Note
Before using this information and the product it supports, read the information in “Notices” on page 671.

This edition applies to Version 2 Release 3 of z/OS (5650-ZOS) and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this information

This information covers the tools and service aids that IBM® provides for use in diagnosing MVS™ problems.

Chapter 1, “Selecting tools and service aids,” on page 1 contains a guide on how to select the appropriate tool or service aid for your purposes. It also provides an overview of all the tools and service aids available.

Each subsequent chapter covers one of the tools or service aids. While topics vary, the following topics are typically covered for each tool or service aid:

• Customizing and planning information
• Starting and stopping the tool or service aid
• Receiving, formatting, and reading the output from the tool or service aid.

At the beginning of each chapter, there is a short editorial style comment that is intended to characterize the tool or service aid that is covered in the chapter.

Who should use this information

This information is for anyone who diagnoses software problems that occur on the operating system. This person is usually a system programmer for the installation. This information is also for application programmers who are testing their programs.

This information assumes that the reader:

• Understands basic system concepts and the use of system services
• Codes in Assembler language, and reads Assembler and linkage editor output
• Codes JCL statements for batch jobs and cataloged procedures
• Understands the commonly used diagnostic tasks and aids, such as message logs, dumps, and the interactive problem control system (IPCS)
• Understands how to search the problem reporting databases
• Understands the techniques for reporting problems to IBM

z/OS information

This information explains how z/OS references information in other documents and on the web.

When possible, this information uses cross document links that go directly to the topic in reference using shortened versions of the document title. For complete titles and order numbers of the documents for all products that are part of z/OS, see z/OS Information Roadmap.

To find the complete z/OS® library, go to IBM Knowledge Center (www.ibm.com/support/knowledgenter/SSLTBW/welcome).

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Feedback on IBM Knowledge Center function
If your comment or question is about the IBM Knowledge Center functionality, for example search capabilities or how to arrange the browser view, send a detailed email to IBM Knowledge Center Support at ibmkc@us.ibm.com.

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• Your name, company/university/institution name, and email address
• The following deliverable title and order number: z/OS MVS Diagnosis: Tools and Service Aids, GA32-0905-30
• The section title of the specific information to which your comment relates
• The text of your comment.

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• Call IBM technical support.
Summary of changes

This information includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations for the current edition are indicated by a vertical line to the left of the change.

Summary of changes for z/OS MVS Diagnosis: Tools and Service Aids for Version 2 Release 3

The following changes are made for z/OS Version 2 Release 3 (V2R3).

New and changed

- For APAR OA55959, Chapter 19, “AMAPDUPL: Problem Documentation Upload Utility,” on page 631 has been updated.
- For APAR OA54807, in Chapter 8, “System trace,” on page 155, information about ssid 0151 has been added to “SSRV trace entries” on page 189.
- For APAR OA54086, the IBM z/OS Problem Documentation Upload Utility (PDUU) is updated to allow AMAPDUPL to accept a CASE number in place of a PMR number. See “JCL statements for PDUU” on page 632.
- Updates for APAR OA50653: z/OS zHyperLinks Support in the following sections:
  - System trace: “Summary of system trace entry identifiers” on page 158 and “SYNS and SYNE trace entries” on page 202.
  - Generalized trace facility (GTF) trace:
    - “GTF trace options” on page 228
    - “Prompting keywords” on page 233
    - “Reading GTF output” on page 243
    - “Trace record identifiers” on page 245
    - “SYNS and SYNE trace records” on page 286
    - “SYNCH I/O trace records” on page 287
  - Updates to “Stopping GTF” on page 227.
- The IOSQTim field has been added to the EOS, IO, IOCS, and PCI records in “EOS, INTG, IO, IOCS, and PCI trace records” on page 256.
- A PRECHECK option was added to the PARM parameter for SPZAP to check the SYSIN input for errors before any updates are made to the target dataset. For more information, see “Running SPZAP” on page 604.
- Chapter 11, “The Generic Tracker (GTZ),” on page 323 was updated to include:
  - “JES2 control statement tracking” on page 348.
  - “TSO/E tracking” on page 351.
- Updates were made to:
  - “MVS Allocation tracking” on page 350.
  - “SDSF tracking” on page 350.
- The syntax and examples have been updated in “Using the AMDSADDD utility” on page 81.
- The CP column of the system trace table was changed from 2 characters to 4 characters. For more information, see Chapter 8, “System trace,” on page 155.
Summary of changes for z/OS MVS Diagnosis: Tools and Service Aids for Version 2 Release 2 (V2R2) as updated September 2016

The following changes are made for z/OS V2R2 as updated September 2016.

General content changes for z/OS MVS Diagnosis: Tools and Service Aids

The following content is new, changed, or no longer included in V2R2 as updated September 2016.

New

The following content is new.

- MGMTCLAS was added to the JCL statements for the Problem Documentation Upload Utility (PDUU). For more information, see “JCL statements for PDUU” on page 632.
- A new PDUU example was added. For more information, see “Example 12: Using a proxy server with multiple FTPCMDs DD statements” on page 643.
- The REAL parameter was added to the AMDSADMP macro. For more information, see “Syntax of the AMDSADMP macro” on page 70.

Changed

The following content is changed.

- All of the system trace entries in Chapter 8, “System trace,” on page 155 were updated with the latest format.
- The event identifiers for USR trace records were updated. For more information, see “Event Identifiers (EIDs) for USR trace records” on page 297.
- The information about naming a logrec log stream was updated. For more information, see “Defining a logrec log stream” on page 516.
- The information about the available DASD space needed for SADMP was updated. For more information, see “If I do dump to DASD, how much space do I need?” on page 62.

Summary of changes for z/OS MVS Diagnosis: Tools and Service Aids for Version 2 Release 2 (V2R2) as updated December 2015

The following changes are made for z/OS V2R2 as updated December 2015.

