSTATE	The scheduler and dispatcher state of the user. It tells you whether this user is ready to be dispatched or is idle.
VMDSLIST	A description of the scheduling list of this user. This byte tells you whether this user is currently in the dispatch list, eligible list, dormant list, or not in any of the lists.
VMDDLCTL	A description of the status of the user in the dispatch list. This byte gives information about the time-slice of the user on the dispatch list and whether the user should be dropped or reordered.
VMDIOACT	The number of I/O operations outstanding for this user at the time the dump was issued.
VMDCFCTL	A byte describing the status of the console function for this user at the time the dump was issued.
VMDCYCLE	A pointer to the next VMDBK of the global cyclic list of logged-on users.
VMDLCYCL	A pointer to the next user-defined or system-generated VMDBK for the user on the local cyclic list.
VMDCHRDN	The anchor for the radix tree to VDEVs by device number.
VMDCHRSN	The anchor for the radix tree to VDEVs by subchannel number.

HCPRDEV: Real Device Control Block

CP uses RDEVs to manage real and logical devices. For real devices, an RDEV is created as part of system generation. Since it is resident in the nucleus, it is never deleted. For logical devices, RDEVs are created as needed when the logical devices are created. A logical RDEV is deleted when the logical device is no longer needed.

There are four ways to find the RDEV for a real device:

- Use the DUMPSCAN RIOBLOK subcommand, the USER (userid) operand of the PRTDUMP command, or the RIOBLOK operand of the PRTDUMP command. These are all part of the dump viewing facility. See the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* for details on using them.
- If you are a user with privilege class C or E, use the LOCATE *nnnn* command to obtain the RDEV address for device number *nnnn*.
- Check the assembly listing for the assembly of HCPRIO. The RDEV value for RDEV*nnnn* appearing in the cross-reference is the RDEV address for device *nnnn*.
- Follow the radix tree procedure explained in the following text.

Using a Radix Tree Structure to Locate RDEVs

RDEVs for real and logical devices are stored in a radix tree structure. You can use information about the radix tree structure to locate RDEVs for both real and logical devices. The procedure for locating RDEVs for real and logical devices is nearly identical for both types of devices. The instructions below tell how to locate an RDEV for a real device. The differences in the process for locating the RDEV for a logical device are pointed out. Assume you are trying to locate the RDEV for real device 0191. You use the device number in the process outlined here.

1. Find the address of the anchor, HCPRIOPT, for the radix tree.

   You can do so by any of the following methods:

   - Enter LOCATE HCPRIOPT
   - Examine a load map of the system
   - Use a chaining procedure.

   Assume you are using a chaining procedure.

2. Look in HCPPFXPG, the x page, to find PFXSYS. PFXSYS points to HCPSYSCM, the system common area.
3. Find SYSDVFRX in HCPSYSCM. SYSDVFRX points to HCPRIOPT.
4. Examine the contents of HCPRIOPT. HCPRIOPT points to HCPRIOIX, the address of the first table or anchor of the radix tree.
5. Look 0 fullwords past that anchor (HCPRIOIX) address because the first digit of the device number is 0.

   The address at 0 fullwords past the anchor is the next (second) address you use.
6. Look 1 fullword past that second address because the second digit of the device number is 1.

   The address at 1 fullword past the second address is the next (third) address you use.
7. Repeat this procedure for the remaining two digits, 9 and 1, for the device. The last address points to the address for the RDEV of real device 0191.

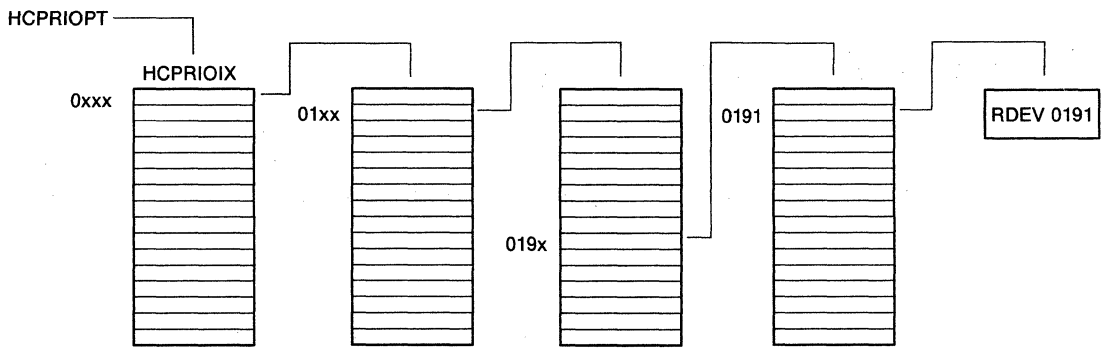


Figure 4. Using a Radix Tree to Locate an RDEV Block

To find the logical RDEV for a logical device, use the procedure outlined above, with the following exceptions:

- Look for SYSDVFLX (rather than SYSDVFRX) in HCPSYSCM.
- SYSDVFLX points to HCPLSOLX (rather than HCPRIOPT).
- HCPLSOLX points *directly* to the first table on the radix tree (rather than to another field that in turn points to the first table on the tree).

If you are working from a printed dump, you will need to use this procedure every time you wish to view an RDEV. If you use the dump viewing facility, however, you need only use the RIOBLOK subcommand to view an RDEV.

Control block fields of diagnostic value in the RDEV are as follows:

RDEVAIOR	A pointer to the active IORBK for this device.
RDEVAFLG	The control flag for the device allocated at the address of this RDEV. It describes the use of the RDEV—for instance system use, CP volume, and other usages.
RDEVDFLG	The device-dependent status flag.
RDEVRFLG	The device error recovery control flag.
RDEVSTAT	The device-operation control flag.
RDEVVDEV	The address of the VDEV, if one is present, associated with this RDEV. RDEVVDEV contains a VDEV address only if the virtual device is dedicated. When it does not contain a VDEV address, it contains zeros. If two or more virtual devices are linked to this RDEV, the address of the queue of VDEV addresses resides in RDEVLINK.
RDEVLINK	The address of the VDEV queue. The queue may consist of one or more VDEVs, with each VDEV representing a virtual machine's link to a nondedicated, shared device. When RDEVLINK does not contain the address of the VDEV queue, it contains zeros.
RDEVUSER	The address of the owning VMDBK for this device.

HCPIORBK: I/O Request and Response Block

In performing I/O functions, CP dynamically creates an IORBK when HCPFREE is called and deletes the IORBK when HCPFRET is called. There are various ways to locate an active IORBK. One way is to look at the RDEVAIOR field of the RDEV block.

Some key areas of the IORBK are as follows:

IORSCHED	The scheduling and control flags for the IORBK
IORFCTL	A description of the subchannel function of the IORBK
IORQSTAT	A description of the status of the IORBK—waiting, active, or in dispatcher control
IORETCOD	The return code of the I/O operation after I/O is completed

IORUSER	The address of the VMDBK using the IORBK
IORCPA	The address of the channel program (CCWs)
IORIRA	The address of second level interrupt handler (SLIH) routine
IORFPNT	The address of the next queued IORBK
IORBPNT	The address of a previously queued IORBK
IORRDEV	The RDEV associated with this IORBK operation.

HCPVDEV: Virtual Device Block

A VDEV describes the status of a real or virtual I/O device that can be accessed by a virtual machine. A VDEV defines the device to the virtual machine, whereas an RDEV defines the device to the system.

A VDEV remains active while the virtual machine is either running or disconnected. It is deleted only when the virtual machine is logged off or the virtual device detached. VDEVs are created and deleted by HCPVDB.

You can locate VDEVs in the following manner:

If VM/XA SP is running, users with class B or E privileges can find the address of a VDEV by using the CP LOCATE command. For example, to find the VDEV for USER1's 191 disk, you enter:

```
locate user1 191
```

The dump viewing facility also offers ways to locate a user's VDEV easily. For further information on finding virtual device blocks, refer to the VIOBLOK subcommand of DUMPSCAN and the USER *userid* operand of the PRTDUMP command in the *VM/XA SP Dump Viewing Facility Operation Guide and Reference*.

To locate VDEVs from a dump, use the following pointers:

RDEVVDEV	The address of the VDEV, if one is present, associated with this RDEV. RDEVVDEV contains a VDEV address only if the virtual device is dedicated. When it does not contain a VDEV address, it contains zeros. If two or more virtual devices are linked to this RDEV, the address of the queue of VDEV addresses resides in RDEVLINK.
RDEVLINK	The address of the VDEV queue. The queue may consist of one or more VDEVs, with each VDEV representing a virtual machine's link to a nondedicated, shared device. When RDEVLINK does not contain the address of the VDEV queue, it contains zeros.
IORVDEV	A pointer from the IORBK to the VDEV for that I/O operation.

Diagnostic information found in the VDEV includes:

VDEVUSER	The address of the VMDBK that owns this VDEV
VDEVRDEV	The address of the RDEV associated with this VDEV.

HCPCPEBK: CP Execution Block

A CPEBK represents one unit of asynchronous work. The format of the CPEBK is identical to that of the SAVBK.

HCPSAVBK: Save Area Block

A SAVBK is a dynamic save area. The format of the SAVBK is identical to that of the CPEBK.

When a CPEBK or SAVBK is used, it contains the following:

- A caller's registers 0-15
- The usage status of the CPEBK or SAVBK
- Work areas
- The size of the CPEBK or the SAVBK.

The following fields are helpful when you are checking CPEBKs or SAVBKs:

CPEXFPNT/CPEXBPNT (SAVEFPNT/SAVEBPNT)	The forward and backward pointers for threaded lists.
CPEXSCHC (SAVESCHC)	The stacking control field of a CPEBK or SAVBK. Information found here specifies what type of function the CPEBK or SAVBK performs.
CPEXCALC (SAVECALC)	The dispatching control field of a CPEBK or SAVBK. The values in this field specifies the status of the CPEBK or SAVBK.
CPEXREGS (SAVEREGS)	A caller's registers R0 through R15.
CPEXR11 (SAVER11)	The VMDBK address of the user for whom the CPEBK or SAVBK is scheduled.
CPEXR13 (SAVER13)	Generally, the previous save area address on call.

HCPFRMTE: Frame Table Entry

FRMTE manages frames of real storage in VM/XA SP. It keeps track of how each frame is currently being used and what frames of storage are currently available.

The frame table is created at system generation by HCPGENER and is never deleted during processing. The start of the frame table is located by PFXFTBL in any prefix page. For further information on finding frame table entries, refer to the FRAMETBL subcommand of DUMPSCAN and the FRMTB operand of the PRTDUMP command in the *VM/XA SP Dump Viewing Facility Operation Guide and Reference*.

Important HCPFRMTE fields include the following:

FRMFPNT	A forward pointer to the next frame table entry for a chained frame
FRMBPNT	A backward pointer to the previous frame table entry for a chained frame

FRMCSWRD A fullword that has the following byte fields:

- FRMCSB0 A description of how the frame is currently being used. For example, CP is using the frame of storage for a trace table or user page.
- FRMCSB1 A description of the static state of the real storage frame.
- FRMCSB2 A description of the dynamic state of the real storage frame.
- FRMCSB3 A field used in serializing the frame state changes.

Chapter 5. Dealing with Abends and Hangs

Abends

Abnormal termination occurs in VM/XA SP when system integrity may be jeopardized. Internal checks on control block fields often determine whether CP issues an abend.

An abend in VM/XA SP includes two primary sources of diagnostic information: an abend code as well as symptom record information at the beginning of the dump.

The abend code tells what module issued the dump and what actions CP is taking or has taken. An abend code has a specific format:

```
mmmnnn
```

mmm is the module issuing the abend and *nnn* is the message number of the abend.

When the system terminates abnormally, you receive an error message. For example:

```
HCPDMP908I SYSTEM FAILURE ON CPU nnnn; CODE - mmmnnn
```

HCP in the error message indicates that VM/XA SP issued the message. Therefore, in this instance, system failure was with VM/XA SP itself.

For an explanation of error messages and abend codes, check the *VM/XA SP System Messages and Codes Reference* manual. The explanation for the abend code gives you a start in performing diagnosis.

VM/XA SP issues two types of abends—hard and soft.

Hard Abend

A hard abend is issued when CP cannot isolate the error to a single virtual machine. CP dumps all CP and free storage to a dump device, set either at initialization or with the CP SET DUMP command.

Soft Abend

A soft abend is issued when CP can isolate the error to a virtual machine or when system integrity is not jeopardized by the error. A soft abend dump results, giving only selected CP pages.

The DUMPLOAD command allows you to load and print a soft abend dump file from a spooled reader file. Since the dump is limited to capturing only certain pages, a subset of dump viewing commands are useful. See the *VM/XA SP Dump Viewing Facility Operation Guide and Reference* for more information on those commands. In general, the dump viewing commands DUMPSCAN and PRTDUMP process soft abend dump files. When you display or print dump pages, pages that are flagged as containing inconsistent data are preceded by a message indicating that the data to follow is suspect.

Hang Conditions

A hang condition occurs when either CP cannot continue processing or a virtual guest cannot be dispatched. As a result, VM/XA SP halts processing.

When gathering data about hang conditions, bear in mind that a delay may occur between the time the error-causing request is issued and the time the system hangs. The module executing when the hang occurs may not be the module responsible for the hang. As a result, some tools may provide no useful diagnostic data. For example, CP continuously creates trace entries in a trace table for each active processor in your configuration. Later trace entries may be written over the trace entry describing the event that caused the hang.

There are two types of hangs:

- System hangs
- User hangs.

System Hangs

System hangs occur when VM/XA SP cannot perform any tasks to completion.

The best way to handle a system hang is for the hung system's operator to restart VM/XA SP from the operator's console. At that point, CP issues an SVC002 abend dump and attempts a restart.

Diagnosing the cause of a system hang can be difficult. The following actions are starting points:

- Locate the active VMDBK to determine which user was executing at the time of the dump. By looking at the scheduling controls (VMDSLIST and VMDSTATE) in that VMDBK, you can determine if this was the active VMDBK and what the user was doing.
- Check the restart old PSW.
- Examine any trace entries available.

User Hangs

A user hang occurs when a virtual machine is no longer dispatched by CP. You need to determine if the hang was caused by VM/XA SP or the operating system you are running in the virtual machine. The first step is to look at the operating system running in the virtual machine to determine if it is hung.

One way of determining that the virtual machine is hung is to attempt a #CP command. (For more information on issuing CP commands with #CP, see the *VM/XA SP CP Command Reference* manual.) For instance, entering the command:

```
#cp ind user
```

causes one of two things to appear on your screen if you are in line mode:

1. Information about your virtual machine, if it is not hung
2. Nothing, if your virtual machine is hung.

When in full-screen mode, you may have to depress the BREAK key twice if the guest is not responding to attention interrupts. If the BREAK key does not function, your virtual machine is hung.

As with a system hang, the best source of information about a hung user is the VMDBK. Check the scheduling and dispatching controls (VMDSLIST and VMDSTATE) in the hung user's VMDBK to determine what state the user was in when the hang condition occurred.

When reporting a hung user problem to IBM, follow this procedure to help expedite resolution of your problem:

An Example of Finding User Hang

Once in the Dumpscan environment, the FINDUSER macro can be invoked by typing FINDUSER userid (FILE) on the command line. An example of the DUMPSCAN macro FINDUSER follows. The following screens, Figures 5, 6, and 7, represent contiguous output. The subcommand entered is:

```
finduser iucv3 file (dumpname cpdump01)
```

```
FINDUSER IUCV3 FILE (DUMPNAME CPDUMP01)

VMDBK AT 02B9D000 FOR USERID - IUCV3

*********************************************
* START OF MODULE CHAIN FOR USERID - IUCV3    *
*********************************************
   022B6F2A IS 2DA BYTES INTO MODULE HCPVIX AT 022B6C50
   022B6F2A IS 27A BYTES INTO ENTRY HCPVIXVI AT 022B6CB0
   02259E86 IS 6C6 BYTES INTO MODULE HCPIUF AT 022597C0
   02259E86 IS 26 BYTES INTO ENTRY HCPIUFRF AT 02259E60
   0225D232 IS 1D2 BYTES INTO MODULE HCPLCK AT 0225D060
   0225D232 IS 11A BYTES INTO ENTRY HCPLCKAX AT 0225D118
*********************************************
* END OF MODULE CHAIN FOR USERID - IUCV3      *
*********************************************
```

Figure 5. FINDUSER Output (1)

```
*********************************************************
* START OF SELECTED VMDBK FIELDS FOR USERID - IUCV3      *
*********************************************************

                BLOCK  'HCPVMDBK'  AT LOCATION  02B9D000

 ADDR/OFF  NAME          CONTENTS       DESCRIPTION
     0156  VMDINST(0)    B2F0           INTERCEPTED INSTRUCTION BIT 0
     0330  VMDWVDEV      00000000       ADDRESS OF VDEVBK FOR STATUS
     0380  VMDCOMND      'MESSAGE '     LAST CP COMMAND EXECUTED
     0388  VMDCFCTL      01             CONSOLE FUNCTION CONTROL
           VMDCFACT      ....  ...1      "X'01'" INDICATES THAT THE VI
     0389  VMDCFLAG      00             CONSOLE FUNCTION STATUS FLAGS
     038A  VMDOSTAT      44             VIRTUAL MACHINE OPERATING STA
           VMDUSRCT      .1..  ....      "X'40'" USER INCLUDED IN SYST
                                        CT
           VMDDISC       ....  .1..      "X'04'" USER IS RUNNING DISCO
     038B  VMDCWAIT      00             CF WAIT CONTROL
     038C  VMDCFPND      FF             CONSOLE FUNCTION IS PENDING.
     038D  VMDCFPDR      FF             CONSOLE FUNCTION READ PENDING
     038E  VMDCFHXF      00             CONSOLE FUNCTION HALT FLAG.
     038F  VMDCFLG2      00             CONSOLE FUNCTION STATUS FLAGS
     0390  VMDCFBUF      00000000       THIS IS THE ANCHOR TO A STACK
     0394  VMDCFCAL      00000000       QUEUE OF CPEBKS TO BE
     0398  VMDCFREQ      00             CONSOLE FUNCTION ENTRY FLAG.
     0399  VMDCFDSP      00             CONSOLE FUNCTION ENDOP FLAG.
     039C  VMDCFCNT      00000001       CONSOLE FUNCTION ENDOP COUNT.
     03A0  VMDCFLKQ      00000000       QUEUE OF CPEBKS THAT DEFERRED
     0509  VMDRSTAT      20             RUNNING BLOCKAGE STATUS. THIS
           VMDSIMWT      ..1.  ....      "X'20'" PERFORMING GUEST SIMU
     0510  VMDQURCP      00000000       URGENT CPEBK PUSH-THRU STACK
     0514  VMDQIORF      00000000       IORBK/TRQBK PUSH-THRU STACK
     0518  VMDQCPEF      00000000       CPEBK PUSH-THRU STACK
     051C  VMDDFRWK      00000001       DEFERED WORK COUNTER
     0521  VMDWRKCK      00             EXECUTION-BLOCK STACK STATUS

*********************************************************
* END OF SELECTED VMDBK FIELDS FOR USERID - IUCV3        *
*********************************************************
```

Figure 6. FINDUSER Output (2)

In Figure 6, output produced by the BLOCK subcommand was modified by the EXEC. Specifically, only bits that were set on were display for the fields VMDOSTAT, VMDRSTAT, and VMDCFCTL.

```
************************************************
* START OF SAVE AREA CHAIN FOR USERID - IUCV3    *
************************************************
DISPLAY 02387D80   80              OFFSET
      0000  00000000  00000000  00000000  0388A080 06 *................*
      0010  00800000  0229500A  FF1E4000  0228F940    *......&... ...9 *
      0020  FF1E4000  0228F940  02259E60  010000E2    *.. ...9 ...-...S*
      0030  00000000  02259E60  02BE1148  00000000    *.......-........*
      0040  02B9D000  02B9D000  022B6C50  03EB0D00    *..........%&....*
      0050  822B6F2A  02259E60  02B9D828  00000000    *..?....-..Q.....*
      0060  00000000  00000000  00000000  00000000    *................*
      0070  00000000  00000000  00000000  00000000    *................*
DISPLAY 03EB0B00   80              OFFSET
      0000  00000000  00000000  00000000  0388A080 06 *................*
      0010  80400000  02294D70  FF1E4000  02B9D828    *. ....(... ...Q.*
      0020  02B9D828  0228F940  02259E60  010000E2    *..Q...9 ...-...S*
      0030  00000000  02259E60  02BE1148  00000000    *.......-........*
      0040  02B9D000  02B9D000  022597C0  02387D80    *.............'.*
      0050  82259E86  0225D232  00000000  02B9D000    *......K.........*
      0060  00000000  00000000  00000000  00000000    *................*
      0070  00000000  00000000  00000000  00000000    *................*
************************************************
* END OF SAVE AREA CHAIN FOR USERID - IUCV3      *
************************************************
```

Figure 7. FINDUSER Output (3)

Appendix A. The Relationship of Some Major CP Control Blocks

The relationship of some major CP control blocks are shown on the foldout page that is collated at the back of this publication.

Appendix B. Format of a CP Hard Abend Dump

FILE: 8056APN2 SCRIPT A1 (BAH191) 12/14/87 11:42:17 PAGE 1

The following is a small portion of a VM/XA System Product dump that has been edited and annotated.

The portion of the dump presented here typifies the information found in a complete dump. Rather than serving as an example of how to actually locate an error, the modified dump serves to illustrate how you can access various items in a VM/XA SP dump. In fact, no problem caused the dump. It was taken because the operator chose to initiate a system restart as indicated by the abend code.

ABEND CODE SVC002

In this example, VM/XA SP is running on a uniprocessor, so that the information for one CPU and prefix is displayed.

CPU ADDR 0000

Don't forget to examine the registers for important clues. For example, GPR12 indicates the current module and GPR11 indicates the current VMDBK address. CR12 indicates where you should look in the CP trace table for the next entry.

In this case, GPR11 is pointing at the SYSTEM VMDBK.

```
GPRS 0- 7   00000000  00300858  7FFFFFFE  D1B6C400  00000064  11972157  8034CBA0  00300710
GPRS 8-15   00323000  803557D4  00300000  00300000  0034C2F0  007F1758  00000203  00000000
CRS  0- 7   90B0FE40  007D0001  00000000  00000000  00000000  00000000  C0000000  00000000
CRS  8-15   00000000  00000000  00000000  00000000  007DC141  00000000  5F000000  00000000
FPRS 0- 6   00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
TOD CLOCK   95973D16  D4B42C00      TOD CLOCK COMP  95973D0C  56F65C40
CPU TIMER   7FFFFFDC  EF862600
```

Here is the prefix page, located above the V=R region and within the initialization modules. Look for clues by examining the old PSWs, the static SAVEAREAs, and the hardware status area (interrupt information). For example, PFXIOINT at offset X'B8' contains an interrupt for SCHIB 3E0 with an RDEV at 329480.

PFX VALUE 00331000

```
00331000  00FC3000  8036F238  030E0000  00000000   FFFFFFFF  FFFFFFFF  030E0000  00000000  E6  *.....2.....*
00331020  00000000  00000000  000C0000  8036E848   00000000  00000000  030E0000  00000000      *.........Y.....*
00331040  00000000  00000000  00000000  00000000   00000000  00000000  000C0000  8034CDF0      *.............0*
00331060  000C0000  8036EEE0  000C0000  803630A0   00080000  8035E4F0  000C0000  80356720      *.............UO.....*
00331080  00000000  00001004  00000000  00040016   00000000  00000000  00000000  00000000      *................*
003310A0  00000000  00000000  00000000  00000000   00000000  00000000  000103E0  00329480      *................*
003310C0  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *................*
003310E0  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *................*
00331100  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *................*
00331120  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *................*
00331140  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *................*
00331160  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *................*
00331180  00000000  00300858  7FFFFFFE  D1B6C400   00000064  11972157  8034CBA0  00300710      *.....".J.D.....*
003311A0  00323000  803557D4  00300000  00300000   0034C2F0  007F1758  00000203  00000000      *.....M.....BO."....*
003311C0  90B0FE40  007D0001  00000000  00000000   00000000  00000000  C0000000  00000000      *... ..........*
003311E0  00000000  00000000  00000000  00000000   007DC141  00000000  5F000000  00000000      *.............'A.....¬.....*
00331200  00000001  1972157C  007EC240  00000000   00973D0D  007D0BC8  007D0BC8  007F1DE8      *.....@.=B .....'.H.'.H.".Y*
00331220  00350E40  11970552  8036DE1C  00300710   8036E868  8036E5FE  007F1DE8  007D0000      *.....Y...V.".Y.'..*
00331240  0036D9E0  0036E9E0  8036EA02  00370B40   95973D07  91BCF840  F0F0F0F0  F0F0F0C5      *..R...Z..... .....'8 0000000E*
00331260  00000000  00000000  00000000  00000000   00000000  007D0000  00000000  00000000      *.............'.....*
00331280  00000000  00000000  00000000  6AE4CC00   7FFFFFFE  D1B6C400  00000064  11972157      *.....U.".J.D.....".*
003312A0  8034CBA0  00300710  00323000  803557D4   00300000  00300000  0034C2F0  007F1758      *.....M.....BO."....*
003312C0  8034C82A  0036E228  0000000E  00E3D6D9   00000000  0000000E  00000000  00000000      *..H...S.....TOR.....*
003312E0  00000000  00000000  00000000  00000000   00000000  00000000  00000000  00000000      *.....'.....*
00331300  00000025  007EF130  007D0000  80350F16   00350E40  007ECA78  00000000  00300710      *.....=1.'.....  =.....*
00331320  00329480  00356C90  007F1DE8  007D0000   00355C90  007F1758  8035621E  003557A0      *.....%..".Y.'....*.."....'*
00331340  00000000  00300000  003F0000  00364070   803647DC  0030A6F0  007D13C4  007D1F88      *.....  .....0.'.D.'..*
00331360  00365070  00000000  00000000  00000000   00000000  00000000  00000025  007FF778      *..&.....".7.*
```

```
00331380  007D0000  80350F00  00350E40  007ECA78  00000000  00300710  00329480  00000000   *.'..... .=.....*
003313A0  007F1DE8  007D0000  00350E20  00351E20  80351554  0034D190  80000000  007FF768   *.".Y.'.....J.....".7.*
003313C0  00000000  00000000  00000000  00000000  007F1EC8  007F1EC8  0034DD24  007EC000   *.............".H.".H.....=..*
003313E0  0034C2F0  007F1758  00000203  00000000  00000000  0034B0F0  8034B23A  0033F020   *..B0."..............0.....0.*
00331400  0036D9E0  0036E9E0  8036DA54  0037D368  00000000  003621F0  00000000  00000000   *..R...Z.....L.....0.....*
00331420  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *........................*
00331480  95973D0B  6AE4CC00  00000000  00000000  00000000  00000000  00000000  00000000   *.....U.....".....".....*
003314A0  7FFFFFDD  33A10E00  00000000  06133800  7FFFFFFF  00000000  00000000  00000000   *".....".....".....".....*
003314C0  90B0FE40  007D0001  00000000  00000000  00000000  00000000  C0000000  00000000   *... .'.....'A.....¬.....*
003314E0  00000000  00000000  00000000  00000000  007DC141  00000000  5F000000  00000000   *.....'A.....¬.....*
00331500  C6C5C9C2  D440F5F6  F6F460F1  F6F94040  00344EE0  003478D0  00347B20  00347B58   *FEIBM 5664-169  ..+.....#...#.*
00331520  0034C310  00389470  0034D190  0034D5C0  003531A0  003531D0  003531F0  003531B8   *..C.....J...N.....0....*
00331540  00353050  003561E0  00364090  003658C0  00365808  00365E50  0036B4B8  0036DAA0   *...&../... .....;&.....*
00331560  0036DA38  0036DC78  0036BFA0  0036EDA0  0036EDE0  00323000  00303000  00300000   *........................*
00331580  0036B290  0034CC80  00000000  00000000  00000000  00000000  00380000  00000400   *........................*
003315A0  00000460  00000000  00000000  00000000  00000000  00000000  00331000  00331000   *...-....................*
003315C0  00000000  00000000  00000000  00000000  007FFAD0  007FFEC8  007EC130  00000000   *.............".....".H.=A.....*
003315E0  00000000  00000000  007EC628  00000000  00000000  00000000  00000000  00000000   *.........=F.....*
00331600  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *........................*
00331620  00000000  00000000  40404040  40404040  FFFFFFFF  FFFFFFFF  00000001  00000002   *........ ...............*
00331640  00000003  00000004  00000005  00000006  00000007  00000008  00000009  0000000A   *........................*
00331660  0000000F  00000010  00000014  00000018  0000003C  000000F0  000000FF  00000100   *.....................0.....*
00331680  00000200  000007FF  00000800  00000FFF  00001000  0000FFFF  00FFFFFF  7FFFF000   *.....................".0.*
003316A0  7FFFF800  7FFFFFC0  80000000  FF000000  00000000  00000000  00000000  00000000   *".8."..................*
003316C0  90CF03F0  58F0056C  07FF0000  00000000  90CF03F0  B22200E0  58F00570  07FF0000   *...0.0.%.....0.....0.....*
003316E0  07FF0000  00000000  00000000  00000000  07FF0000  00000000  00000000  00000000   *........................*
00331700  00000000  00000000  00000000  FEFC00FF  00000000  00000000  00000000  00000000   *........................*
00331720  FF021427  30810000  00000000  00000000  00000064  00000000  00000000  00000000   *........................*
00331740  00300000  00800000  00000000  00000000  88060000  00000000  E2E5C302  00000000   *.....................SVC.....*
00331760  7FFFFFFF  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *".....".....".....".....*
00331780  7FFFFFDD  33A10E00  7FFFFFFF  00000000  7FFFFFFE  BC9FE000  7FFFFFFE  D1B6C400   *".....".....".....".J.D.*
003317A0  7FFFFFFF  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *".....".....".....".....*
003317C0  40000000  00000000  00000000  00000000  00000000  00000000  00001400  00000000   *........................*
003317E0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *.....'.....'.....'.....*
00331800  007D2000  00000000  0036D9E0  0036E9E0  00000001  15420000  007D0000  00000064   *.'.....R...Z.....'.....*
00331820  00000000  007F1DE8  00350E40  00000005  007EDDC8  003510A8  00000000  007F1048   *.....".Y... .....=.H.....".*
00331840  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *........................*
00331A00  07FE0000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *........................*
00331A20  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *........................*
00331FE0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *........................*
```

The gap up to X'00200000' is the region for the preferred virtual machine. At X'00200000' space has been reserved for the VMDBK of the V=R guest currently not logged on. Space is also available for guest recovery.

```
00200000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  04  *........................*
002004E0  00000000  00000000  00000000  00000000  00000000  00000000  00200700  00000001      *........................*

00200500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *........................*
00200700  00000000  000FF700  00000000  00000000  00000000  00000000  00000000  00000000      *.....7..................*
00200720  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *........................*
```

The area below is the SYSTEM VMDBK, the beginning of the system common area (SYSCM). From it, all other VMDBKs may be accessed via the VMDCYCLE field at offset X'600'. Currently, it is pointing to X'00770000', a machine called OPERACCT that has been autologged. From OPERACCT, we continue to OPEREREP (at X'00771000), then to OPERATOR (at X'007D0000), and finally loop back to OPERACCT (not SYSTEM).

```
00300000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  06  *........................*
00300080  E2E8E2E3  C5D44040  E2E8E2E3  C5D44040  00000000  00000000  E2E8E2E3  C5D44040      *SYSTEM  SYSTEM  .....SYSTEM  *
003000A0  00000000  00000000  00000000  00000000  00000000  95973CEB  00000000  00000000      *........................*
003000C0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *........................*
00300280  00000000  00000000  80000000  00000000  00200000  00000000  00000000  00000000      *........................*
003002A0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *........................*
```

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```
003002E0  00000000  007EF6E8  00000000  00000000  00000000  00000000  00000000  00000000
00300300  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
00300380  00000000  00000000  04000080  00000000  00000000  00000000  00000000  00000000
003003A0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
003003C0  00000000  00000000  00000000  00000000  00000000  00000000  007F1758  00000000
003003E0  07FE07FE  07FE07FE  07FE07FE  07FE07FE  00000000  00000000  00000000  00000000
00300400  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
00300480  0030AB80  00306860  00000000  00000000  00000000  00000000  0030107F  00000000
003004A0  00000000  00000000  00000000  000000FE  0000006A  000000D6  00000000  00000000
003004C0  00000000  0000005C  00000000  00000000  00000000  00000000  00000000  00000000
003004E0  00000800  00000000  00000000  00000000  00000000  00000000  003008E8  00000001
00300500  007D0000  007D0000  00403700  2C000002  00000000  00000000  00000000  00000000
00300520  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
00300560  95973D0B  6AB52A80  00000000  00000000  00000000  00000000  00000000  00000000
00300580  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
003005C0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  58000000
003005E0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
00300600  00770000  00300000  00300000  00300000  00000000  00000000  00000000  00000000
00300620  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
00300700  0000002D  00300878  00000034  C9E2D96E  00000000  00770000  00000000  061A8000
00300720  00000000  02710000  0000001C  9C380000  00000000  00000000  00000000  00000000
00300740  00000000  00000000  00000001  00000000  00000002  00000000  00000000  00000000
00300760  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
003007A0  00000000  00000000  00000000  00000000  00000001  00000000  00000000  00000000
003007C0  00000080  00000000  00000001  E8480000  0000000F  42400000  00000000  00000000
003007E0  00000000  00000000  00000080  00000000  00000001  E8480000  0000000F  42400000
00300800  00000000  000000C0  00000000  00000000  00000F00  00000400  00000100  0000009A
00300820  00000000  00000000  00000000  00000000  00000000  00000001  00000000  00000000
00300840  40000000  00000000  00000000  00000000  00000000  00000000  00000000  0034C410
00300860  00000000  00000000  00000000  00000000  00000000  00000000  4C4C4C4C  00300700
00300880  0000000A  003008E0  000003E8  D9C5C36E  00000000  00000000  E2E8E2E3  C5D44040
003008A0  003008B8  00000028  00000000  00000000  00000000  00000000  00000000  00000000
003008C0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
003008E0  4C4C4C4C  00300880  00000000  00000718  00000000  00000000  000000C0  00000000
00300900  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
```

.... Much of SYSCM has been deleted....

The RDEVs begin after SYSCM.

.... Many RDEV entries have been deleted....

Here is the RDEV for which the last interrupt was taken. From the information here we can see that it is a terminal and that the real device is attached to a VMDBK at 7D0000 (the OPERATOR).

.... Look for the associated IORBK (from RDEVAIOR) at X'007F1DE8'.
.... Look for the associated VDEV (from RDEVVDEV) at X'007ED5B8'.

```
00329480  40800002  007D0000  007ED5B8  00800000  80000090  00000000  A0005008  00000000
003294A0  007ECA78  0A001000  00000000  00000000  00000000  00000000  00000000  00000000
003294C0  00000000  00000000  00000000  00000000  00000000  00000000  007F1DE8  000103E0
003294E0  03E00104  0032E880  32741D80  00000000  00350C20  007EC988  00000000  00000000
```

.... Many RDEV entries deleted ....

Next is the SYSTEM Residence RDEV, currently mounted on 440. The label of the pack is SYSRES.