General content changes for z/OS MVS Diagnosis: Tools and Service Aids

The following content is new, changed, or no longer included in V2R2 as updated December 2015.

New

The following content is new.

- SYSDUMP component trace was added to the SDUMP component. For more information, see “SYSDUMP component trace” on page 406.
- CTIDMPxx parmlib member was added. For more information, see “Planning for component tracing” on page 354.
Summary of changes for z/OS MVS Diagnosis: Tools and Service Aids for Version 2 Release 2

The following changes are made for z/OS Version 2 Release 2 (V2R2).

New

• New section about JES3 control statement tracking in Chapter 11, “The Generic Tracker (GTZ),” on page 323. For more information, see “JES3 control statement tracking” on page 347.
• New topic about changing the logrec recording medium. For more information, see “Changing the logrec recording medium” on page 518.
• New subsections for the GTZLQRY REXX callable function, data persistence, and simplified generic tracking services added to the generic tracker facility section. For more information, see Chapter 11, “The Generic Tracker (GTZ),” on page 323.

Changed

• Information about recording logrec error records was updated for new functionality. For more information, see Chapter 15, “Recording logrec error records,” on page 513.
• An update to the RMODE field was added to the AMBLIST output for LISTLOAD OUTPUT=XREF. For more information, see “LISTLOAD OUTPUT=XREF output” on page 575.
• The SYSXES component trace information has been updated about the SYSXES trace buffer size. For more information, see “Prepare for specific component traces on systems in a sysplex” on page 370 and “CTnXESxx parmlib member” on page 497, and “Requesting a SYSXES trace” on page 497.

Summary of changes for z/OS Version 2 Release 1 (V2R1) as updated February 2015

The following changes are made for z/OS Version 2 Release 1 (V2R1) as updated February 2015. In this revision, all technical changes for z/OS V2R1 are indicated by a vertical line to the left of the change.

New

• The HCAS (HCSAbyASID), HCNO (HCSANoOwner), and HCSY (HCSASysOwner) options were added to the SDATA parameter. For details, see “Customized contents using the SDATA parameter” on page 24.

Changed

• The CSA option on the SDATA parameter was updated for high virtual storage. For details, see “Customized contents using the SDATA parameter” on page 24.

Summary of changes for z/OS Version 2 Release 1 (V2R1) as updated March 2014

The following changes are made for z/OS Version 2 Release 1 (V2R1) as updated March 2014. In this revision, all technical changes for z/OS V2R1 are indicated by a vertical line to the left of the change.

New

• Various new and changed topics document new support for internal flash memory exploitation. The coupling facility can now migrate objects out to storage-class memory (SCM) when the number of objects exceeds a calculated threshold, then it can fetch the objects back into main CF storage when requested.
Various new and changed topics document support for the new XCF Note Pad Service function. The XCF Note Pad Service is a new application programming interface that allows programs to manipulate notes in an XCF note pad. A note pad is an abstraction layered on top of the existing coupling facility list structure interfaces. You can use the new IXCNOTE macro to manipulate data in a coupling facility list structure, provided the note pad abstraction meets the needs of the application.

z/OS Version 2 Release 1 summary of changes

See the Version 2 Release 1 (V2R1) versions of the following publications for all enhancements related to z/OS V2R1:

- z/OS Migration
- z/OS Planning for Installation
- z/OS Summary of Message and Interface Changes
- z/OS Introduction and Release Guide
Chapter 1. Selecting tools and service aids

This topic introduces the tools and service aids that MVS provides for diagnosis. For the purposes of this document, **tools** includes dumps and traces, while **service aids** include the other facilities provided for diagnosis. For example:

- SVC dump and system trace are tools
- Logrec data set and AMBLIST are service aids.

There are major two topics:

- **“How do I know which tool or service aid to select?”** on page 1 - This topic lists problem types and matches them with the appropriate service aid or the appropriate tool. Use this topic to select the tool or service aid you need for a particular problem.
- **“What tools and service aids are available?”** on page 2 - This topic describes each tools and service aids, including when to use it for diagnosis. Use this topic when you need an overview of tools and service aids available or to find the appropriate time to use a particular tool or service aid.

### How do I know which tool or service aid to select?

This topic contains tables that provide criterion for selecting a tool or service aid, depending on the problem or need. The tables show the problem or need, the corresponding tool or service aid, and the topic or document that covers it in complete detail. (Most of the detailed information on tools and service aids is in this document.) Use these tables to quickly find a tool or service aid.

**Table 1** on page 1 provides guidance on how to select the type of dump to use for a specific problem.

<table>
<thead>
<tr>
<th>What is the problem or need?</th>
<th>Type of dump to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing of an authorized program or a problem program while it is running, especially for 64-bit applications</td>
<td>Transaction dump (see Chapter 3, “Transaction dump,” on page 51)</td>
</tr>
<tr>
<td>Testing of a problem program while it is running</td>
<td>SNAP dump (see Chapter 6, “SNAP dump,” on page 143)</td>
</tr>
<tr>
<td>Abnormal end of an authorized program or a problem program</td>
<td>ABEND dump (see Chapter 5, “ABEND dump,” on page 123)</td>
</tr>
<tr>
<td>System problem when the system continues processing</td>
<td>SVC dump (see Chapter 2, “SVC dump,” on page 7)</td>
</tr>
<tr>
<td>System problem when the system stops processing or is stopped by the operator because of slowdown or looping</td>
<td>Stand-alone dump (see Chapter 4, “Stand-alone dump,” on page 61)</td>
</tr>
</tbody>
</table>