```
0032A100  04108000  00300000  00000000  00C00000  80520080  00000000  00000000  00324490
0032A120  E2E8E2E1  C5E10008  00000000  0000022B  00780000  00000000  00000000  00000000
0032A140  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00010440
0032A160  04400136  0032EEC0  383002C0  33500000  003480C0  007EC178  00000000  00000000
```

.... Many RDEV entries have been deleted....

Most of the resident modules have been deleted from this dump. However, the following is a fragment of HCPIOS showing what PROLG and EPILG expansions look like in practice. From this prolog we can see that HCPIOS was assembled on 4/30/84 at 9:55 and that it is X'3C1' doublewords long.

```
00355C80  00000000  00000000  00000000  00000000  C8C3D7C9  D6E203C1  F2F1F0F0  F0F00000   *.............HCPIOS.A210000..*
00355CA0  F0F461F3  F061F8F4  7AF0F94B  F5F5D9C5  18CF4BC0  F0084700  00205890  06901E9C   *04/30/84:09.55RE....0.........*
00355CC0  9204A048  47F0978C  18CF4BC0  F0084700  00385890  06901E9C  9202A048  47F0978C   *.....0......0.............0..*

.... Much of HCPIOS has been deleted....

00357A40  0036F1A8  07000700  0700FFFF  D8C30020  D8C80038  D8D40050  D8E20068  C3C10210   *..1.........QC..QH..QM.&QS..CA..*
00357A60  C8C10380  D9D80550  C9C706C0  D9C306E8  D9C50730  D9E20790  E6C40968  C5E60A58   *HA..RQ.&IG..RC.YRE..RS..WD..EW..*

00357A80  C9D50A90  E2C91110  E2E31150  E2C11198  E2C311C0  C4D811E8  00000000  00000000   *IN..SI..ST.&SA..SC..DQ.Y.......*

.... Many modules have been deleted....
```

This is the VMDBK for the system called OPERACCT that has been autologged. Note that VMDCYCLE at X'600' points to OPEREREP.

```
00770000  00000020  80000020  80000020  80000020  80000020  80000020  80000020  80000020  06  *.................................*
00770020  80000020  80000020  80000020  80000020  80000020  80000020  80000020  80000020      *.................................*
00770080  D6D7C5D9  C1C3C3E3  D6D7C5D9  C1C3C3E3  D6D7C5D9  C1E3D6D9  C1C3E3F2  40404040      *OPERACCTOPERACCTOPERATORACT2    *
007700A0  F1C6F1F1  60F7F0F7  00000000  00000000  95973CFF  95973CFF  7FFFFFFF  00000000      *1F11-707.............."........*
007700C0  7FFFFFFF  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *".................................*
007700E0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770100  00000010  00000000  00000007  00000000  00000000  00000000  00020000  00000000      *.................................*
00770120  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770140  404C0000  00000000  80000000  00000000  00000000  00000000  00000000  00000000      * <...............................*
00770160  01F00000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.0...............................*
00770180  000000E0  00000000  FFFFFFFF  00000000  00000000  00000000  00000000  00000000      *.................................*
007701A0  00000000  00000000  00000000  00000000  00000000  00000000  C2000000  00000200      *.....................B...........*
007701C0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770260  00000000  00000000  00000000  00000000  95973CFF  F5633200  00000000  00000000      *.....................5...........*
00770280  FF021427  30810000  00080000  00000000  00000000  00000000  00000000  00000000      *.................................*
007702A0  00000000  00000000  00000000  00000000  00000000  00000000  007707D8  00770A10      *.............................Q....*
007702C0  00000000  00000000  00000000  00000000  00000000  00000000  00770AA0  00000000      *.................................*
007702E0  00000000  00000000  00000000  00770AF0  00000000  00000000  00000000  00000000      *..............0..................*
00770300  00000000  00000000  00000000  08000000  00770E28  00770CC8  00770710  007F1D28      *.....................H.....".....*
00770320  10000003  000E0004  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770340  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00770C18      *.................................*
00770360  40C0003C  00000000  7B4A7C7F  00000000  00006C00  00000000  00000000  00000000      * .......#.@".....%..............*
00770380  D3D6C7C9  D5404040  06004690  FF000000  00000000  00000000  FFFF0000  00000000      *LOGIN    .......................*
007703A0  00000000  00000000  00770000  00000000  00000000  00000000  00000000  00000000      *.................................*
007703C0  FA000000  007ED390  00D40000  00000000  00000000  00000000  007F1638  00000000      *.....=L..M..............."......*
007703E0  07FE07FE  07FE07FE  07FE07FE  07FE07FE  00000000  00000000  00000000  00000000      *.................................*
00770400  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770480  00770480  00770480  00000000  00000000  00000000  00000000  00770001  00000000      *.................................*
007704A0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770500  00771000  00771000  00400B00  00000002  00000000  00000000  00000000  00000000      *.................................*
00770520  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770540  00000000  00000000  00000000  03507800  7FFFFFFE  FD35F800  7FFFFFFF  00000000      *.............&.."......8."......*
00770560  95973CFF  F5F5E460  00000000  00000000  00000064  00000000  00000000  00000000      *....55U-.........................*
00770580  95973CFF  B8EEC260  00000001  E8480000  95973CFF  F630B820  00000064  00000000      *......B-....Y.......6............*
007705A0  7FFFFFFF  00000000  00000000  00000000  95973D01  A1350020  00000000  00000000      *"................................*
007705C0  00770BC8  00000000  00000000  00000000  00000000  00320000  15000000  00000000      *...H.............................*
007705E0  00000000  00000000  00000000  00000000  00000001  00000000  00000000  00000000      *.................................*
00770600  00771000  00770000  00770000  00770000  00000000  00000000  00000000  00000000      *.'...............................*
00770620  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770700  00000016  007707C0  0000019C  C2E5D46E  00000000  00000000  00000000  00000000      *.............BVM>...............*
00770720  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000      *.................................*
00770740  00770740  00770740  00770748  00770748  00770750  00770750  00770758  00770758      *... ... ..........&...&........*
00770760  00770760  00770760  00770768  00770768  00770770  00770770  00770778  00770778      *...-...-........................*
```

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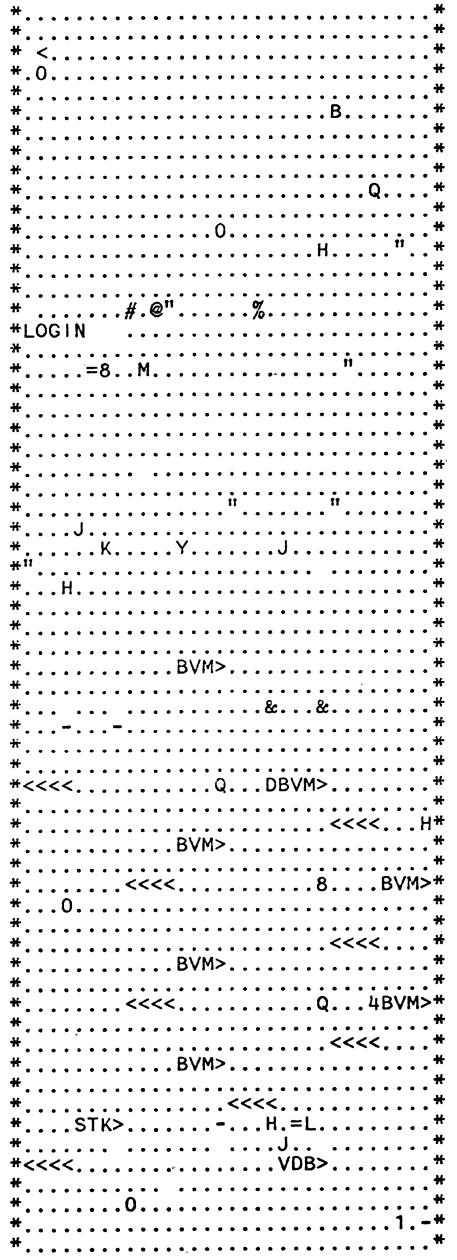
```
00770780 00770780 00770780 00770788 00770788 00770790 00770790 00770798 00770798  *.............................*
007707A0 007707A0 007707A0 007707A8 007707A8 007707B0 007707B0 007707B8 007707B8  *.............................*
007707C0 4C4C4C4C 00770700 00000020 007708D8 000001C4 C2E5D46E 00000000 00000000  *<<<<.........Q...DBVM>.....*
007707E0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
007708C0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 007707C8  *.....................<<<<...H*
007708E0 0000000F 00770968 000001DC C2E5D46E 00000000 00000000 00000000 00000000  *...........BVM>.............*
00770900 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770960 00000000 00000000 4C4C4C4C 007708E0 0000000F 007709F8 000001DC C2E5D46E  *........<<<<.........8....BVM>*
00770980 007708F0 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *...0.........................*
007709A0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
007709E0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 00770970  *.....................<<<<....*
00770A00 0000000F 00770A88 000001DC C2E5D46E 00770980 00000000 00000000 00000000  *...........BVM>.............*
00770A20 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770A80 00000000 00000000 4C4C4C4C 00770A00 00000007 00770AD8 000001F4 C2E5D46E  *........<<<<.........Q...4BVM>*
00770AA0 00770000 00370928 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770AC0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 00770A90  *.....................<<<<....*
00770AE0 00000018 00770BB0 00000234 C2E5D46E 00000000 00000000 00000000 00000000  *...........BVM>.............*
00770B00 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770BA0 00000000 00000000 00000000 00000000 4C4C4C4C 00770AE0 00000007 00770C00  *.................<<<<........*
00770BC0 000007B0 E2E3D26E 00770000 0036DB60 007D0BC8 00370CC8 00000000 00000000  *....STK>.......-.'.H...H.....*
00770BE0 95973CFF B8EF3620 95973D01 A1373620 95973CFF F6305800 95973CFF B8ED7E60  *.....................6.........=-*
00770C00 4C4C4C4C 00770BB8 00000013 00770CB0 00000070 E5C4C26E 00770C18 00770C18  *<<<<.................VDB>.....*
00770C20 00000000 00000000 00008040 00770000 00002000 00000000 00000000 00810009  *.............................*
00770C40 80000080 0000FF80 F0000000 00000000 00000000 00000000 00000000 00000000  *........0....................*
00770C60 00000000 00000000 00000000 00770F88 00000000 00000000 95973CFF DD056240  *.............................*
00770C80 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770CA0 00000000 00000000 00000000 00000000 4C4C4C4C 00770C08 00000008 00770D08  *.................<<<<........*
00770CC0 000005EC E2C3D56E 00770D20 00000000 00000000 00000000 00000000 00000000  *....SCN>....................*
00770CE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770D00 00000000 00000000 4C4C4C4C 00770CB8 00000008 00770D60 000005EC E2C3D56E  *........<<<<.........-....SCN>*
00770D20 00770D78 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770D40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770D60 4C4C4C4C 00770D10 00000008 00770DB8 000005EC E2C3D56E 00770DD0 00000000  *<<<<.................SCN>.....*
00770D80 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770DA0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 00770D68  *.....................<<<<....*
00770DC0 00000008 00770E10 000005EC E2C3D56E 00000000 00000000 00000000 00000000  *...........SCN>.............*
00770DE0 00000000 00000000 00000000 00000000 00000000 00770C18 00000000 00000000  *.............................*
00770E00 007F1968 007F1C68 007F1D28 00000000 4C4C4C4C 00770DC0 00000008 00770E68  *.".....".....".....<<<<.....*
00770E20 000005EC E2C3D56E 00770E80 00000000 00000000 00000000 00000000 00000000  *....SCN>....................*
00770E40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770E60 00000000 00000000 4C4C4C4C 00770E18 00000008 00770EC0 000005EC E2C3D56E  *........<<<<.........SCN>....*
00770E80 00770ED8 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *...Q.........................*
00770EA0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770EC0 4C4C4C4C 00770E70 00000008 00770F18 000005EC E2C3D56E 00770F30 00000000  *<<<<.................SCN>.....*
00770EE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770F00 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 00770EC8  *.....................<<<<...H*
00770F20 00000008 00770F70 000005EC E2C3D56E 00770C18 007F1968 007F1C68 007F1D28  *...........SCN>.....".....".....*
00770F40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770F60 00000000 00000000 00000000 00000000 4C4C4C4C 00770F20 0000000E 00770FF8  *.....................<<<<.....8*
00770F80 00000534 E5C4E26E 00000000 00002000 00000000 00000000 00000000 00000000  *....VDS>....................*
00770FA0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
00770FC0 00000000 00000000 E9010600 00000000 D6D7C5D9 C1C3C3E3 F1C6F1F1 60F7F0F7  *........Z.......OPERACCT1F11-707*
00770FE0 40404040 40404040 40404040 40404040 40404040 40404040 4C4C4C4C 00770F78  *                                   <<<<....*
```

This is the VMDBK for the system called OPEREREP that was logged on with the AUTOLOG command. Note that VMDCYCLE at X'600' points to OPERATOR.

```
00771000 00000020 80000020 80000020 80000020 80000020 80000020 80000020 80000020 06  *.............................*
00771020 80000020 80000020 80000020 80000020 80000020 80000020 80000020 80000020     *.............................*
00771080 D6D7C5D9 C5D9C5D7 D6D7C5D9 C5D9C5D7 D6D7C5D9 C1E3D6D9 C1C3E3F2 40404040  *OPEREREPOPEREREPOPERATORACT2    *
007710A0 F1C6F1F1 60F7F0F7 00000000 00000000 95973CFF 95973CFF 7FFFFFFF 00000000  *1F11-707.....................".....*
007710C0 7FFFFFFF 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *".............................*
007710E0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000  *.............................*
```



```
00771100 00000010 00000000 00000007 00000000  00000000 00000000 00020000 00000000
00771120 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771140 404C0000 00000000 80000000 00000000  00000000 00000000 00000000 00000000
00771160 01F00000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771180 000000E0 00000000 FFFFFFFF 00000000  00000000 00000000 00000000 00000000
007711A0 00000000 00000000 00000000 00000000  00000000 00000000 C2000000 00000200
007711C0 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771260 00000000 00000000 00000000 00000000  95973CFF D0E05620 00000000 00000000
00771280 FF021427 30810000 00080000 00000000  00000000 00000000 00000000 00000000
007712A0 00000000 00000000 00000000 00000000  00000000 00000000 007717D8 00771A10
007712C0 00000000 00000000 00000000 00000000  00000000 00000000 00771AA0 00000000
007712E0 00000000 00000000 00000000 00771AF0  00000000 00000000 00000000 00000000
00771300 00000000 00000000 00000000 08000000  00771E28 00771CC8 00771710 C07F1BA8
00771320 10000003 000E0004 00000000 00000000  00000000 00000000 00000000 00000000
00771340 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00771C18
00771360 40C0003C 00000000 7B4A7C7F 00000000  00006C00 00000000 00000000 00000000
00771380 D3D6C7C9 D5404040 06004690 FF000000  00000000 00000000 FFFF0000 00000000
007713A0 00000000 00000000 00771000 00000000  00000000 00000000 00000000 00000000
007713C0 FA000000 007EF8E0 00D40000 00000000  00000000 00000000 007F0C18 00000000
007713E0 07FE07FE 07FE07FE 07FE07FE 07FE07FE  00000000 00000000 00000000 00000000
00771400 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771480 00771480 00771480 00000000 00000000  00000000 00000000 00771001 00000000
007714A0 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771500 00770000 00770000 00400B00 00000002  00000000 00000000 00000000 00000000
00771520 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771540 00000000 00000000 00000000 043A9200  7FFFFFFE FE201200 7FFFFFFF 00000000
00771560 95973CFF D1701620 00000000 00000000  00000064 00000000 00000000 00000000
00771580 95973CFF ACA6D220 00000001 E8480000  95973CFF D1FA9620 00000064 00000000
007715A0 7FFFFFFF 00000000 00000000 00000000  95973D01 94ED2440 00000000 00000000
007715C0 00771BC8 00000000 00000000 00000000  00000000 00000000 00320000 15000000
007715E0 00000000 00000000 00000000 00000000  00000001 00000000 00000000 00000000
00771600 007D0000 00771000 00771000 00771000  00000000 00000000 00000000 00000000
00771620 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771700 00000016 007717C0 0000019C C2E5D46E  00000000 00000000 00000000 00000000
00771720 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771740 00771740 00771740 00771748 00771748  00771750 00771750 00771758 00771758
00771760 00771760 00771760 00771768 00771768  00771770 00771770 00771778 00771778
00771780 00771780 00771780 00771788 00771788  00771790 00771790 00771798 00771798
007717A0 007717A0 007717A0 007717A8 007717A8  007717B0 007717B0 007717B8 007717B8
007717C0 4C4C4C4C 00771700 00000020 007718D8  00000000 C2E5D46E 00000000 00000000
007717E0 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
007718C0 00000000 00000000 00000000 00000000  00000000 00000000 4C4C4C4C 007717C8
007718E0 0000000F 00771968 000001DC C2E5D46E  00000000 00000000 00000000 00000000
00771900 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771960 00000000 00000000 4C4C4C4C 007718E0  0000000F 007719F8 000001DC C2E5D46E
00771980 007718F0 00000000 00000000 00000000  00000000 00000000 00000000 00000000
007719A0 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
007719E0 00000000 00000000 00000000 00000000  00000000 00000000 4C4C4C4C 00771970
00771A00 0000000F 00771A88 000001DC C2E5D46E  00771980 00000000 00000000 00000000
00771A20 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771A80 00000000 00000000 4C4C4C4C 00771A00  00000007 00771AD8 000001F4 C2E5D46E
00771AA0 00771000 00370928 00000000 00000000  00000000 00000000 00000000 00000000
00771AC0 00000000 00000000 00000000 00000000  00000000 00000000 4C4C4C4C 00771A90
00771AE0 00000018 00771BB0 00000234 C2E5D46E  00000000 00000000 00000000 00000000
00771B00 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
00771BA0 00000000 00000000 00000000 00000000  4C4C4C4C 00771AE0 00000007 00771C00
00771BC0 000007B0 E2E3D26E 00771000 0036DB60  00770BC8 007ED390 00000000 00000000
00771BE0 95973CFF ACA73640 95973D01 94EF3640  95973CFF D1FA5840 95973CFF ACA5A200
00771C00 4C4C4C4C 00771BB8 00000013 00771CB0  00000070 E5C4C26E 00771C18 00771C18
00771C20 00000000 00000000 00008040 00771000  00002000 00000000 00000000 00810009
00771C40 80000080 0000FF80 F0000000 00000000  00000000 00000000 00000000 00000000
00771C60 00000000 00000000 00000000 00771F88  00000000 00000000 95973CFF C0F1C060
00771C80 00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000
```



FILE: 8056APN2 SCRIPT A1 (BAH191) 12/14/87 11:42:17 PAGE 7

```
00771CA0 00000000 00000000 00000000 00000000 4C4C4C4C 00771C08 00000008 00771D08
00771CC0 000005EC E2C3D56E 00771D20 00000000 00000000 00000000 00000000 00000000
00771CE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771D00 00000000 00000000 4C4C4C4C 00771CB8 00000008 00771D60 000005EC E2C3D56E
00771D20 00771D78 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771D40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771D60 4C4C4C4C 00771D10 00000008 00771DB8 000005EC E2C3D56E 00771DD0 00000000
00771D80 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771DA0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 00771D68
00771DC0 00000008 00771E10 000005EC E2C3D56E 00000000 00000000 00000000 00000000
00771DE0 00000000 00000000 00000000 00000000 00000000 00771C18 00000000 00000000
00771E00 007F1A28 007F1AE8 007F1BA8 00000000 4C4C4C4C 00771DC0 00000008 00771E68
00771E20 000005EC E2C3D56E 00771E80 00000000 00000000 00000000 00000000 00000000
00771E40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771E60 00000000 00000000 4C4C4C4C 00771E18 00000008 00771EC0 000005EC E2C3D56E
00771E80 00771ED8 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771EA0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771EC0 4C4C4C4C 00771E70 00000008 00771F18 000005EC E2C3D56E 00771F30 00000000
00771EE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771F00 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 00771EC8
00771F20 00000008 00771F70 000005EC E2C3D56E 00771C18 007F1A28 007F1AE8 007F1BA8
00771F40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771F60 00000000 00000000 00000000 00000000 4C4C4C4C 00771F20 0000000E 00771FF8
00771F80 00000534 E5C4E26E 00000000 00002000 00000000 00000000 00000000 00000000
00771FA0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
00771FC0 00000000 00000000 E9010600 00000000 D6D7C5D9 C5D9C5D7 F1C6F1F1 60F7F0F7
00771FE0 40404040 40404040 40404040 40404040 40404040 40404040 4C4C4C4C 00771F78
```

```
*.................<<<<.............*
*....SCN>.........................*
*.................................*
*........<<<<.............-....SCN>*
*.................................*
*.................................*
*<<<<................SCN>........*
*.................................*
*.........................<<<<....*
*.............SCN>................*
*.................................*
*."...".Y."......<<<<.............*
*....SCN>.........................*
*.................................*
*........<<<<................SCN>*
*...Q.............................*
*.................................*
*<<<<................SCN>........*
*.................................*
*.........................<<<<...H*
*.............SCN>....."...".Y."..*
*.................................*
*.................<<<<...........8*
*....VDS>.........................*
*.................................*
*........Z.......OPEREREP1F11-707*
*                          <<<<....*
```

.... Many modules have been deleted....

What follows is the VMDBK for the operator. Note that VMDCYCLE at X'600'points back to OPERACCT, completing the loop.
Notice further that the operator's console is device 3E0 (RDEV at X'00329480') at VMDRTERM.

```
007D0000 00000020 00000020 80000020 80000020 80000020 80000020 80000020 80000020 06
007D0020 80000020 80000020 80000020 80000020 80000020 80000020 80000020 80000020
007D0080 D6D7C5D9 C1E3D6D9 D6D7C5D9 C1E3D6D9 D6D7C5D9 C1E3D6D9 C1C3E3F1 40404040
007D00A0 F1C6F1F1 60F7F0F7 00000000 00000000 95973CF9 95973CF9 7FFFFFFF 00000000
007D00C0 7FFFFFFF 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D00E0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0100 00000010 00000000 0000001F 00000000 00000000 00000000 00020000 00000000
007D0120 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0140 404C0000 00000000 80000000 00000000 00000000 00000000 00000000 00000000
007D0160 01F00000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0180 000000E0 00000000 FFFFFFFF 00000000 00000000 00000000 00000000 00000000
007D01A0 00000000 00000000 00000000 00000000 00000000 00000000 C2000000 00000200
007D01C0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0260 00000000 00000000 00000000 00000000 95973CFF B8BED600 00000000 00000000
007D0280 FF021427 30810000 00200000 00000000 00000000 00000000 00000000 00000000
007D02A0 00000000 00000000 00000000 00000000 00000000 00000000 007D07D8 007D0A10
007D02C0 00000000 00000000 00000000 00000000 00000000 00000000 007D0AA0 00000000
007D02E0 00000000 00000000 00000000 007D0AF0 00000000 00000000 00000000 00000000
007D0300 00000000 00000000 00000000 08000000 007D0E28 007D0CC8 007D0710 007EDC78
007D0320 10000010 03970011 00000000 00000000 00000000 00000000 00000000 00000000
007D0340 00000000 00000000 00000000 0000004E 00000000 00000000 00329480 007ED5B8
007D0360 70C0003C 00800000 7B4A7C7F 00000000 00006C00 00000000 00000000 00000000
007D0380 E2C5E340 40404040 0600C080 FFFF0000 00000000 00000000 FFFF0000 00000000
007D03A0 00000000 00000000 007D0000 00000000 00000000 00000000 00000000 10000000
007D03C0 FA000000 00000000 00D40000 00000000 00000000 00000000 007F1758 00000000
007D03E0 07FE07FE 07FE07FE 07FE07FE 07FE07FE 00000000 00000000 00000000 00000000
007D0400 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0480 007D0480 007D0480 00000000 00000000 00000000 00000000 007D0001 00000000
007D04A0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D04E0 00010000 00000000 00000000 00000000 00000000 00000000 007D0FD0 00000001
```

```
*.................................*
*.................................*
*OPERATOROPERATOROPERATORACT1    *
*1F11-707.........9...9".........*
*".................................*
*.................................*
*.................................*
*.................................*
* <................................*
*.0...............................*
*.....................B...........*
*.................................*
*.....................0...........*
*.........................'.Q.'....*
*.....................'.0.'.......*
*.................'...'.H.'...=...*
*.................................*
*.............+.............=N.....*
*........#.@".....%...............*
*SET      .'......................*
*.........M.....................".*
*.................................*
*.'...'.........................'.*
*.....................'...........*
*.................................*
```



```
007D0500 00300000 00300000 00403700 2C000002 00000000 00000000 00000000 00000000
007D0520 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0540 00000000 00000000 00000000 06133800 7FFFFFFE D660BA00 7FFFFFFF 00000000
007D0560 95973D0B 6AE4CC00 00000000 00000000 00000064 00000000 00000000 00000000
007D0580 95973D0B 6AB24640 00000001 E8480000 95973D07 A2454840 00000064 00000000
007D05A0 7FFFFFFF 00000000 00000000 00000000 95973D0D 52F72460 00000000 00000000
007D05C0 007D0BC8 00000000 00000000 00000000 00000000 00000000 00320000 15000000
007D05E0 00000000 00000000 00000000 00000000 00000001 00000000 00000000 00000000
007D0600 00770000 007D0000 007D0000 007D0000 00000000 00000000 00000000 00000000
007D0620 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
```

The fields below are in the same page as the operator's VMDBK, but are part of FREE storage. However, only long term tables and control blocks (like the radix trees and the VDEVs) will be allocated from this region for the operator. This makes it somewhat easier to find things like the configuration.

```
007D0700 00000016 007D07C0 0000019C C2E5D46E 00000000 00000000 00000000 00000000
007D0720 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0740 007D0740 007D0740 007D0748 007D0748 007D0750 007D0750 007D0758 007D0758
007D0760 007D0760 007D0760 007D0768 007D0768 007D0770 007D0770 007D0778 007D0778
007D0780 007D0780 007D0780 007D0788 007D0788 007D0790 007D0790 007D0798 007D0798
007D07A0 007D07A0 007D07A0 007D07A8 007D07A8 007D07B0 007D07B0 007D07B8 007D07B8
007D07C0 4C4C4C4C 007D0700 00000020 007D08D8 000001C4 C2E5D46E 00000000 00000000
007D07E0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D08C0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 007D07C8
007D08E0 0000000F 007D0968 000001DC C2E5D46E 00000000 00000000 00000000 00000000
007D0900 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0960 00000000 00000000 4C4C4C4C 007D08E0 0000000F 007D09F8 000001DC C2E5D46E
007D0980 007D08F0 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D09A0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D09E0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 007D0970
007D0A00 0000000F 007D0A88 000001DC C2E5D46E 007D0980 00000000 00000000 00000000
007D0A20 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0A80 00000000 00000000 4C4C4C4C 007D0A00 00000007 007D0AD8 000001F4 C2E5D46E
007D0AA0 007D0000 00370928 00000000 00000000 00000000 00000000 00000000 00000000
007D0AC0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 007D0A90
007D0AE0 00000018 007D0BB0 00000234 C2E5D46E 00000000 00000000 00000000 00000000
007D0B00 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0BA0 00000000 00000000 00000000 00000000 4C4C4C4C 007D0AE0 00000007 007D0C00
007D0BC0 000007B0 E2E3D26E 007D0000 0036DB50 007EF940 007EC328 80000000 00000000
007D0BE0 95973D0B 6AB29440 95973D0D 52FA9440 00000000 00000000 95973D0B 6AAFB840
007D0C00 4C4C4C4C 007D0BB8 00000013 007D0CB0 00000070 E5C4C26E 007D0C18 007D0C18
007D0C20 00000000 00000000 00000410 007D0000 00001800 00000000 00000000 00830191
007D0C40 C00000C0 0000FFC0 1024FFFF FFFFFFFF 00000000 00000000 00000000 00000000
007D0C60 00000000 00000000 00000000 00000000 00326E00 00000000 95973CF8 8DAFB200
007D0C80 00000000 0000022A 00000000 00000000 00000000 00000000 00000000 00000000
007D0CA0 00000000 00000000 00000000 00000000 4C4C4C4C 007D0C08 00000008 007D0D08
007D0CC0 000005EC E2C3D56E 007D0D20 00000000 00000000 00000000 00000000 00000000
007D0CE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0D00 00000000 00000000 4C4C4C4C 007D0CB8 00000008 007D0D60 000005EC E2C3D56E
007D0D20 007D0F88 007D0D78 007EE2A8 007EDED0 00000000 00000000 00000000 00000000
007D0D40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0D60 4C4C4C4C 007D0D10 00000008 007D0DB8 000005EC E2C3D56E 007EE788 00000000
007D0D80 00000000 00000000 00000000 00000000 00000000 00000000 00000000 007D0DD0
007D0DA0 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 007D0D68
007D0DC0 00000008 007D0E10 000005EC E2C3D56E 007EDE10 007D0C18 007ED768 00000000
007D0DE0 00000000 000000C0 00000000 00000000 00000000 00000000 007EE080 00000000
007D0E00 00000000 00000000 007EDF78 00000000 4C4C4C4C 007D0DC0 00000008 007D0E68
007D0E20 000005EC E2C3D56E 007D0E80 00000000 00000000 00000000 00000000 00000000
007D0E40 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0E60 00000000 00000000 4C4C4C4C 007D0E18 00000008 007D0EC0 000005EC E2C3D56E
007D0E80 007D0ED8 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0EA0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
007D0EC0 4C4C4C4C 007D0E70 00000008 007D0F18 000005EC E2C3D56E 007D0F30 007EF628
```

```
007D0EE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000   *.............................*
007D0F00 00000000 00000000 00000000 00000000 00000000 00000000 4C4C4C4C 007D0EC8   *.........................<<<<.'.H*
007D0F20 00000008 007D0F70 000005EC E2C3D56E 007D0C18 007ED768 007ED5B8 007EDA08   *.....'......SCN>.'...=P..=N..=..*
007D0F40 007EDBB8 007EDC78 007EDE10 007EDF78 007EE080 007EE188 007EE350 007EE458   *.=...=...=...=...=...=...=...=T&.=U.*
007D0F60 007EE560 007EE668 007EF3E8 007EF4A8 4C4C4C4C 007D0F20 00000008 007D0FC8   *.=V-.=W..=3Y.=4.<<<<.'.......'.H*
007D0F80 000005EC E2C3D56E 007EDAC8 007EC418 00000000 00000000 00000000 00000000   *....SCN>.=.H.=D.................*
007D0FA0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000   *.....................................*
007D0FC0 00000000 00000000 4C4C4C4C 007D0F78 00000000 00000030 00000000 00000000   *........<<<<.'.....0.............*
007D0FE0 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000   *.....................................*
```

.... More storage has been deleted....

The system trace table begins here.

```
007D2000 74003CFF 8065E280 00003600 4D000000 00C9D6D3 007D0000 66586182 803557E4 06  *......S.....(....IOL.'..../....U*
007D2020 74003CFF 80671C60 00003600 63000000 00C4E2E6 007D0000 66586223 8034CBA0     *.....-.........DSW.'.....#.....*
007D2040 74003CFF 9368D480 00000500 03E003E0 00329480 00300000 030E0000 00000000     *.....M.....................0.....*
007D2060 74003CFF 93794420 00001050 03E003E0 00C04007 007EF278 0C000000 0080000B     *.....&.....  ..=2.....@.......*
007D2080 74003CFF 937B6600 00002800 00000000 00C9D6E2 007F08B8 80356996 00356E78     *.....#.........IOS."........>.*
007D20A0 74003CFF 937C2A20 00002C00 00356E78 00C9D6E2 007F08B8 80356996 80356ED2     *.....@........>..IOS."........>K*
007D20C0 74003CFF 937D1C20 00003000 D2C94040 002C3700 007D0000 007F17E8 8035624A     *.....'.....KI  .....'...".Y....*
007D20E0 74003CFF 937F1660 00003600 2C000000 00C9D6D3 00300000 66664429 803557E4     *.....".-.....IOL.....'.....U*
007D2100 74003CFF 938E0A60 00003010 E4C94040 00000000 007D0000 007F17E8 00356252     *.....-....UI  .....'...".Y....*
007D2120 74003CFF 938EC440 00002C00 00000000 00C9D6E2 007EC628 80351EFE 80356286     *.....D .......IOS.=F.....#.....*
007D2140 74003CFF 9391FA80 00002800 00000000 00C7D9C6 007EC628 80351EFE 003561E0     *.............GRF.=F.....#./.....*
007D2160 74003CFF 93B8F800 00001030 03E003E0 007F17E8 00329480 00C08000 007EF260     *.....8.........".Y.........=2-...*
007D2180 74003CFF 93B97840 00003600 4D000000 00C9D6D3 007D0000 66665364 803557E4     *.....  ....(....IOL.'.....Sf..U*
007D21A0 74003CFF 93BA6080 00003600 63000000 00C4E2E6 007D0000 66665378 8034CBA0     *.....-.........DSW.'.....Sf....*
007D21C0 74003CFF 9C229040 00000500 03E003E0 00329480 00300000 030E0000 00000000     *.....  .....................0.....*
007D21E0 74003CFF 9C360A60 00001050 03E003E0 00C04007 007EF278 0C000000 0080000B     *.....-...&.....  ..=2.....@.....*
007D2200 74003CFF 9C390660 00002800 00000000 00C9D6E2 007F08B8 80356996 00356E78     *.....-.........IOS."........>.*
007D2220 74003CFF 9C39E820 00002C00 00356E78 00C9D6E2 007F08B8 80356996 80356ED2     *.....Y.......>..IOS."........>K*
007D2240 74003CFF 9C3B0440 00003000 D2C94040 002C3700 007D0000 007F17E8 8035624A     *.....  ....KI  .....'...".Y....*
007D2260 74003CFF 9C3D7280 00003600 2C000000 00C9D6D3 00300000 66700243 803557E4     *.............IOL.....'.....U*
007D2280 74003CFF 9C43AC40 00003010 E4C94040 00000000 007D0000 007F17E8 00356252     *.....  ....UI  .....'...".Y....*
007D22A0 74003CFF 9C445860 00002C00 00000000 00C9D6E2 007EC628 80351EFE 80356286     *.....-.........IOS.=F.....#.....*
007D22C0 74003CFF 9C476600 00000700 00000000 0000000C 007EF250 007D0000 80351572     *.....=2&.'.....#.....*
007D22E0 74003CFF 9C497400 00002800 00000000 00C7D9C6 007EC628 80351A0C 00366748     *.............GRF.=F.....#.....*
007D2300 74003CFF 9C4AB800 00000600 00000000 0000000F 007F1758 007D0000 8036682E     *.....".....'...".....#.....*
007D2320 74003CFF 9C577A60 00003300 D2C34040 004D3700 007D0000 007F1758 8036684A     *.....:-....KC  .(...'...".....*
007D2340 74003CFF 9C594460 00000700 00000000 0000000B 007EF370 007D0000 803667C4     *.....-.....=3..'.....D.....D*
007D2360 74003CFF 9C5AEE80 00002C00 00366748 00D8C3D6 007EC628 80351A0C 803667A2     *.............QCO.=F.....#.....*
007D2380 74003CFF 9C5C8E20 00000700 00000000 0000001B 007F17E8 007D0000 80353098     *.....*.....".Y.'.....#.....*
007D23A0 74003CFF 9C5E2C80 00003600 4D000000 00C7D9C6 007D0000 66700767 80351F34     *.....;.....(....GRF.'.....#.....*
007D23C0 74003CFF 9C5F8080 00003310 E4C34040 00000000 007D0000 007F1758 003667C6     *.....¬.....UC.....'...".....F*
007D23E0 74003CFF 9C602480 00002C00 00365E50 00D8C3D6 007F11B8 803455C2 80366822     *.....-.....;&.QCO."....B....*
007D2400 74003CFF 9C618E60 00002800 00000000 00C3C6D4 007F11B8 80345644 00392020     *...../.-.....CFM.".....#.....*
007D2420 74003CFF 9C654640 00002C00 00392020 20C3C6C3 007F11B8 80345644 807BC0B2     *.....  .....CFC."....#..#.....*
007D2440 74003CFF 9C660C60 00002301 00000000 00000060 86868080 C1E4E3D6 D3D6C740     *.....-.....-....AUTOLOG #.....*
007D2460 74003CFF 9C665220 00002800 00000000 00C3C6D4 007F11B8 803456DA 003B5070     *.............CFM."........&.....*
007D2480 74003CFF 9C682820 00000600 00000000 00000013 007ED3F0 007D0000 807998B0     *.....=LO.'.....#.....0.....*
```

Here we have HCPLOG calling HCPUDR. HCPUDR does many things prior to returning through the SAVBK at X'007F1758'.