**Table 2** on page 1 provides guidance on how to select the type of trace to use for a specific problem.

<table>
<thead>
<tr>
<th>What is the problem or need?</th>
<th>Type of trace to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>System problem: diagnosis requires checking of component events</td>
<td>Component trace (see Chapter 12, “Component trace,” on page 353)</td>
</tr>
<tr>
<td>System problem: diagnosis requires detailed checking of one or two system events</td>
<td>Generalized trace facility (GTF) trace (see Chapter 10, “The Generalized Trace Facility (GTF),” on page 213)</td>
</tr>
</tbody>
</table>
Table 2. Selecting a trace (continued)

<table>
<thead>
<tr>
<th>What is the problem or need?</th>
<th>Type of trace to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>System or authorized program problem: diagnosis requires the messages related to a dump</td>
<td>Master trace (see Chapter 9, “Master trace,” on page 207)</td>
</tr>
<tr>
<td>System problem: diagnosis requires checking many system events</td>
<td>System trace (see Chapter 8, “System trace,” on page 155)</td>
</tr>
<tr>
<td>System or problem program: diagnosis requires information about allocation of virtual storage.</td>
<td>GETMAIN, FREEMAIN, STORAGE (GFS) trace (see Chapter 14, “GETMAIN, FREEMAIN, STORAGE (GFS) trace,” on page 507)</td>
</tr>
</tbody>
</table>

Table 3 on page 2 provides guidance on how to select the service aid to use for a specific problem.

Table 3. Selecting a service aid

<table>
<thead>
<tr>
<th>What is the problem or need?</th>
<th>Type of service aid to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>System or hardware problem: need a starting point for diagnosis or when diagnosis requires an overview of system and hardware events in chronological order.</td>
<td>Logrec data set (see Chapter 15, “Recording logrec error records,” on page 513)</td>
</tr>
<tr>
<td>Information about the content of load modules and program objects or problem with modules on system.</td>
<td>AMBLIST (see Chapter 16, “AMBLIST: Map load modules and program objects,” on page 537)</td>
</tr>
<tr>
<td>Diagnosis requires dynamic change to a program, such as fixing program errors, inserting a SLIP trap match, or altering a program to start component trace.</td>
<td>SPZAP (see Chapter 17, “SPZAP: Modify data in programs and VTOCs,” on page 593)</td>
</tr>
<tr>
<td>Need to pack the diagnostic materials for transmission to another site, and create similar data sets at the receiving site.</td>
<td>AMATERSE (see Chapter 18, “AMATERSE: Pack and unpack a data set,” on page 625)</td>
</tr>
<tr>
<td>Need to eliminate duplicate or unneeded dumps.</td>
<td>DAE (see Chapter 20, “Dump suppression,” on page 647)</td>
</tr>
<tr>
<td>Diagnosis requires a trap to catch problem data while a program is running.</td>
<td>SLIP (see z/OS MVS System Commands)</td>
</tr>
<tr>
<td>Diagnosis requires formatted output of problem data, such as a dump or trace.</td>
<td>IPCS (see z/OS MVS IPCS User’s Guide)</td>
</tr>
</tbody>
</table>

What tools and service aids are available?

This topic provides an overview of the tools and service aids in more detail. The tables that follow contain a brief description of each tool or service aid, some reasons why you would use it, and a reference to the topic or document that covers the tool or service aid in detail. (Most of the detailed information on tools and service aids is in this document.) The tools and service aids are covered in three tables; the dumps, traces, or service aids are listed in order by frequency of use.

Table 4 on page 3 lists each type of dump and gives an overview of how they can be used.
## Table 4. Description of dumps

<table>
<thead>
<tr>
<th>Type of dump</th>
<th>Description</th>
</tr>
</thead>
</table>
| **ABEND Dump**    | Use an ABEND dump when ending an authorized program or a problem program because of an uncorrectable error. These dumps show:  
• The virtual storage for the program requesting the dump.  
• System data associated with the program.  
The system can produce three types of ABEND dumps, SYSABEND, SYSMDUMP, and SYSUDUMP. Each one dumps different areas. Select the dump that gives the areas needed for diagnosing your problem. The IBM supplied defaults for each dump are:  
• SYSABEND dumps - The largest of the ABEND dumps, containing a summary dump for the failing program plus many other areas useful for analyzing processing in the failing program.  
• SYSMDUMP dumps - Contains a summary dump for the failing program, plus some system data for the failing task. SYSMDUMP dumps are the only ABEND dumps that you can format with IPCS.  
• SYSUDUMP dumps - The smallest of the ABEND dumps, containing data and areas only about the failing program.  
**Reference:** See Chapter 5, “ABEND dump,” on page 123 for detailed information. |
| **Transaction Dump (IEATDUMP)** | Similar to SNAP dumps, an application can issue an IEATDUMP macro to dump virtual storage areas of interest if the application is running. However, the result is an unformatted dump that must be analyzed using IPCS. See Chapter 3, “Transaction dump,” on page 51 for details. |
| **SNAP Dump**     | Use a SNAP dump when testing a problem program. A SNAP dump shows one or more areas of virtual storage that a program, while running, requests the system to dump. A series of SNAP dumps can show an area at different stages in order to picture a program’s processing, dumping one or more fields repeatedly to let the programmer check intermediate steps in calculations. SNAP dumps are preformatted, you cannot use IPCS to format them.  
Note that a SNAP dump is written while a program runs, rather than during abnormal end.  
**Reference:** See Chapter 6, “SNAP dump,” on page 143 for detailed information. |
| **Stand-Alone Dump** | Use a stand-alone dump when:  
• The system stops processing.  
• The system enters a wait state with or without a wait state code.  
• The system enters an instruction loop.  
• The system is processing slowly.  
These dumps show central storage and some paged-out virtual storage occupied by the system or stand-alone dump program that failed. Stand-alone dumps can be analyzed using IPCS.  
**Reference:** See Chapter 4, “Stand-alone dump,” on page 61 for detailed information. |
| **SVC Dumps**     | SVC dumps can be used in two different ways:  
• Most commonly, a system component requests an SVC dump when an unexpected system error occurs, but the system can continue processing.  
• An authorized program or the operator can also request an SVC dump when they need diagnostic data to solve a problem.  
SVC dumps contain a summary dump, control blocks and other system code, but the exact areas dumped depend on whether the dump was requested by a macro, command, or SLIP trap. SVC dumps can be analyzed using IPCS.  
**Reference:** See Chapter 2, “SVC dump,” on page 7 for detailed information. |

Table 5 on page 4 lists each type of trace and gives an overview of how they can be used.
Table 5. Description of traces

<table>
<thead>
<tr>
<th>Trace</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component Trace</td>
<td>Use a component trace when you need trace data to report an MVS component problem to the IBM Support Center. Component tracing shows processing within an MVS component. Typically, you might use component tracing while recreating a problem. The installation, with advice from the IBM Support Center, controls which events are traced for a component. Reference: See Chapter 12, “Component trace,” on page 353 for detailed information.</td>
</tr>
<tr>
<td>GFS Trace</td>
<td>Use GFS trace to collect information about requests for virtual storage through the GETMAIN, FREEMAIN, and STORAGE macro. Reference: See Chapter 14, “GETMAIN, FREEMAIN, STORAGE (GFS) trace,” on page 507 for detailed information.</td>
</tr>
<tr>
<td>GTF Trace</td>
<td>Use a GTF trace to show system processing through events occurring in the system over time. The installation controls which events are traced. GTF tracing uses more resources and processor time than a system trace. Use GTF when you are familiar enough with the problem to pinpoint the one or two events required to diagnose your system problem. GTF can be run to an external data set as well as a buffer. Reference: See Chapter 10, “The Generalized Trace Facility (GTF),” on page 213 for detailed information.</td>
</tr>
<tr>
<td>Master Trace</td>
<td>Use the master trace to show the messages most recently issued. Master trace is useful because it provides a log of these messages in a dump. These can be more pertinent to your problem than the messages accompanying the dump itself. Reference: See Chapter 9, “Master trace,” on page 207 for detailed information.</td>
</tr>
<tr>
<td>System Trace</td>
<td>Use system trace to see system processing through events occurring in the system over time. System tracing is activated at initialization and, typically, runs continuously. It records many system events, with minimal detail about each. The events traced are predetermined, except for branch tracing. This trace uses fewer resources and is faster than a GTF trace. Reference: See Chapter 8, “System trace,” on page 155 for detailed information.</td>
</tr>
</tbody>
</table>

Table 6 on page 4 describes the service aids and how they can be used.

Table 6. Description of service aids

<table>
<thead>
<tr>
<th>Service Aid</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMATERSE</td>
<td>Use the AMATERSE service aid to create a compact image of diagnostic data sets. The compact image helps to use less space while retaining materials and prepare for efficient transmission of materials from one site to another, such as to send the materials to IBM support.</td>
</tr>
<tr>
<td>AMBLIST</td>
<td>Use AMBLIST when you need information about the content of load modules and program objects or you have a problem related to the modules on your system. AMBLIST is a program that provides lots of data about modules in the system, such as a listing of the load modules, map of the CSECTs in a load module or program object, list of modifications in a CSECT, map of modules in the LPA (link pack area), and a map of the contents of the DAT-on nucleus. Reference: See Chapter 16, “AMBLIST: Map load modules and program objects,” on page 537 for detailed information.</td>
</tr>
<tr>
<td>Service Aid</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Common Storage Tracking** | Use common storage tracking to collect data about requests to obtain or free storage in CSA, ECSA, SQA, and ESQA. This is useful to identify jobs or address spaces using an excessive amount of common storage or ending without freeing storage. Use RMF or the IPCS VERBEXIT VSMDATA subcommand to display common storage tracking data. **References:**  
  - See *z/OS MVS Initialization and Tuning Guide* for detailed information on requesting common storage tracking.  
  - See the VSM chapter of *z/OS MVS Diagnosis: Reference* for information on the IPCS VERBEXIT VSMDATA subcommand. |
| **DAE**              | Use dump analysis and elimination (DAE) to eliminate duplicate or unneeded dumps. This can help save system resources and improve system performance. **Reference:** See Chapter 20, “Dump suppression,” on page 647 for detailed information. |
| **IPCS**             | Use IPCS to format and analyze dumps, traces, and other data. IPCS produces reports that can help in diagnosing a problem. Some dumps, such as SNAP and SYSABEND and SYSUDUMP ABEND dumps, are preformatted, and are not formatted using IPCS. **Reference:** See *z/OS MVS IPCS User’s Guide* for detailed information. |
| **Logrec Data Set**  | Use the logrec data set as a starting point for problem determination. The system records hardware errors, selected software errors, and selected system conditions in the logrec data set. Logrec information gives you an idea of where to look for a problem, supplies symptom data about the failure, and shows the order in which the errors occurred. **Reference:** See Chapter 15, “Recording logrec error records,” on page 513 for detailed information. |
| **SLIP Traps**       | Use serviceability level indication processing (SLIP) to set a trap to catch problem data. SLIP can intercept program event recording (PER) or error events. When an event that matches a trap occurs, SLIP performs the problem determination action that you specify:  
  - Requesting or suppressing a dump.  
  - Writing a trace or a logrec data set record.  
  - Giving control to a recovery routine.  
  - Putting the system in a wait state.  
  - Issuing system commands **Reference:** See the SLIP command in *z/OS MVS System Commands* for detailed information. |
| **SPZAP**            | Use the SPZAP service aid to dynamically update and maintain programs and data sets. For problem determination, you can use SPZAP to:  
  - Fix program errors by replacing a few instructions in a load module or member of a partitioned data set (PDS).  
  - Insert an incorrect instruction in a program to force an ABEND or make a SLIP trap work.  
  - Alter instructions in a load module to start component trace.  
  - Replace data directly on a direct access device to reconstruct a volume table of contents (VTOC) or data records that were damaged by an input/output (I/O) error or program error. **Reference:** See Chapter 17, “SPZAP: Modify data in programs and VTOCs,” on page 593 for detailed information. |
Selecting tools and service aids
Chapter 2. SVC dump

An SVC dump provides a representation of the virtual storage for the system when an error occurs. Typically, a system component requests the dump from a recovery routine when an unexpected error occurs. However, an authorized program or the operator can also request an SVC dump when diagnostic dump data is needed to solve a problem.