```
007D24A0 74003CFF 9C6C0480 00002800 00000000 00D3D6C7 007F1758 807997DA 00388860     *.....%.....LOG."........-*
```

Here we have an HCPUDR calling HCPPTS, which quickly returns through SAVBK at X'007EC628'.

```
007D24C0 74003CFF 9C6E1C20 00002800 00000040 00E4C4D9 007EC628 80388D3A 00362340     *.....>.....  .UDR.=F.....  *
007D24E0 74003CFF 9C6F6400 00002C00 00362340 00D7E3E2 007EC628 80388D3A 8036248E     *.....?.....  .PTS.=F.....#.....*
007D2500 74003CFF 9C71A860 00002100 00000000 00000046 003F1000 007EC628 80388D46     *.....-.....=F.....#.....*
007D2520 74003CFF 9C775800 00003300 D2C34040 002C3700 00300000 007F08B8 80361EA8     *.....KC  .....".....#.....*
007D2540 74003CFF 9C785200 00003600 4D000000 00D7C1C7 007D0000 66701186 80361F00     *.....(....PAG.'.....#.....*
```

```
007D2560  74003CFF  9C7A0000  00003310  E4C34040  00000000  00300000  007F08B8  003621E0
007D2580  74003CFF  9CAE0E40  00001030  04400440  007EC1A8  0032A100  00C0C000  007FEDD8
007D25A0  74003CFF  9CAF0400  00003600  4D000000  00C9D6D3  00300000  66702061  803557E4
007D25C0  74003CFF  9CAF9440  00003600  63000000  00C4E2E6  00300000  66702070  8034CAF8
007D25E0  74003CFF  9CB1EE40  00003600  63000000  00C4E2E6  007D0000  66702107  8034CBA0
007D2600  74003CFF  A73D6640  00000500  04400440  0032A100  00300000  030E0000  00000000
007D2620  74003CFF  A74D2080  00001050  04400440  00C04007  007FEE08  0C000000  00400024
007D2640  74003CFF  A74EEE20  00002800  00000000  00C9D6E2  007F08B8  80356996  00356E78
007D2660  74003CFF  A74F9840  00002C00  00356E78  00C9D6E2  007F08B8  80356996  80356ED2
007D2680  74003CFF  A751FE20  00003300  D2C34040  002C3781  007D0000  007EC628  8036213A
007D26A0  74003CFF  A7543C20  00003600  2C000000  00D7C1C7  00300000  66745665  80361F00
007D26C0  74003CFF  A7632A40  00003310  E4C34040  00000081  007D0000  007EC628  003645E8
007D26E0  74003CFF  A76EBC60  00000600  00000000  00000003  007ED360  007D0000  8038888A
007D2700  74003CFF  A7743820  00002800  00000000  00E4C4D9  007EC628  80388BF2  00362490
007D2720  74003CFF  A7753E80  00002800  00000040  00D7E3E2  007F08B8  803624DC  00342460
007D2740  74003CFF  A7786240  00002C00  00342460  00C2D3C4  007F08B8  803624DC  80342A24
007D2760  74003CFF  A778B000  00002C00  00362490  00D7C7E3  007EC628  80388BF2  803624E4
```

Here is an HCPUDR returning to HCPLOG through the SAVBK at X'007F1758'.

```
007D2780  74003CFF  A7793A40  00002C00  00388860  00E4C4D9  007F1758  807997DA  80388C70
007D27A0  74003CFF  A77AD680  00002800  00000000  00D3D6C7  007F1758  8079980E  00388780
007D27C0  74003CFF  A77CC080  00002800  00000040  00E4C4D9  007EC628  80388824  00362340
007D27E0  74003CFF  A77D7880  00002C00  00362340  00D7C7E3  007EC628  80388824  8036248E
007D2800  74003CFF  A77F1660  00002100  00000000  00000046  003F1000  007EC628  80388830
007D2820  74003CFF  A7830000  00003300  D2C34040  002C3700  00300000  007F08B8  80361EA8
007D2840  74003CFF  A783A020  00003600  4D000000  00D7C1C7  007D0000  66746423  80361F00
007D2860  74003CFF  A784C860  00003310  E4C34040  00000000  00300000  007F08B8  003621E0
007D2880  74003CFF  A7A9FA80  00001030  04400440  007EC1A8  0032A100  00C0C000  007FEE18
007D28A0  74003CFF  A7AA9640  00003600  4D000000  00C9D6D3  00300000  66747046  803557E4
```

.... This is a gap in the CP trace table....

Notice the entry at X'007DAFE0'. Instead of
a normal entry it is a linkage from this CP trace page to its prior (X'007DB000')
and successor (X'007D9000') pages. While normally sequential, after the VARY ON PROCESSOR command has been issued these pages may
be in any order.

```
007DAFE0  00000000  00000000  95973D03  1CC9D840  95973D07  77580E20  007DB000  007D9000
007DB000  74003D07  7758C600  00003600  63000000  00C4E2E6  007D0000  07828852  8034CBA0  06
007DB020  74003D07  896FD240  00000500  03E003E0  00329480  00300000  030E0000  00000000
```

.... This is a gap in the CP trace table....

```
007DBC00  74003D07  99468A00  00003600  63000000  00C4E2E6  007D0000  07967845  8034CBA0
007DBC20  74003D07  A21C4220  00000500  03E003E0  00329480  00300000  030E0000  00000000
```

Here is the system writing to the operator's terminal.

```
007DBC40  74003D07  A22A7A00  00001050  03E003E0  00C04007  007EF158  0C000000  0080000C
007DBC60  74003D07  A22BE680  00002800  00000000  00C9D6E2  007EC628  80356996  00356E78
007DBC80  74003D07  A22C7860  00002C00  00356E78  00C9D6E2  007EC628  80356996  80356ED2
007DBCA0  74003D07  A22D2640  00003000  D2C94040  002C3700  007D0000  007F17E8  8035624A
007DBCC0  74003D07  A22E5860  00003600  2C000000  00C9D6D3  00300000  08004323  803557E4
007DBCE0  74003D07  A23C0480  00003010  E4C94040  00000000  007D0000  007F17E8  00356252
007DBD00  74003D07  A23C5640  00002C00  00000000  00C9D6E2  007F1758  80351EFE  80356286
007DBD20  74003D07  A23E0C00  00000700  00000000  0000000C  007EF130  007D0000  80351572
007DBD40  74003D07  A23EE820  00002800  00000000  00C7D9C6  007F1758  80351A0C  00366748
007DBD60  74003D07  A23F6080  00000700  00000000  0000000D  007F1008  007D0000  803667C4
007DBD80  74003D07  A2401820  00002C00  00366748  00D8C3D6  007F1758  80351A0C  803667A2
007DBDA0  74003D07  A240DA60  00000700  00000000  0000001B  007F17E8  007D0000  80353098
007DBDC0  74003D07  A2419260  00003600  4D000000  00C7D9C6  007D0000  08004630  80351F34
007DBDE0  74003D07  A2425E80  00003600  58000000  00C4E2E6  007D0000  08004643  8034CB90
```

```
007DBE00  74003D07  A2442A20  00003210  00000001    15000000  007D0000  00000064  00000000      *.....................'.........*
```

Next is the last I/O interrupt prior to the dump being taken. It occurred for device 3E0, the operator's console.

```
007DBE20  74003D0B  6A65CA00  00000500  03E003E0    00329480  00300000  030E0000  00000000      *................................*
007DBE40  74003D0B  6A769240  00001050  03E003E0    00000011  00000000  80000000  00800000      *.......  ...&.....................*
007DBE60  74003D0B  6A781460  00000600  00000000    0000001B  007F17E8  00300000  80356BA0      *.......-............".Y.....,.*
007DBE80  74003D0B  6A79A480  00002800  00000000    00C9D6E2  007F1758  803569E4  00350C20      *.................IOS."......U....*
007DBEA0  74003D0B  6A7A7A60  00000600  00000000    0000001B  007F1DE8  00300000  80350C5C      *.....::-............".Y.......**
007DBEC0  74003D0B  6A7BC440  00003000  D2C94040    002C3700  00300000  007F1DE8  80350C78      *.....#D ....KI  ..........".Y....*
007DBEE0  74003D0B  6A7C7E20  00002C00  00350C20    00C7D9C5  007F1758  803569E4  80350DA0      *.....@=.........GRE."......U....*
007DBF00  74003D0B  6A7D1620  00002800  00000000    00C9D6E2  007F1758  80356A3A  00356E78      *.....'..........IOS."........>.*
007DBF20  74003D0B  6A7D7E20  00002C00  00356E78    00C9D6E2  007F1758  80356A3A  80356ED2      *.....'=.......>..IOS."........>K*
```

The section show below is the last piece of storage released prior to the dump. See X'007F17E8'.

```
007DBF40  74003D0B  6A7DFC20  00000700  00000000    0000001B  007F17E8  00300000  80356A60      *.....'..............".Y........-*
007DBF60  74003D0B  6A7FBC20  00003600  2C000000    00C9D6D3  00300000  11970552  803557E4      *.....".............IOL............U*
007DBF80  74003D0B  6AAC3C60  00003010  E4C94040    00000000  00300000  007F1DE8  00350E40      *.......-....UI  ..........".Y...  *
007DBFA0  74003D0B  6AACF460  00003000  D2C94040    00000B00  007D0000  007F1DE8  80350EB6      *.......4-....KI  .....'...".Y....*
007DBFC0  74003D0B  6AB16C60  00000300  00000000    00040016  00000000  000C0000  8036E848      *.......%-.....................Y.*
007DBFE0  00000000  00000000  95973D07  77580E20    95973D0B  6AB16C60  007DC000  007DA000      *.....................%-.'...'...*
007DC000  74003D0B  6AB22860  00003200  00000001    15420000  007D0000  00000064  00000000  06  *.......-.....................*
007DC020  74003D0B  6AB41C80  00003600  4D000000    00C7D9C6  00300000  11971391  80350EBE      *.............(....GRF.........*
007DC040  74003D0B  6AB4AC40  00003600  63000000    00C4E2E6  00300000  11971400  8034CAF8      *.....  .........DSW.............8*
007DC060  74003D0B  6AB65A60  00003010  E4C94040    00000000  007D0000  007F1DE8  00350E40      *.......-....UI  .....'...".Y...  *
007DC080  74003D0B  6AB7BA60  00000600  00000000    0000000C  007EF130  007D0000  803527D6      *.......-.............=1..'.....O*
```

Next is the last storage allocation prior to the dump. See X'007FF778'.

```
007DC0A0  74003D0B  6AB90C60  00000600  00000000    00000025  007FF778  007D0000  80351554      *.......-.............."7..'.....*
007DC0C0  74003D0B  6ABA3A40  00002800  007D0000    00C7D9C6  007F1758  80351EFE  003561E0      *.....  .....'...GRF."......../.*
007DC0E0  74003D0B  6AE2C660  00001030  03E003E0    007F1DE8  00329480  00C08000  007EF140      *.....SF-.........".Y.........=1 *
007DC100  74003D0B  6AE33800  00003600  4D000000    00C9D6D3  007D0000  11972144  803557E4      *.....T......(....IOL.'.........U*
007DC120  74003D0B  6AE40640  00003600  63000000    00C4E2E6  007D0000  11972157  8034CBA0      *.....U. .........DSW.'.........*
```

What follows is the location of the last entry in the trace table prior to the dump. Note the differences in the time.

```
007DC140  74003CF9  FC3D3620  00000600  00000000    0000000E  007EEEA8  007D0000  803664B0      *...9.................=...'......*
007DC160  74003CF9  FC3FB440  00000600  00000000    00000006  007EF6E8  007D0000  80366138      *...9... .............=6Y.'..../.*
007DC180  74003CF9  FC40DE00  00002800  007EF716    00D8C3D5  007EC7D8  803662DA  00385998      *...9. .......=7..QCN.=GQ.......*
007DC1A0  74003CF9  FC429600  00000600  00000000    00000008  007EF730  007D0000  803859C8      *...9.................=7..'.....H*
007DC1C0  74003CF9  FC433000  00002C00  00385998    00C9D6D7  007EC7D8  803662DA  80385A04      *...9.............IOP.=GQ.......*
007DC1E0  74003CF9  FC43B200  00000700  00000000    00000006  007EF6E8  007D0000  803662F6      *...9.................=6Y.'.....6*
007DC200  74003CF9  FC479A60  00003300  D2C34040    004D3700  007D0000  007EC7D8  80365D8A      *...9...-....KC  .(...'...=GQ..).*
007DC220  74003CF9  FC485C00  00002200  007EEEA8    80000001  007D0000  007D0000  00329480      *...9..*.....=.....'.....'......*
007DC240  74003CF9  FC489060  00002C00  00365E50    00D8C3D5  007ED0F0  807AA0CE  80365E18      *...9...-.....;&.QCN.=.0.;....;.*
007DC260  74003CF9  FC48DA40  00000700  00000000    00000005  007EDDC8  007D0000  807AA0DC      *...9...  .............=.H.'.....:.*
007DC280  74003CF9  FC4C7E00  00002C00  003A4058    00C3D8E4  007ECCB8  8079C058  807AA058      *...9.<=.......  ..CQU.=.....:..*
007DC2A0  74003CF9  FC4D3220  00002800  00000000    00D3C7D5  007ECCB8  8079C064  003A1020      *...9.(...........LGN.=.....:...*
007DC2C0  74003CF9  FC4F1A60  00000600  00000000    00000002  007EF790  007D0000  807AD030      *...9.|.-.............=7..'...:..*
```

Here are 14 doublewords of storage at X'007EF7C0' being allocated.

```
007DC2E0  74003CF9  FC4FFE00  00000600  00000000    0000000E  007EF7C0  007D0000  807AD324      *...9.|...............=7..'....L.*
007DC300  74003CF9  FC516260  00002800  00000000    00C3D8C6  007ED0F0  807AD408  00365E50      *...9...-.........CQF.=.0..M...;&*
007DC320  74003CF9  FC526600  00000600  00000000    0000000E  007EF850  007D0000  803664B0      *...9.................=8&.'.....*
007DC340  74003CF9  FC542080  00000600  00000000    00000006  007EDDC8  007D0000  80366138      *...9.................=.H.'..../.*
007DC360  74003CF9  FC552400  00002800  007EDDF1    00D8C3D5  007ECD48  803662DA  00385998      *...9.........=.1.QCN.=.........*
007DC380  74003CF9  FC56B880  00000600  00000000    00000008  007EF8E0  007D0000  803859C8      *...9.................=8..'.....H*
007DC3A0  74003CF9  FC575820  00002C00  00385998    00C9D6D7  007ECD48  803662DA  80385A04      *...9.............IOP.=.........*
007DC3C0  74003CF9  FC57C840  00000700  00000000    00000006  007EDDC8  007D0000  803662F6      *...9..H .............=.H.'.....6*
007DC3E0  74003CF9  FC5A2060  00003300  D2C34040    004D3700  007D0000  007ECD48  80365D8A      *...9...-....KC  .(...'...=....).*
```



```
007DC400  74003CF9  FC5A8200  00002200  007EF850  80000001  007D0000  007D0000  00329480    *...9.........=8&.....'...'......*
007DC420  74003CF9  FC5ABC40  00002C00  00365E50  00D8C3D5  007ED0F0  807AD408  80365E18    *...9... ......;&.QCN.=.0..M...;.*

Here are those doublewords of storage at X'007EF7C0' being released.

007DC440  74003CF9  FC5B3C40  00000700  00000000  0000000E  007EF7C0  007D0000  807AD394    *...9.$. .............=7..'....L.*
007DC460  74003CF9  FC5BA480  00000700  00000000  00000002  007EF790  007D0000  807AD3A2    *...9.$..............=7..'....L.*

.... More lines of the CP trace table have been deleted....

007E9F80  74003CFF  802C7E00  00002800  00000000  00C7D9C6  007EC628  80351EFE  003561E0    *......=..........GRF.=F......./.*
007E9FA0  74003CFF  8063E200  00001030  03E003E0  007F17E8  00329480  00C08000  007EF260    *......S..........".Y.........=2-*
007E9FC0  74003CFF  80652E60  00000300  00000000  00040016  00000000  000C1000  8034C352    *.......-.......................C.*

The trace table ends here and wraps back to the beginning.

007E9FE0  00000000  00000000  95973CFE  1B5F6200  95973CFF  80652E60  007D2000  007E8000    *............-.........-.'...=..*

.... Free storage has been deleted....

007EC400  00000000  00000000  00000000  00000000  000005EC  E2C3D56E  00000000  00000000    *.....................SCN>........*
007EC420  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000    *................................*
007EC440  00000000  00000000  00000000  00000000  00000000  007ED5B8  4C4C4C4C  00000000    *.....................=N.>>>>....*

.... Free storage has been deleted....

007ED380  00000007  007ED3C8  00000C6C  C3C6D46E  00770000  00345DD8  007ED210  007EF8E0    *.....=LH...%CFM>......)Q.=K..=8.*
007ED3A0  80000000  00000000  95973CFF  F5F19260  9597405A  44819260  00000000  00000000    *............51.-.. ....-........*
007ED3C0  00000000  00000000  4C4C4C4C  007ED380  4CD3C7D5  007ED380  00000000  00000000    *........<<<<.=L.<LGN.=L.........*
007ED3E0  00000000  00000018  067808B0  D3D6C76E  00000008  D6D7C5D9  C1C3C3E3  FF000000    *.............LOG>....OPERACCT....*
007ED400  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000    *................................*
007ED480  00000000  00000000  4CD3D6C7  007ED3E0  00000000  00000000  00000000  00000000    *........<LOG.=L.................*
007ED4A0  00000003  007ED4C8  000008DC  D7C7E36E  00000000  00080378  E0000000  00000000    *.....=MH....PGT>...............*
007ED4C0  00000000  00000000  4C4C4C4C  007ED4A0  00000000  0000001B  026A0198  E4C4D96E    *........<<<<.=M.............UDR>*
007ED4E0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000    *................................*
007ED580  00000000  00000000  00000000  00000000  4CE4C4D9  007ED4D0  00000000  00000000    *................<UDR.=M.........*

Here is the VDEV associated with the RDEV for the operator's
console on 3E0.

007ED5A0  00000000  00000000  00000013  007ED650  00000070  E5C4C26E  007ED5B8  007ED5B8    *.............=O&....VDB>.=N..=N.*
007ED5C0  00000000  00000000  00028040  007D0000  00002000  00000000  00000000  0081001F    *.......... .'..................*
007ED5E0  80000080  0000FF80  F0000000  00000000  00000000  00000000  00000000  00000000    *........0.......................*
007ED600  00000000  00000000  00000000  007ED678  00329480  00000000  95973CF8  A4405C40    *.............=O............8. * *
007ED620  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000    *................................*
007ED640  00000000  00000000  00000000  00000000  4C4C4C4C  007ED5A8  4CC1E3D9  007ED5A8    *................<<<<.=N.<ATR.=N.*
007ED660  00000000  00000000  0000000E  007ED6E8  00000534  E5C4E26E  00000000  00002000    *.............=OY....VDS>.......*
007ED680  00000000  00000000  00000000  00000000  007ECC40  007EFAC0  00000000  00000000    *.................=. .=..........*
007ED6A0  00000000  00000000  007ED828  00000000  00000000  00000000  E3010E00  00000000    *.........=Q.............T........*
007ED6C0  D6D7C5D9  C1E3D6D9  F1C6F1F1  60F7F0F7  40404040  40404040  40404040  40404040    *OPERATOR1F11-707                *
007ED6E0  40404040  40404040  4C4C4C4C  007ED668  4CD8C3D6  007ED668  007ED170  0000000C    *        <<<<.=O.<QCO.=O..=J.....*
007ED700  012403A8  C9D6D76E  007ED9A8  00000000  00000009  00000038  F1F07AF5  F8404040    *....IOP>.=R.............10:58   *
007ED720  C4C1E2C4  40404040  40F0F1F9  F140C1E3  E3C1C3C8  C5C440D6  D7C5D9C1  E3D6D940    *DASD     0191 ATTACHED OPERATOR *
007ED740  F0F1F9F1  40C2E840  D6D7C5D9  C1E3D6D9  4CC9D6D7  007ED6F8  00000013  007ED800    *0191 BY OPERATOR<IOP.=O8.....=Q.*
007ED760  00000070  E5C4C26E  007ED768  007ED768  00000000  00000000  00010440  007D0000    *....VDB>.=P..=P.............'..*
007ED780  00001800  04000000  00000000  00830192  C00000C0  0000FFC0  0723FFFF  FFFFFFFF    *................................*

.... Free storage has been deleted....

007EF000  007EEF88  0000000F  012403A8  C9D6D76E  007EF130  00000000  0000000A  0000003A  06  *.=.........IOP>.=1.............*
007EF020  F1F07AF5  F8404040  E4D7F340  40404040  40F0F2F9  C340D5D6  E340D3C9  D5D2C5C4      *10:58   UP3      029C NOT LINKED*
007EF040  5E40E5D6  D3C9C440  D8C2C5D4  D6C440D5  D6E340D4  D6E4D5E3  C5C40000  00000000      *; VOLID QBEMOD NOT MOUNTED.....*
007EF060  4CC9D6D7  007EF000  00000000  00000000  00000000  00000000  007EEC88  00000015      *<IOP.=0.................=......*
```

```
007EF080  01840870  D8C3D56E  00000000  00030010  00000000  007D0000  80000000  00000000   *....QCN>.............'..........*
007EF0A0  00000000  00000000  0000003A  007EF0C8  00000000  00000000  115B5F1D  C1115D6B   *.............=0H.........$¬.A.),*
007EF0C0  1D600000  C611C3F0  F1F07AF5  F8404040  E4D7F340  40404040  40F0F2F9  C440D5D6   *.-..F.C010:58   UP3      029D NO*
007EF0E0  E340D3C9  D5D2C5C4  5E40E5D6  D3C9C440  D8C2C5E2  D4D740D5  D6E340D4  D6E4D5E3   *T LINKED; VOLID QBESMP NOT MOUNT*
007EF100  C5C40000  00000000  4CD8C3D6  007EF078  00000000  00000000  00000000  00000000   *ED......<QCO.=0.................*

The RCWBK with CCWs starts below.

007EF120  0000000C  007EF190  00000256  C7D9E26E  00000000  00000000  00000000  00000000   *.....=1.....GRS>...............*

Here are the CCWs being used to drive the final I/O to operator's
console on 3E0.  From CCW1 we see it is a READ for hex 116
bytes of data into a buffer at X'007FF788'.

007EF140  0B600001  00000000  06200116  007FF788  00000000  00000000  00000000  00000000   *.-..........."7................*
007EF160  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *................................*
007EF180  00000000  00000000  00000000  00000000  4C4C4C4C  007EF120  007EF078  00000015   *................<<<<.=1..=0.....*
007EF1A0  01840870  D8C3D56E  00000000  00030010  00000000  007D0000  80000000  00000000   *....QCN>.............'..........*
007EF1C0  00000000  00000000  0000003A  007EF1E8  00000000  00000000  115B5F1D  C1115D6B   *.............=1Y.........$¬.A.),*
007EF1E0  1D600000  C611C540  F1F07AF5  F8404040  E4D7F340  40404040  40F0F2F9  C540D5D6   *.-..F.E 10:58   UP3      029E NO*
007EF200  E340D3C9  D5D2C5C4  5E40E5D6  D3C9C440  D8C2C5D7  D3C940D5  D6E340D4  D6E4D5E3   *T LINKED; VOLID QBEPLI NOT MOUNT*

.... Free storage has been deleted....

007F1760  00800000  007F1758  00000025  007EF130  007D0000  80350F16  00350E40  007ECA78   *....."....=1..'..... .=..*
007F1780  00000000  00300710  00329480  007FF778  007F1DE8  007D0000  00350E20  00351E20   *..........."7.".Y.'.........*
007F17A0  80351EFE  003561E0  00000000  00000000  00000000  00000000  00000000  00000000   *....../.....................*
007F17C0  00000000  00000000  00000000  00000000  4C4C4C4C  007F1748  00000000  0000001E   *................<<<<.".........*

The section shown below is the last piece of storage released prior to the dump by HCPIOS.

007F17E0  0DD00F10  C9D6E26E  00000000  00000000  00000000  00000000  00000000  00000000   *....IOS>.......................*
007F1800  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00329480   *................................*
007F1820  00000000  00000000  00000000  00500080  00000000  00000000  00000011  00000000   *..............&.................*
007F1840  80000000  00800000  00000064  08004643  8034CB90  00300710  00323000  00000000   *................................*
007F1860  00300000  00300000  0034C2F0  00351E20  8034C82A  0036E228  00000000  00000000   *..........B0......H...S.........*
007F1880  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *................................*
007F18C0  4CC9D6E2  007F17D8  007ECBE8  00000009  06B604F8  D8C3D56E  F1F07AF5  F8404040   *<IOS.".Q.=.Y.......8QCN>10:58   *
007F18E0  E4D5C4C5  C6C9D5C5  C4404040  4040C4E4  D4D740E4  D5C9E340  C9D7D340  4040C3D7   *UNDEFINED     DUMP UNIT IPL   CP*
007F1900  4CD8C3D5  007F18C8  00000000  00000000  00000000  00000009  03B80150  C5D9D46E   *<QCN.".H.....................&ERM>*
007F1920  00000000  00000000  00000006  00000000  C3D6D4D4  C1D5C440  C1C3C3C5  D7E3C5C4   *.................COMMAND ACCEPTED*
007F1940  00000000  00000000  00000000  00000000  4CC5D9D4  007F1910  00000013  007F1A00   *.................<ERM."........"..*
007F1960  00000070  E5C4C26E  007F1968  007F1968  00000000  00000000  00012082  00770000   *....VDB>."..."..................*

.... Free storage has been deleted....

007F1DA0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *................................*
007F1DC0  4C4C4C4C  007F1D18  00000000  00000000  00000000  00000000  0000001B  007F1EC0   *<<<<."........................"..*

Here is the IORBK for the last I/O to the OPERATOR's console on 3E0.  IORUSER points to the OPERATOR.  From the IORCPA field we
can find the CCWs at X'007EF140'.

007F1DE0  0000005C  C7D9C56E  007D0000  00356226  00000000  00000000  00000000  00000000   *...*GRE>.'.....................*
007F1E00  007F1758  00000000  007EF130  00000000  00000000  00000000  00000000  00329480   *."........=1..................*
007F1E20  00C08000  007EF140  00000000  00900020  01000000  00000000  00000000  00000000   *.....=1 ......................*
007F1E40  00000000  00000000  00000000  00000000  00000000  00000000  00092993  00000000   *................................*
007F1E60  0005A688  0063C43A  00000000  00000000  00000000  00000000  00000000  00000000   *......D........................*
007F1E80  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *................................*

007F1EC0  4C4C4C4C  007F1DD8  007FF650  0000C648  00000000  00000000  00000000  00000000   *<<<<.".Q."6&..F................*
007F1EE0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000   *................................*
007FF020  23400001  007FF04F  31400005  007FF04A  08000000  007FF028  00401000  007FF018   *. ...."0|. ..."0....."0.. ..."0.*
007FF040  04300001  00000000  00000000  00000000  00000000  00000000  07400006  007FF088   *.......................... ..."0.*
```

```
007FF060  23400001  007FF08F  31400005  007FF08A  08000000  007FF068  00401000  007FF058  *. ..."0.. ..."0......"0.. ..."0.*
007FF080  04300001  00000000  00000000  00000000  00000000  00000000  07400006  007FF0C8  *.......................... ..."0H*
007FF0A0  23400001  007FF0CF  31400005  007FF0CA  08000000  007FF0A8  00401000  007FF098  *. ..."0.. ..."0......"0.. ..."0.*
007FF0C0  04300001  00000000  00000000  00000000  00000000  00000000  07400006  007FF108  *.......................... ..."1.*
007FF0E0  23400001  007FF10F  31400005  007FF10A  08000000  007FF0E8  00401000  007FF0D8  *. ..."1.. ..."1......"0Y. ..."0Q*
007FF100  04300001  00000000  00000000  00000000  00000000  00000000  07400006  007FF148  *.......................... ..."1.*
007FF120  23400001  007FF14F  31400005  007FF14A  08000000  007FF128  00401000  007FF118  *. ..."1|. ..."1......"1.. ..."1.*
007FF140  04300001  00000000  00000000  00000000  00000000  00000000  07400006  007FF188  *.......................... ..."1.*
007FF160  23400001  007FF18F  31400005  007FF18A  08000000  007FF168  00401000  007FF158  *. ..."1.. ..."1......"1.. ..."1.*
007FF180  04300001  00000000  00000000  00000000  00000000  00000000  4C4C4C4C  007FED70  *.....................<<<<."..*
007FF1A0  00000048  007FF3F0  0000008E  D9C4C16E  0B0B022B  007ECBC8  007ED4B0  08080808  *....."30....RDA>.....=.H.=M.....*
007FF1C0  81010101  01010101  82020808  08080808  0808080E  08080808  08080808  08080808  *................................*
007FF1E0  08080808  08080808  08080808  08080808  0808080E  08080808  08080808  08080808  *................................*
007FF3E0  08080808  08080808  08080800  00000000  4C4C4C4C  007FF1A0  00000048  007FF648  *................<<<<."1......"6.*
007FF400  0000008E  D9C4C16E  4848022B  00000000  00000000  5CC3D75C  08080808  08080808  *....RDA>...........*CP*........*
007FF420  C0400808  08080808  08080808  08080808  0808080E  08080808  08080808  08080808  *. ..............................*
007FF440  08080808  08080808  08080808  08080808  0808080E  08080808  08080808  08080808  *................................*
007FF640  08080800  00000000  4C4C4C4C  007FF3F8  00000000  00000118  03AC023E  D8C3D66E  *........<<<<."38...........QCO>*
007FF660  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  *................................*
007FF6A0  00000000  00000000  00000800  00000000  00000000  00000000  00000000  00000000  *................................*
007FF6C0  00000000  00000000  00000000  00000000  00000000  00000000  00000004  0C000010  *................................*
007FF6E0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  *................................*
```

The following piece of storage was allocated by HCPGRF just prior to dump. After tracing the I/O path we see that it is the buffer used to receive the next OPERATOR command.

```
007FF760  4CD8C3D6  007FF650  00000025  007FF8A0  00000734  C7D9C66E  00000000  00000000  *<QCO."6&.....".8.....GRF>........*
007FF780  00000025  00000000  6D000000  00000000  00000000  00000000  00000000  00000000  *................................*
```

.... There is a large buffer here....

```
007FF8A0  4C4C4C4C  007FF768  00000040  007FFAB8  0000039C  D6D7D96E  00000000  00000000  *<<<<."7.... ."......OPR>........*
007FF8C0  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  *................................*
007FFAA0  00000000  00000000  00000000  00000000  00000000  00000000  4C4C4C4C  007FF8A8  *.....................<<<<."8.*
007FFAC0  00000053  007FFD68  0000050A  D4D7E26E  E2E5C302  00000000  00FC3000  8036F238  *....."......MPS>SVC...........2.*
007FFAE0  030E0000  00000000  FFFFFFFF  FFFFFFFF  030E0000  00000000  00000000  00000000  *................................*
```

.... Free storage has been deleted....