An SVC dump comes in the following types, depending on how it was requested. Note that the type of dump requested determines its contents.

- **Asynchronous SVC dump (scheduled SVC dump):**
  The system issues an instruction or the caller uses a combination of parameters on the SVC dump macro invocation. SVC dump captures all of the dump data into a set of data spaces then writes the dump data from the data spaces into a dump data set. The system is available for another SVC dump upon completion of the capture phase of the dump. In an asynchronous SVC dump, the summary dump data is captured first and can be considered more useful for diagnosis.

- **Synchronous SVC dump:**
  The requester's SVC dump macro invocation issues an instruction to obtain the dump under the current task. The system returns control to the requester once the dump data has been captured into a set of data spaces. SVC dump processing then writes the dump data from the data spaces into a dump data set. The system is available for another SVC dump upon completion of the capture phase of the dump. In a synchronous SVC dump, the summary dump data is captured last.

Each SVC dump also contains a summary dump, if requested. Because dumps requested from disabled, locked, or SRB-mode routines cannot be handled by SVC dump immediately, system activity overwrites much useful diagnostic data. The summary dump supplies copies of selected data areas taken at the time of the request. Specifying a summary dump also provides a means of dumping many predefined data areas simply by specifying one option. Summary dump data is dumped using ASID(X'aaaa') SUMDUMP records and ASID(X'aaaa') DSPNAME(dddddddd) SUMDUMP records. The IPCS user has the option of causing storage dumped in these records also to be mapped as ASID(X'aaaa') or ASID(X'aaaa') DSPNAME(dddddddd) storage. Message BLS18160D is displayed during dump initialization when TSO prompting and IPCS confirmation options permit. If the TSO prompting and the IPCS confirmation options don't permit, the additional mapping is performed. Selective display of ASID(X'aaaa') SUMDUMP or ASID(X'aaaa') DSPNAME(dddddddd) SUMDUMP storage might be requested by referring to those address spaces.

This section includes information system programmers need to know about SVC dump and SVC dump processing:

- “Using automatically allocated dump data sets” on page 8
- “Using pre-allocated dump data sets” on page 12
- “Choosing SVC dump data sets” on page 13
- “Obtaining an SVC dump” on page 16
- “Printing, viewing, copying, and clearing a pre-allocated or SYS1.DUMPxx data set” on page 22
- “Contents of SVC dumps” on page 23
- “Analyzing summary SVC dumps” on page 34
- “Analyzing an SVC dump” on page 37

See z/OS MVS Programming: Authorized Assembler Services Guide for information any programmer needs to know about programming the SDUMP or SDUMPX macros to obtain an SVC dump:

- Deciding when to request an SVC dump
- Understanding the types of SVC dumps that MVS produces
• Designing an application program to handle a specific type of SVC dump
• Identifying the data set to contain the dump
• Defining the contents of the dump
• Suppressing duplicate SVC dumps using dump analysis and elimination (DAE)

Planning data set management for SVC dumps

SVC dump processing stores data in dump data sets that the system allocates automatically, as needed, or that you pre-allocate manually. IBM recommends the use of automatically allocated dump data sets whenever possible. Only the space required for the dump being written is allocated. The dump is written using a system-determined block size, so write time is reduced. SMS extended attributes, such as compression and striping, can be assigned to further reduce the amount of space required and the time to write.

IBM recommends using extended format sequential data sets as dump data sets for SVC Dumps. For the reasons why, see “Choosing SVC dump data sets” on page 13.

Use pre-allocated dump data sets only as a back up, in case the system is not able to automatically allocate a data set. Otherwise, the dump can become truncated, making error diagnosis difficult.

Using automatically allocated dump data sets

SVC dump processing supports automatic allocation of dump data sets at the time the system writes the dump to DASD. Automatically allocated dumps will be written using the system-determined block size. The dump data sets can be allocated as SMS-managed or non-SMS-managed, depending on the VOLSER or SMS classes defined on the DUMPDS ADD command. When the system captures a dump, it allocates a data set of the correct size from the resources you specify. See “Choosing SVC dump data sets” on page 13 for DFSMS support of extended format sequential data sets. Using Extended Format Sequential data sets, the maximum size of the dump can exceed the size allowed for non-SMS managed data sets.

If automatic allocation fails, pre-allocated dump data sets are used. If no pre-allocated SYS1.DUMPnn data sets are available, message IEA793A is issued, and the dump remains in virtual storage. SVC Dump periodically retries both automatic allocation and writing to a pre-allocated dump dataset until successful or until the captured dump is deleted either by operator intervention or by the expiration of the CHNGDUMP MSGTIME parameter governing message IEA793A. If you set the MSGTIME value to 0, the system will not issue the message, and it deletes the captured dump immediately.

Naming automatically allocated dump data sets

The installation has control of the name of the data sets created by the automatic allocation function, and you can select a name-pattern to allow for dump data set organization according to your needs. The name is determined through an installation-supplied pattern on the DUMPDS command. A set of symbols is available so that you can include the following kinds of information in the names of your automatically allocated dump data sets:

• System name
• Sysplex name
• Job name
• Local and GMT time and date
• Sequence number

You can specify a name-pattern to generate any name acceptable under normal MVS data set name standards. The only requirement is that you include the sequence number symbol to guarantee each automatically allocated dump data set has a unique name.
Using automatic allocation of SVC dump data sets

You can specify the command instructions to enable or disable automatic allocation either in the COMMNDxx parmlib member, to take effect at IPL, or from the operator console at any time after the IPL, to dynamically modify automatic allocation settings. The DUMPDS command provides the following flexibility:

- Activate automatic allocation of dump data sets
- Add or delete allocation resources
- Direct automatic allocation to SMS or non-SMS managed storage
- Deactivate automatic allocation of dump data sets
- Reactivate automatic allocation of dump data sets
- Change the dump data set naming convention

Set up automatic allocation with the following steps:

- Set up allocation authority
- Establish a name pattern for the data sets
- Define resources for storing the data sets
- Activate automatic allocation

After automatic allocation of these SVC dump data sets is active, allocation to a DASD volume is done starting with the first resource allocated via the DUMPDS ADD command. When allocation to that volume is no longer successful, the next resource is then used.

SVC Dump data sets can be SMS-managed or non-SMS-managed. If the DUMPDS ADD command defined SMS classes, then the allocation will first pass these classes to the ACS routines to try to allocate the SVC dump data set as SMS-managed. If this allocation is not successful for any reason, or if no SMS classes are defined, then the data set allocation will use the DASD volumes that were defined on the DUMPDS ADD command, and the SVC Dump data set will be allocated as non-SMS-managed.

SVC Dump data sets allocated as non-SMS-managed must be single volume; they can have multiple extents but they cannot span multiple volumes. Non-SMS-managed DASD does not support striping. SVC Dump data sets allocated as SMS-managed can be multi-volume only if they are allocated as striped data sets. Striping is an attribute that must be defined in the SMS classes. Striping and compression, another SMS attribute, can be used to allocate datasets that are larger than those allowed for a pre-allocated or non-SMS managed dataset.

**Note:** You must update automatic class selection (ACS) routines to route the intended data set into SMS-management so that it is assigned a storage class.

Setting up allocation authority

To allocate dump data sets automatically, the DUMPSRV address space must have authority to allocate new data sets. Do the following:

1. **Associate the DUMPSRV address space with a user ID.**
   - Use the RACF® STARTED general resource class or the RACF Started Procedures Table, ICHRIN03, to associate DUMPSRV with a user id.

2. **Authorize DUMPSRV's user ID to create new dump data sets using the naming convention in the following topic.**
   - With the high-level qualifier of SYS1, the data sets are considered group data sets. You can assign CREATE group authority to the DUMPSRV user ID within that group.

Establishing a name pattern

Establishing the name pattern for the dump data sets is accomplished by the DUMPDS NAME= command. Names must conform to standard data set naming conventions and are limited to 44 characters, including periods used as delimiters between qualifiers. For a complete description, see z/OS DFSMS Using Data Sets. To allow meaningful names for the dump data sets, several symbols are provided that are resolved when the dump data is captured in virtual storage. For a complete list of the symbols you can use, see the explanation of DUMPDS NAME= in z/OS MVS System Commands.

When determining the pattern for the dump data set names, consider any automation tools you may have at your installation that work on dump data sets. Also, the automatic allocation function requires you to include the &SEQ. sequence number symbol in your data set name pattern to guarantee unique data set names. If you do not use the sequence number, the system rejects the name pattern with message IEE855I and the previous name pattern remains in effect.

By default, the system uses one of three name patterns. The system typically uses the normal pattern SYS1.DUMP.D&DATE..T&TIME..&SYSNAME..S&SEQ:. The system automatically uses &SYSNAME convention when the system name begins with numeric and is less than 8 characters long. For example:

- SYS1.DUMP.D&YYMMDD..T&HHMMSS..&SYSNAME..S&SEQ or
- SYS1.DUMP.D&YYMMDD..T&HHMMSS..&SYSNAME(2&colon.8)..<S&SEQ when the system name begins with numeric and is 8 characters long.

Figure 1 on page 10 describes the default name pattern.

![Default name pattern for automatically allocated dump data set](image)

Figure 1. Default name pattern for automatically allocated dump data set

**Note:** While the default data sets begin with a high-level qualifier of SYS1, this convention is no longer a requirement for data sets named by your installation.

Notice that the symbols are resolved into date, time, and sequence numerics, so they are preceded by an alphabetic character to conform to MVS data set name requirements. Also, the symbol starts with an ampersand (&) and ends with a period (.), resulting in a name pattern that has double periods when a symbol finishes a qualifier. One period ends the symbol, and the second serves as the delimiter between qualifiers of the generated data set name.

Defining resources for dump data sets

If allocation is active, SVC dump data sets can be automatically allocated as soon as resources are defined to store them. If you have not changed the name pattern, then the system default is used. See “Establishing a name pattern” on page 10. You can define dump data set resources using the DUMPDS ADD,VOL=volser (for DASD volumes) and DUMPDS ADD,SMS=class (for SMS classes) commands. You can remove resources using the DUMPDS DEL,VOL=volser and DUMPDS DEL,SMS=class commands. Automatic allocation is directed to SMS classes in preference to DASD volumes.

When automatic allocation is inactive, dumps are written to pre-allocated SYS1.DUMPxx data sets. Deactivating automatic allocation does not result in the loss of resource definitions, however. So, if automatic allocation is reactivated, all the previous resources remain available for receiving automatically allocated dump data sets. Similarly, removing the last allocation resource will not cause automatic
allocation to be inactive. Removing the last allocation resource effectively ‘turns off’ the function, though, just as if all the defined resources were full. In both cases the system responds with message IEA799I and dumps are written to pre-allocated SYS1.DUMPxx data sets if they exist. Otherwise the dump remains captured until:

- You create a place for it
- The established time limit, as indicated by the CHNGDUMP MSGTIME parameter, expires
- The operator deletes the dump.