```
007FFD60  00000000  00000000  4C4C4C4C  007FFAC0  0000004F  007FFFF8  000004CA  D4D7E26E  *........<<<<."....|."..8....MPS>*
007FFD80  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  *................................*
007FFF40  007FFD80  00000000  00000000  00000000  00000000  00000000  00000000  00000000  *."..............................*
007FFF60  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000  *................................*
007FFFE0  00000000  00000000  00000000  00000000  00000000  00000000  4C4C4C4C  007FFD70  *.....................<<<<."..*
00800000  *** END OF DUMP ***
```

Appendix C. Overview of the Diagnosis Task

The following section is intended to give you an overview in flowchart form of a method for analyzing system problems.

System operators can use "Before You Force a Restart" on page 52 for information on how to accumulate clues concerning a system problem before turning that problem over to a system programmer. System programmers can start with "1-Before You Look at a Dump" on page 54 to begin their problem analysis. From this point, depending on answers to questions posed by the chart, subsets of questions pinpoint the area of difficulty in the system.

Before You Force a Restart

A. If an excessive amount of processing time has elapsed with no results, refer to the operator's guide to determine whether your system WAIT indicator is on and whether CPU utilization is 0 (indicating that the processor is not running).

A. If CPU utilization is 0, inform your system programmer that you want to force a restart. Tell your system programmer whether the problem occurred in a standalone program, in CP, or in a virtual machine.

B. If CPU utilization is 100%, this is usually an indication of a loop. Check with your installation policy on loop determination.

B. In the case of a loop, first try to determine if the loop is short. If the loop is short, the operator should write down the lines of the loop. If the loop is long, the operator can do spot checks on the loop. Use the ALTER/DISPLAY console mode to display the real PSW. Gather the instructions in the loop before you force a restart.

C. If CPU utilization is not 100%, there may still be a loop if the loop has I/O statements. In this case, the loop may be indicated by the presence of a runaway device when all other devices are quiet.

C. It is generally not possible to vary a device offline if it is in a loop. The VARY command will not be accepted. Manually restarting a device sometimes works.

D. Restart the system. Did the system restart fail and fail to produce a dump?

D. If the system abends and the restart fails, there will be no dump. The original failure has been overridden by a secondary failure and it is now necessary to take a standalone dump. If you are unsure of how to take a standalone dump, see the *VM/XA SP Real System Operation* manual.

E. Did the system restart produce a dump but fail to re-IPL VM?	E. If so, then re-IPL the system. The system may not re-IPL, so spend a few moments taking notes on the environment at the time of the problem. For example, display and note the contents of the real PSW. Then try to re-IPL.
F. Does one user appear to be in a loop while others are experiencing no problems?	F. The method of handling a virtual machine problem is site-dependent. Some problem determination can be made before taking a dump of the virtual machine. A dump, of course, is the best source of problem detection, but the user may not know how to take a dump. If the user liaison cannot help the user solve the problem over the telephone, the liaison may need to take over the userid.
G. Does the virtual machine appear to be hung in a wait condition?	G. If so, take a virtual machine dump and re-IPL the virtual machine.

1-Before You Look at a Dump

1. Start problem analysis.	1. Something happened that makes you think there's a problem. We will refer to this as an event.
2. Has the environment changed in the last week?	2. Consider any changes, additions, or deletions to hardware or software. If your environment has changed in the last week, go to "2-Environment" on page 55. If you do not understand what is meant by environment, please refer to "2-Environment" on page 55. If the environment has not changed, continue.
3. Is this the duplicate of a previous problem? Is this a single event or the first event of a multiple event problem?	3. Is the event you are diagnosing the first event connected with the problem, or are there previous events? If you are not sure, see "3-First Event" on page 57. See this section if this is also a recurring problem.
4. Can the problem be consistently reproduced?	4. Debug the problem in a second-level environment.
5. Is the event an unexpected result?	5. Is the event one in which you receive information that is contrary to your understanding of what is going on with the system? If so, see "4-Unexpected Results" on page 65.
6. Is the problem under analysis one in which an excessive amount of time has passed without a system response?	6. If so, this may be the result of a system or user hang. Go to "3-Hang" on page 63.

2-Environment

A. Has software service been applied during the last week?

A. Service includes any changes that have been made to IBM software via PUT level changes, corrective changes, or local changes. Service also includes any customer-developed updates to customer-developed software, or any vendor-developed changes for vendor software. If service has been applied in any of these categories, go to "2-Change" on page 56.

B. Have any new software products been installed in the past week?

B. New software products include IBM products or releases, new vendor products, new locally developed enhancements to IBM or vendor products, or new locally developed application functions. If any of these products have been applied, go to "2-Change" on page 56.

C. Have any changes been made to the hardware in the last week?

C. Hardware includes I/O, channels, new processors, control units, devices, or storage. Changes to hardware include engineering changes or changes to hardware configuration. If any of these changes have been made, go to "2-Change" on page 56.

D. Does the problem persist after the latest environmental changes have been removed?

D. If so, continue with "3-First Event" on page 57.

2-Change

A. Is the cause of the problem a new change?

A. You must first determine if the new change is causing the problem. Do initial problem determination, that is, read the dump, investigate whether this is a user-related problem, and so forth.

B. Is it easy to remove the change?

B. If it is possible to remove the software change, such as by backing off maintenance changes, do so.

C. Can you disable the change without physically disconnecting the device?

C. If it is possible to change the software definition that controls the physical hardware, do so. This might be accomplished with a command (such as VARY OFFLINE) to disable the troublesome hardware, or you could remove the device definition in HCPRIO.

D. Is the problem serious enough to warrant physical disconnection of the device to determine if the device is the problem?

D. If the problem is serious enough to warrant physically disconnecting the device from the system, do so. If not, go to "3-First Event" on page 57.

3-First Event

A. Review the operator's console listing, if there is one. In today's automated environment, hardcopy operator's console listings are not always available.

A. The operator's console listing shows if and when an event occurred. You are looking for I/O errors, machine checks, hard and soft abends, and (possibly) wait conditions. Loops could appear on the console listing as a restart if the machine has been restarted to escape a looping condition.

B. Is CP external trace in operation?

B. If CP external trace is in operation, examine the results.

C. Is this the duplicate of a problem on which your installation is already working?

C. If the event is an abend, a symptom string is produced. You must examine the symptom string to determine if this problem occurred before. If this is a duplicate problem, give the documentation from this occurrence to whoever is working on the problem. If the event is not a duplicate of a previous event, or if it is not one of many events, go to "4-Unexpected Results" on page 65.

D. Is this the first or only event of a problem?

D. If you find evidence of earlier events, use the earliest related event for debugging. If you have already traced events back to the earliest event, or there is only one event and that event is:

- An I/O error, go to "3-I/O" on page 58
- A machine check, go to"3-Machine Check" on page 59
- An abend condition, go to "3-Abend" on page 61
- A restart, go to "3-Restart" on page 64
- A wait condition, go to "3-Wait" on page 62
- A loop, go to "3-Loop" on page 60
- An undetermined hang (when it's not clear that this is a wait or a loop), go to "3-Hang" on page 63 for more help.

3-I/O

A. Use EREP to look at the recording of hardware events.

B. Did a device or control unit present an invalid status?

A. Run CPEREP to produce a report on information contained in the error recording data set (ERDS).

B. Normally, an I/O error is not a problem in that it does not bring the system down. The I/O event is recorded and the system goes on. There are instances, however, in which the device presents an invalid status.

In the event of an I/O error involving invalid I/O status, first contact an IBM customer engineer to fix the hardware. If, in addition, the software has failed with a program check or entered a loop, the control program must also be fixed.

Failure on a device shouldn't bring a system down. If it does, there is a software problem as well as a hardware problem.

3-Machine Check

A. Use EREP to look at the recording of hardware events.

A. Run CPEREP to produce a report on information contained in the ERDS (error recording data set). A machine check might indicate a failure in the processor's real storage or in a channel.

B. Did the processor present an invalid machine check status?

B. The first step to take in the event of a machine check is to notify an IBM customer engineer (CE). With the help of the CE, you need to determine if there is also a software problem:

- If the processor presented valid machine check indicators, but the problem was not handled properly by CP, CP requires a fix.
- If the machine check status was invalid and CP did not handle the status as invalid, there is a bug in CP that requires a fix.

3-Loop

A. Examine the internal trace in the dump.

A. If the loop is small enough, the internal trace will usually reflect the call to the module that's looping and the events that led up to the loop. The existence of a loop between several modules also shows itself in the trace table (calls) but may overlay the events that led up to the loop. In this case, you may need an external trace.

Usually register 12 (or sometimes register 15) is the base register of the module that was running at the time the dump was taken.

B. Did the operator provide information about a loop?

B. If the operator provided information about the loop from examining the PSW, registers and instruction stepping, examine that to determine the size of the loop and its source in the module.

C. Is this an interrupt loop?

C. An interrupt loop is usually obvious in the trace. The interrupt handler may be causing the interrupt without checking for recursion or before checking for recursion. Continuous I/O interrupts can also come from a malfunctioning I/O device, which is referred to as "hot I/O."

3-Abend

A. Is the problem in a module that contains local modifications?

A. If the problem is in a module that has been modified by the customer, the information in the *VM/XA SP System Messages and Codes Reference* manual may be useful in helping to understand whether the problem is related to your modifications. It might be necessary to try to duplicate the error in an environment that does not include the local change. If duplication is not possible, if may be necessary to back off to a version of VM that does not include the local modifications and run production until the problem recurs.

B. Is this an IBM problem?

B. Call your IBM support team and provide them with the information in the symptom string. This includes the module name and the abend code. The problem may be the duplicate of a problem that another customer has had.

It may be necessary for a customer to trace or trap the problem to provide valid documentation for an APAR. IBM will provide you with a PTF number to fix an existing APAR. If the problem is a new problem for IBM, IBM will ask for related documentation and open an APAR for which a PTF will be provided as quickly as possible.

C. Is this a hard abend?

C. If the abend has brought down your system, ask your IBM support team for a circumvention or a bypass. It might be necessary to disable the troublesome part of the code so that you can keep your system up and running until IBM produces a fix for the problem. If the abend is soft, it will still be possible to keep the system up and running while IBM produces a fix.

3-Wait

A. Is the wait occurring in the control program?

A. Look up the wait code in the *VM/XA SP System Messages and Codes Reference* manual for further instructions.

If the wait is not listed in the book, go to "3-First Event" on page 57.

B. Is the wait occurring in a virtual machine?

B. Refer to the wait code documentation for the component or product running in this virtual machine. Examine the virtual machine dump for a duplicate problem.

C. Is the wait occurring in a standalone utility?

C. If the wait is standalone, consult the wait codes in the *VM/XA SP System Messages and Codes Reference* manual for further guidance.

3-Hang

A. Do you have a successful restart dump?

B. Do you have a standalone dump taken as the result of an unsuccessful restart?

A. Go to "3-Restart" on page 64.

B. If the restart failed to complete its dump and the store status was performed before the stand-alone dump was taken, the registers in the stand-alone dump are from the restart failure and not the original problem.

If you have a partial restart dump, the PSW and registers from it may be helpful. At the time of the restart, HCPDMP saves status in the STDBK. Locating this control block will help you to locate status at the time the restart dump was taken. If this is not available, check the interrupt save area in the prefix page (PFXIRPSV) of the standalone dump. It may still contain the registers at the time restart was forced. The trace table may also be helpful in establishing whether you have a wait or a loop. Go to "3-Restart" on page 64.

3-Restart

A. Determine if the system is in a wait state.

B. If it is in a wait state, determine if the wait is enabled or disabled.

C. If it is not in a wait state, the machine is in a loop.

A. Look at the restart PSW in the trace or dump to determine if the system is in a wait state.

B. The type of wait can be determined from the restart PSW.

C. Go to "3-Loop" on page 60.

4-Unexpected Results

A. Did you issue a CMS or CP command that didn't work?	A. If so, go to "4-Failed Command" on page 66.
B. Did you use any other IBM product installed in the VM system that didn't work?	B. If so, go to "4-Failed Command" on page 66.
C. Was the output from an application program incorrect or inaccurate? Did you receive an answer you did not expect?	C. If so, the problem is probably in the problem program (application). If the problem is not in the problem program, call IBM.
D. Did you receive repetitive information?	D. If so, go to "3-Loop" on page 60.
E. Is the program's output unsolicited?	E. If you receive spontaneous, unsolicited output, try to relate the triggering event in the internal or external trace table to a virtual machine.

4-Failed Command

A. Is the failing program an IBM program?

A. If the problem is in an IBM program that has been modified by the customer, the information in the *VM/XA SP System Messages and Codes Reference* manual may be useful in helping you understand whether the problem is related to your modifications. It might be necessary to try to duplicate the error in an environment that does not include the local change. If duplication is not possible, it may be necessary to back up to a version of VM that does not include the local modification and run production until the problem recurs.

B. Is this an IBM problem?

B. If so, call your IBM support team and provide them with information on the failing program. This may be the duplicate of a problem that another customer has had. IBM will provide you with a PTF number to fix an existing APAR. It may be necessary for you to trace or trap the problem to obtain valid documentation for an APAR. If the problem is a new problem for IBM, IBM will ask for related documentation and open an APAR for which a PTF will be provided as quickly as possible.

Bibliography

This bibliography gives the names and order numbers of microfiche and publications about VM/XA System Product.

VM/XA System Product Microfiche

You can order microfiche listings that contain code. The order numbers for the microfiche are:

Order No.	Description
LYC7-0330	VM/XA System Product: CP listings
LYC7-0331	VM/XA System Product: CMS listings
LYC7-0332	VM/XA System Product: GCS listings
LYC7-0334	VM/XA System Product: dump viewing facility listings.

VM/XA System Product Publications

The publications are shown in Figure 8 on page 68. You can order any of them by their individual order numbers or you can order most of them as a group by using a single order number, SBOF-0260. SBOF-0260 provides:

- All unlicensed publications (order numbers that do not begin with LY)
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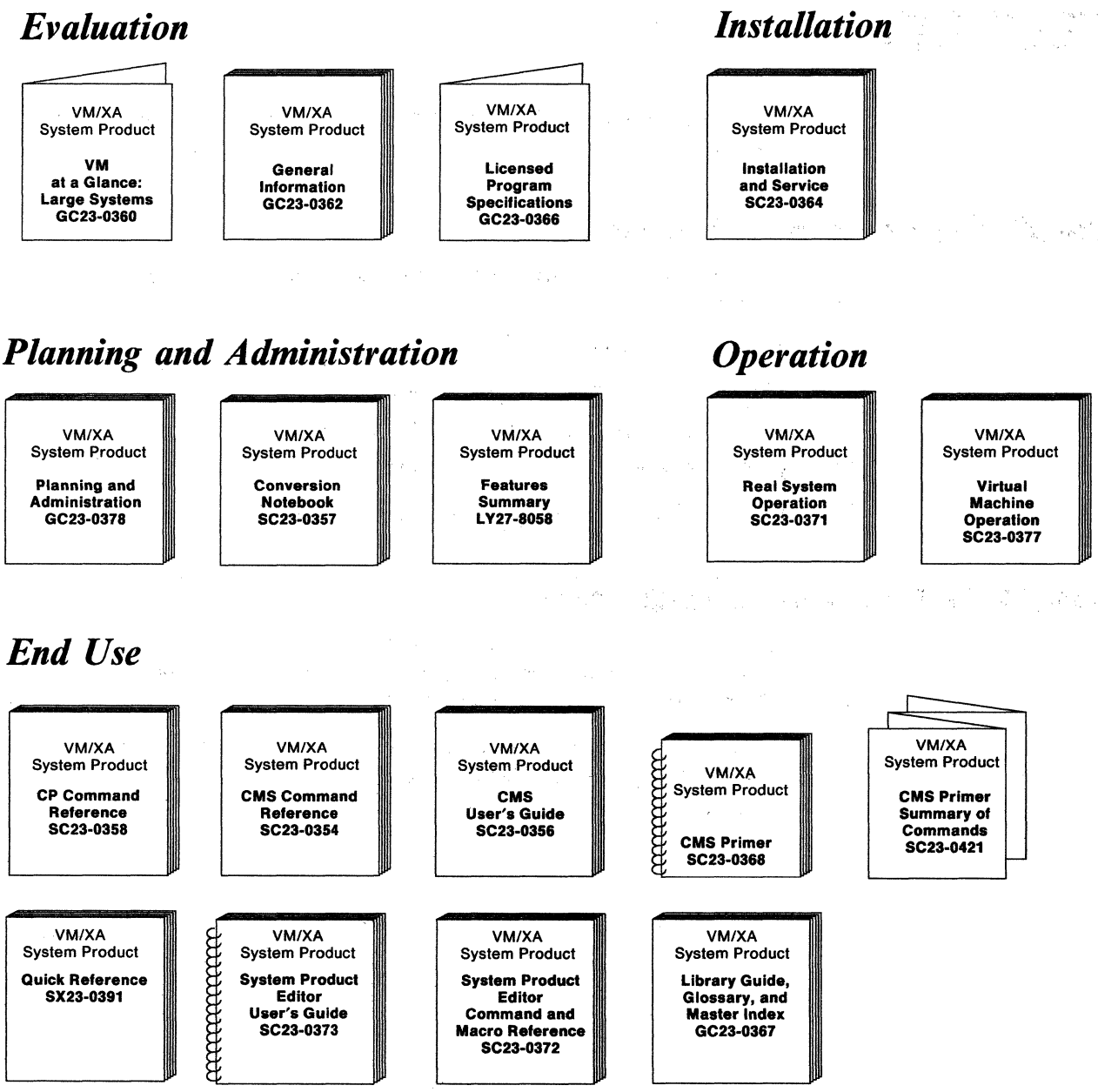

Figure 8 (Part 1 of 2). VM/XA System Product Publications

Application Programming

VM/XA System Product — **CP Programming Services SC23-0370**

VM/XA System Product — **CMS Application Program Development Guide SC23-0355**

VM/XA System Product — **CMS Application Program Development Reference SC23-0402**

VM/XA System Product — **CMS Application Program Conversion Guide SC23-0403**

VM/XA System Product — **Application Development Guide for FORTRAN and COBOL SC23-0369**

VM/XA System Product — **GCS Command and Macro Reference SC23-0433**

VM/XA System Product — **System Product Interpreter User's Guide SC23-0375**

VM/XA System Product — **System Product Interpreter Reference SC23-0374**

VM/XA System Product — **EXEC2 Reference SC23-0361**

VM/XA System Product — **Directory of Programming Interfaces for Customers GC23-0434**

Diagnosis

VM/XA System Product — **System Messages and Codes Reference SC23-0376**

VM/XA System Product — **Diagnosis Guide LY27-8056**