**Activating automatic allocation**

By default, automatic allocation is inactive after IPLing the system. However, you can add to your COMMNDxx parmlib member the DUMPDS NAME= command, any DUMPDS ADD commands, and the DUMPDS ALLOC=ACTIVE command to activate automatic allocation during IPL.

If you have turned off automatic allocation using ALLOC=INACTIVE, reactivate it by entering the DUMPDS ALLOC=ACTIVE operator command.

**Verifying dump status**

To verify dump status issue the DISPLAY DUMP,STATUS command. For example, after IPLing SYSTEM1 specifying DUMP=NO as a system parameter, and without requesting any dumps or specifying any DUMPDS or CHNGDUMP commands, the output shown in Figure 2 on page 11 would be expected as a result of the DISPLAY DUMP,STATUS command:

```
IEE852I 10.56.03 SYS1.DUMP STATUS
SYS1.DUMP DATA SETS AVAILABLE=000 AND FULL=000
CAPTURED DUMPS=0000, SPACE USED=00000000M, SPACE FREE=00000500M
AUTOMATIC ALLOCATION IS: INACTIVE
NO SMS CLASSES DEFINED
NO DASD VOLUMES DEFINED
NAME=SYS1.DUMP.D&DATE..T&TIME..&SYSNAME..S&SEQ.
EXAMPLE=SYS1.DUMP.D930324.T105603.SYSTEM1.S00000
```

*Figure 2. Example: verifying dump status*

Now assume that the following steps are performed to establish the automatic allocation function:

1. Set up your installation data set name pattern using the DUMPDS command:

   ```
   ```

   **Note:** This step is only required if you are not using the default name pattern as shown in Figure 1 on page 10.

2. Add dump data set resources that can be used by the automatic allocation function:

   ```
   DUMPDS ADD,VOL=(SCRTH1,HSM111)
   DUMPDS ADD,SMS=(DUMPDA)
   ```

3. Activate automatic dump data set allocation using the DUMPDS command:

   ```
   DUMPDS ALLOC=ACTIVE
   ```

   **Note:** These steps can be performed after IPL using the DUMPDS command from an operator console, or early in IPL by putting the commands in the COMMNDxx parmlib member and pointing to the member from the IEASYSxx parmlib member using CMD=xx.

   If you use COMMNDxx, you may want to specify DUMP=NO in the IEASYSxx parmlib member to prevent dumps taken during IPL from being written to SYS1.DUMPxx data sets.
After issuing the DUMPDS commands shown in steps “1” on page 11 through “3” on page 11, requesting dump status would be as shown Figure 3 on page 12.

```
SYSTEM1  IEE852I 12.34.18 SYS1.DUMP STATUS 886
SYS1.DUMP DATA SETS AVAILABLE=000 AND FULL=000
CAPTURED DUMPS=0000, SPACE USED=00000000M, SPACE FREE=00000500M
AUTOMATIC ALLOCATION IS: ACTIVE
AVAILABLE SMS CLASSES: DUMPD
AVAILABLE DASD VOLUMES: SCRTH1,HSM111
   EXAMPLE=SYSTEM1.#MASTER#.Y1994M01.D26T1634.S00000
```

**Figure 3. Example of dump status**

### Managing automatically allocated dump data sets

Automatic allocation of dump data sets is managed through the DUMPDS command. Placing appropriate commands into the COMMNDxx parmlib member allows the function to be established at IPL.

The DISPLAY DUMP command can display information about the last 100 data sets that were automatically allocated during the current IPL. Typical dump inventory management should be done using the Sysplex Dump Directory. The System Dump Directory provides access to all of the cataloged and added dump data sets created across system IPLs. Details about using the User and Sysplex Dump Directory can be found in [z/OS MVS IPCS User’s Guide](https://www.ibm.com/support/docview.ws/docid/5736).

The installation must manage the space allocated to dump data sets by limiting the volumes (non-SMS) or the classes (SMS) available for automatic allocation of dump data sets. [z/OS MVS System Commands](https://www.ibm.com/support/docview.ws/docid/175378) contains the syntax of the DUMPDS ADD, DEL, and ALLOC=ACTIVE commands.

For more information about SMS, see [z/OS DFSMSdfp Storage Administration](https://www.ibm.com/support/docview.ws/docid/ps100167).

### Using pre-allocated dump data sets

Pre-allocated dump data sets should be used as a backup method to automatic allocation. Like the automatically allocated dump data sets, pre-allocated dump data sets will hold SVC dump information for later review and analysis, but have size and performance limitations that automatically allocated dump data sets do not have. This section describes how to set up pre-allocated data sets for SVC dump, including:

- “Allocating SYS1.DUMPxx data sets with secondary extents” on page 12
- “Specifying SYS1.DUMPxx data sets” on page 15
- “Controlling SYS1.DUMPxx data sets” on page 15

#### Allocating SYS1.DUMPxx data sets with secondary extents

Allocate SYS1.DUMPxx data sets using the following requirements:

- Name the data set SYS1.DUMPxx, where xx is decimal 00 through 99.
- Select a device with a track size of 4160 bytes. The system writes the dump in blocked records of 4160 bytes.
- Initialize with an end-of-file (EOF) record as the first record. (If you use ISPF 3.2 to allocate SYS1.DUMPxx data sets, the EOF record will be automatically written on the first track.)
- Allocate the data set before requesting a dump. Allocation requirements are:
  - UNIT: A permanently resident volume on a direct access device.
  - DISP: Catalog the data set (CATLG). Do not specify SHR.
  - VOLUME: Place the data set on only one volume. Allocating the dump data set on the same volume as the page data set could cause contention problems during dumping, as pages for the dumped address space are read from the page data set and written to the dump data set.
SPACE: An installation must consider the size of the page data set that will contain the dump data. The data set must be large enough to hold the amount of data as defined by the MAXSPACE parameter on the CHNGDUMP command, VIO pages, and pageable private area pages.