VM/XA System Product — **CP Diagnosis Reference LY27-8054**

VM/XA System Product — **CMS Diagnosis Reference LY27-8052**

VM/XA System Product — **GCS Diagnosis Reference LY27-8060**

VM/XA System Product — **Dump Viewing Facility Operation Guide and Reference SC23-0359**

VM/XA System Product — **CP Data Areas and Control Blocks LY27-8053**

VM/XA System Product — **CMS Data Areas and Control Blocks LY27-8051**

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A single 3-ring binder (holds one or more publications) **SX23-0399**

Spine and cover inserts for binders (enough for all publications) **SX23-0398**

Figure 8 (Part 2 of 2). VM/XA System Product Publications

Summary of Changes

Second Edition

Form of Publication: LY27-8056-1

Level of Product: VM/XA System Product Release 2

Date of Publication: November 1988

Changes to this publication are indicated by a vertical line to the left of the change.

- **Group Control System (GCS)**

  GCS is a new component that allows you to implement a native SNA communication network or run RSCS Version 2.

- **CP system trace facility enhancements**

  The CP system trace facility allows you to save CP system trace data in system trace files on disk or tape.

- **Data trace facility**

  VM/XA System Product Release 2 provides a facility that allows you to set three different types of data tracing for recording in system data files. These three data tracing types are:

  – CP data trace
  – I/O data trace
  – Guest data trace.

  Chapter Three of this manual gives three scenarios that illustrate the use of the TRSOURCE command in tracing CP. I/O, and guest data.

- **Soft abend dump enhancements**

  VM/XA System Product Release 2 enhances existing soft abend dump support by:

  – Allowing more CP functions to request soft abends rather than hard abends.

- **Dump viewing facility enhancements**

  VM/XA System Product Release 2 enhances the dump viewing facility to allow you to:

  – Format any CP control block found in a CP dump or any virtual machine control block found in a VM dump. You can format all or just selected fields as well as specify the level of formatting detail (bit or byte level) you want to see. This manual documents the BLOCK subcommand of DUMPSCAN, which formats control blocks within the dump.
  – Select which trace table entries you wish to view in a CP, standalone, or soft abend dump. The SELECT subcommand of DUMPSCAN documents the ability to select trace table entries you want to see and to reduce these entries through several options.
  – Process data trace information as well as CP trace table data

- Use the XEDIT interface to extract data from dumps for use in a REXX EXEC.
- Write your own DUMPSCAN macros using DUMPSCAN macro subcommands FINDSTRG, READSTRG and NOTE. Those subcommands are documented in the DUMPSCAN subcommand section of the book. The creation of macros with these macro subcommands is documented in Chapter 2.
- Use the new SCAN subcommand of DUMPSCAN to process a PF key assignment or command string to the system product interpreter
- Collect GCS guest trace records in a simulated OS QSAM file. This is documented in the TRACERED command.
- Process dumps with any CMS file name
- View dump data via the XEDIT interface
- Use an IBM-supplied EXEC to search a dump for a hung user. This is documented under the FINDUSER subcommand of DUMPSCAN.

New and changed publications

VM/XA System Product Release 2 adds two new books to the VM/XA SP library and combines two existing books into one book. The two new books are:

- *VM/XA System Product: Group Control System Command and Macro Reference*, SC23-0433
- *VM/XA System Product: Group Control System Diagnosis Reference*, LY27-8060

The combined book is *VM/XA SP Release 2 Planning and Administration.* This book replaces the *VM/XA SP Release 1 Administration* (SC23-0353) and *VM/XA SP Release 1 Planning* (GC23-0378) manuals.

Programming enhancements

VM/XA System Product Release 2 provides new and changed DIAGNOSE code and IUCV functions.

Glossary

A

automatic software re-IPL. The process by which the control program attempts to restart the system after abnormal termination. This process does not involve the hardware IPL process. See also virtual=real machine recovery.

C

CCS. Console communication services.

CCW. Channel command word.

channel command word (CCW). A doubleword structure that directs an I/O operation on a device or channel and includes pointers to any storage areas associated with the operation. One or more CCWs make up a channel program.

CMS. Conversational monitor system.

console communication services (CCS). A group of CP routines that interface with the VTAM service machine, providing full VM/XA SP console capabilities for SNA/CCS terminal users.

control program (CP). The component of VM/XA SP that manages the resources of a single System/370-Extended Architecture system so that multiple computing systems appear to exist. Each virtual machine is the functional equivalent of either a System/370 computing system or a System/370-Extended Architecture computing system.

conversational monitor system (CMS). The component of VM/XA SP that, as a virtual machine operating system, provides interactive time-sharing. CMS allows users to communicate with the system and with each other, to create and edit files, and to develop and run application programs. It operates in either System/370 mode or 370-XA mode under the control of CP.

CP. Control program.

D

DCSS. Discontiguous saved segment.

directory. A CP disk file that includes an entry for each user in the system. The entry defines the characteristics of the user's initial virtual machine configuration. These characteristics include the userid, the password, normal and maximum allowable virtual storage, virtual device definitions, the privilege class, the dispatching priority, logical line editing characters, and the account number.

discontiguous saved segment (DCSS). A saved segment that occupies one or more architecturally-defined segments. It begins and ends on segment boundaries. It is accessed by its own name. Contrast with member saved segment. See also saved segment, segment, segment space.

dump viewing facility. A VM/XA SP component that allows users to display, format, and print data interactively from CP hard and soft abend, stand-alone, and virtual machine dumps, and to process CP trace table data stored on tape or in a system trace file.

dynamic paging area. The area of real storage allocated by CP for V=V machine paging. This area also contains CP nonresident modules, CP control blocks, CP trace tables, free storage pages, and the alternate processor's prefix storage areas.

E

Expanded Storage. Optional integrated high-speed storage. In VM/XA SP, Expanded Storage may be shared by CP and one or more virtual machines. It may also be dedicated to CP or to a particular virtual machine.

F

full-pack minidisk. A virtual disk that contains all of the addressable cylinders of a real DASD volume.

full-screen mode. In VM/XA SP, the environment in which an entire 3270 display screen is under the control of a program running in a virtual machine.

G

GCS. Group control system.

group control system (GCS). The component of VM/XA SP that, as a virtual machine supervisor, executes in a group of System/370 virtual machines under CP control to provide an interface that helps support a native Systems Network Architecture (SNA) network.

guest. An operating system running in a virtual machine managed by the VM/XA SP control program. Contrast with host.

guest real storage. The storage that appears real to the operating system running in a virtual machine. Contrast with guest virtual storage, host real storage, and host virtual storage.

guest virtual storage. The storage that appears virtual to the operating system running in a virtual machine. Contrast with guest real storage, host real storage, and host virtual storage.

H

host. The VM/XA SP control program in its capacity as manager of a virtual machine in which another operating system is running. Contrast with guest.

host real storage. The storage that appears real to the control program. If VM/XA SP is running native, this is real storage; if VM/XA SP is running in a virtual machine, this is virtual storage. Contrast with guest real storage, guest virtual storage, and host virtual storage.

host virtual storage. The storage that appears virtual to the control program. Contrast with guest real storage, guest virtual storage, and host real storage.

I

image library. A set of modules, contained in a system data file, that define the spacing, characters, and copy modification data that a 3800 printer uses to print a spool file or that define the spacing and character set that an impact printer uses to print a spool file. See also system data file.

inter-user communication vehicle (IUCV). A generalized CP interface that facilitates the transfer of data among virtual machines.

IUCV. Inter-user communication vehicle.

M

member saved segment. A saved segment that begins and ends on a page boundary. It belongs to up to 64 segment spaces and is accessed either by the segment space name or by its own name. Contrast with discontiguous saved segment. See also saved segment, segment, segment space.

message repository file. A type of system data file that, when a compiled message repository has been installed, contains a set of VM/XA SP messages translated into a national language.

missing interrupt handler. A CP function for detecting and dealing with real I/O operations that do not complete within a specified time.

multiple preferred guests. A VM/XA SP facility that supports up to six preferred virtual machines when the Processor Resource/System Manager (PR/SM™) feature is installed in the real machine. See also preferred virtual machine.

N

named saved system (NSS). A copy of an operating system that a user has named and retained in a system data file. The user can load the operating system by its name, which is more efficient than loading it by device number. See also discontiguous saved segment, member saved segment, saved segment, segment space, system data file.

PR/SM is a trademark of International Business Machines Corporation.

NSS. Named saved system.

P

pageable virtual machine. Synonymous with virtual=virtual machine.

preferred virtual machine. A virtual machine that runs in the V=R area. CP gives this virtual machine preferred treatment in the areas of performance, processor assignment, and I/O interrupt handling. See also multiple preferred guests, virtual=fixed machine, virtual=real area, virtual=real machine.

Processor Resource/Systems Manager (PR/SM). A separately orderable feature available with 3090E processors that provides for logical partitioning of the real machine and support of multiple preferred guests. See also multiple preferred guests.

PR/SM. Processor Resource/Systems Manager.

R

real system operator. Any user who loads and runs VM/XA SP in the real machine. Contrast with virtual machine operator.

S

saved segment. One or more pages of storage that have been named and retained in a system data file. See also discontiguous saved segment, member saved segment, segment, segment space, system data file.

segment. In System/370 architecture, 64 kilobytes of storage. In 370-XA architecture, 1 megabyte of storage. See also saved segment.

segment space. A saved segment composed of up to 64 member saved segments accessed by a single name. A segment space occupies one or more architecturally-defined segments; it begins and ends on segment boundaries. A user with access to a segment space has access to all of its members. See also discontiguous saved segment, member saved segment, saved segment, segment.

service virtual machine. A virtual machine that provides system services. These services include accounting, error recording, monitoring, and those provided by supported licensed programs.

SMSG function. A CP function that allows a virtual machine to send a special message to another virtual machine programmed to accept and process the message. See also special message.

SNA. Systems Network Architecture.

SNA/CCS terminal. Any terminal accessing VM/XA SP that is managed by a VTAM service machine.

special message. A data transmission, made up of instructions or commands, sent from one virtual machine to another via the SMSG function. A special message is processed by the receiving virtual machine and does not appear on the receiver's console. See also SMSG function.

spool file. A collection of data along with CCWs for processing on a unit record device. Contrast with system data file.

SVC 76. In VM/XA SP, a supervisor call instruction that records the error incidents encountered by certain operating systems running in virtual machines. When a virtual machine operating system issues an SVC 76, VM/XA SP translates the virtual storage and I/O device addresses to real addresses, records the information on the VM/XA SP error recording virtual machine, and returns control to the issuing virtual machine. This interface bypasses the virtual machine's own error recording routine, and avoids duplicate error recording.

System/370 mode. A virtual machine operating mode in which System/370 functions are simulated. Contrast with 370-XA mode.

system data file. A collection of data associated with a particular function. Types of system data files include saved segments, NSSs, UCR files, image libraries, message repository files, and system trace files. Because a system data file contains no CCWs, it cannot be processed on a unit record device. Contrast with spool file.

system hold status. A spool file status that prevents a file from being printed, punched, or read until the real system operator releases it. Contrast with user hold status.

system trace file. A type of system data file that contains CP or virtual machine trace data.

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

U

UCR file. User class restructure file.

unit record device. A reader, a printer, or a punch.

user class restructure file (UCR file). A type of system data file that contains information used to override the IBM-defined privilege class structure of CP commands, DIAGNOSE instruction codes, and certain CP system functions.

user directory. See directory.

user hold status. A spool file status that prevents a file from being printed, punched, or read until the file owner releases it. Contrast with system hold status.

V

Vector Facility (VF). A hardware feature that provides synchronous instruction processing for high-speed manipulation of fixed-point and floating-point data.

VF. Vector Facility.

V = F machine. Virtual = fixed machine.

virtual = fixed machine (V = F machine). A preferred virtual machine with a fixed, contiguous area of host real storage that does not start at page 0. CP provides performance enhancements for this virtual machine. See also multiple preferred guests, preferred virtual machine, virtual = real area, virtual = real machine, virtual = virtual machine.

virtual machine. In VM/XA SP, a functional equivalent 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/XA SP controls the concurrent execution of multiple virtual machines on an actual System/370-Extended Architecture system.

Virtual Machine/Extended Architecture System Product (VM/XA SP). An operating system that allows multiple IBM System/370 and 370-XA operating systems to run simultaneously on a single 370-XA processor. The multiple systems may be used for production, testing, developing application programs, maintenance, and migration. VM/XA SP also provides a high-capacity interactive environment. There are four components: the control program (CP), the conversational monitor system (CMS), the dump viewing facility, and the group control system (GCS).

virtual machine operator. Any user who loads and runs an operating system in a virtual machine. Contrast with real system operator.

virtual = real area (V = R area). A fixed, contiguous section of real storage, starting at page 0, in which preferred virtual machines execute. CP does not page this storage. See also preferred virtual machine, virtual = fixed machine, virtual = real machine.

virtual = real machine (V = R machine). A preferred virtual machine with a fixed, contiguous area of host real storage that starts at page 0. CP provides performance enhancements and an automatic recovery facility for this virtual machine. See also multiple preferred guests, preferred virtual machine, virtual = real area, virtual = real machine recovery, virtual = virtual machine.

virtual = real machine recovery (V = R machine recovery). A CP function that allows the V = R machine to resume operation after most CP abnormal terminations. When possible, the facility reestablishes the V = R machine environment, allowing the operating system running in that virtual machine to perform its own recovery processes. See also automatic software re-IPL.

virtual = virtual machine (V = V machine). A virtual machine that runs in the dynamic paging area. CP pages this virtual machine's guest real storage in and out of host real storage. See also dynamic paging area, virtual = fixed machine, virtual = real machine.

virtual supervisor state. A condition, controlled by a virtual machine's current PSW, during which the control program allows the virtual machine to issue input/output and other privileged instructions. When these instructions are not emulated, the control program intercepts these instructions and simulates their functions for the virtual machine.

virtual wait time. The period during which the control program suspends the processing of a program while a required resource is unavailable.

VM/XA SP. Virtual Machine/Extended Architecture System Product.

VTAM service machine. A collection of networking programs running in a virtual machine that, together with the CP console communication services (CCS) routines, provide full VM/XA SP console capabilities for SNA/CCS terminal users. A VTAM service machine contains either (1) VM/VTAM with VSCS running as an application under control of GCS, or (2) VM/VCNA running as a VTAM application under control of the VSE or VS1 operating system.

V=R area. Virtual=real area.

V=R machine. Virtual=real machine.

V=R machine recovery. Virtual=real machine recovery.

V=V machine. Virtual=virtual machine.

Numerics

370 mode. Synonym for System/370 mode.

370-XA mode. A virtual machine operating mode in which System/370-Extended Architecture functions are simulated. Contrast with System/370 mode.

Index

T

U

V

**Virtual Machine/
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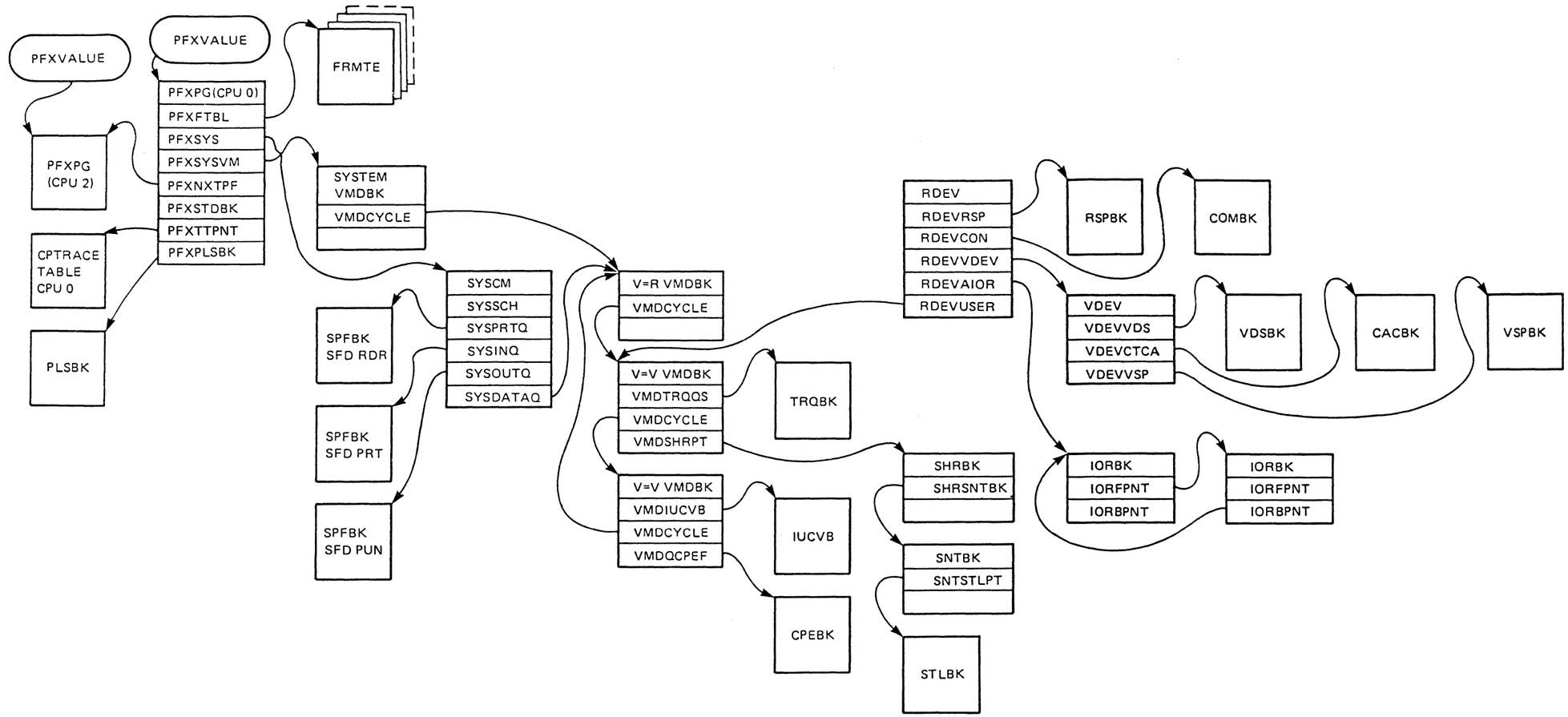

Figure 9. The Relationship of Some Major CP Control Blocks

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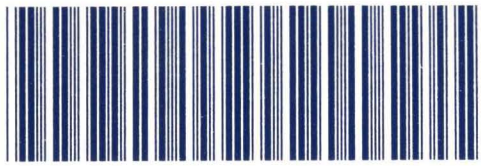

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