SVC dump processing improves service by allowing secondary extents to be specified when large dump data sets are too large for the amount of DASD previously allocated. An installation can protect itself against truncated dumps by specifying secondary extents and by leaving sufficient space on volumes to allow for the expansion of the dump data sets.

For the SPACE keyword, you can specify CONTIG to make reading and writing the data set faster. Request enough space in the primary extent to hold the smallest SVC dump expected. Request enough space in the secondary extent so that the primary plus the secondary extents can hold the largest SVC dump. The maximum size of a data set is 65,535 tracks. For a 3390 this is 4369 cylinders, and will hold about 2.8 gigabytes of data. The actual size of the dump depends on the dump options in effect when the system writes the dump.

Estimate the largest dump size as follows:

\[
\text{Bytes of SDATA options} + \text{bytes in largest region size} = \text{Result1}
\]
\[
\text{Result1} \times \text{number of address spaces in dump} = \text{Result2}
\]
\[
\text{PLPA} \times 26\% = \text{Result3}
\]
\[
\text{Bytes of requested data space storage} = \text{Result4}
\]
\[
\text{Result2} + \text{Result3} + \text{Result4} = \text{Bytes in SVC dump}
\]

Where:

- Result1, Result2, Result3, Result 4: Intermediate results
- SDATA options: Described in “Contents of SVC dumps” on page 23
- PLPA: Pageable link pack area

For the size of the smallest dump, use the default options for the SDUMPX macro. The difference between the largest dump and the smallest dump will be the size of the secondary extent.

For example, to calculate the largest amount of storage required for a 3390 DASD, assume that, from the preceding calculations, the records needed for the SVC dump amount to 43200 kilobytes. There are 11 records per track and 15 tracks per cylinder. To determine the number of cylinders needed to allocate a data set of this size, do the following:

- For 43200 kilobytes of storage, you will need space for 10800 SVC dump records (43200 / 4 kilobytes per record).
- With 11 records per track, you will require 982 (10800 / 11 records) tracks.
- Therefore, the data set would require 66 cylinders (982 / 15 tracks per cylinder) for allocation.

Note: If you are not receiving the dump data you require, increase the size of the dump data set. You will receive system message IEA911E.

The system writes only one dump in each SYS1.DUMPxx data set. Before the data set can be used for another dump, clear it using the DUMPDS command with the CLEAR keyword.

See z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDU for information about the default dump options of the SDUMPX macro. See z/OS MVS System Commands for information about using the DUMPDS command.

Choosing SVC dump data sets

IBM recommends using extended format sequential data sets as dump data sets for SVC Dumps. Extended format sequential data sets:

- Have a greater capacity than sequential data sets
- Support striping
Support for compression

Greater capacity: Some dump data sets are quite large compared with other data sets generated by a system. An extended format sequential data set can hold the largest SVC dumps, as much as 128 gigabytes.

Support for striping: Striping spreads sections, or stripes, of a data set across multiple volumes and uses independent paths, if available, to those volumes. The multiple volumes and independent paths accelerate sequential reading and writing of the data set, reducing the time during which dump I/O competes with production I/O.

It is recommended that the number of stripes match the number of volumes you use. This combination will yield the best performance because MVS data management allows random access to any record as though it appeared on a single volume. This is particularly useful during an IPCS analysis of a dump. The savings when loading the data set are real but smaller, the result of reducing the number of times end of volume processing comes into play.

In a striped data set, when the last volume receives a stripe, the next stripes are placed on the first volume, the second volume, the third, and so on to the last volume, then back to the first volume.

If you use more than six dozen stripes, the performance benefit of each additional stripe is much less than the performance benefit of adding the earlier stripes. Keep in mind that this is talking about the original data set definition. You can not add stripes to an existing striped data set. You must plan ahead. The faster processing speeds up moving dump data from relatively expensive data space storage to less expensive DASD.

Support for compression: Compression allows dump data sets to use less DASD space. Before using compression, consider the following:

- Compression and decompression trade off processing cycles for more efficient use of DASD. If hardware compression is not available, the number of processing cycles is significantly higher.

Using DSN_TYPE=LARGE: In z/OS V1R7 and later releases, sequential data sets that use DSN_TYPE=LARGE are allowable for SVC dumps when the systems that are involved in processing a DSN_TYPE=LARGE data set are migrated to V1R7 prior to their use. If analysis using an earlier release is required, use z/OS V1R7 to transcribe the dump into a data set supported by the earlier release.

Placing dump data sets in cylinder-managed space: In z/OS V1R11 and later releases, extended format sequential data sets can be placed in either track-managed space or cylinder-managed space. SVC dump fully supports placement of dump data sets in cylinder-managed space.

Finding automatically allocated dump data sets

The AUTODSN= parameter of the DISPLAY DUMP,TITLE operator command enables you to list up to 100 of the most recent dump data sets that were automatically allocated during this IPL. No information is preserved about data sets that were automatically allocated before the last 100. As an example, if you wanted to see the titles of the last 5 automatically allocated dump data sets, you would issue:

```display dump,title,autodsn=5```

For complete information on the use of the DISPLAY DUMP command, see DISPLAY DUMP in z/OS MVS System Commands.

Communication from the system

The system communicates about automatic allocation of dump data sets using two messages:

- IEA611I is issued when a complete or partial dump is taken to an automatically allocated dump dataset. IEA611I is an informational message, it will not be issued highlighted.

- IEA799I is issued once per captured dump when automatic allocation fails; it will not be re-issued as a result of automatic allocation failing for subsequent attempts to allocate the same dump data set unless the reason text is different.
Specifying SYS1.DUMPxx data sets

When planning SYS1.DUMPxx data sets, remember that the data sets frequently contain sensitive data (user or installation confidential information, logon passwords, encryption keys, etc.). Protect these data sets with RACF to limit access to them.

The installation can specify SYS1.DUMPxx data sets in two ways:

• IBM recommends that you use the DUMPDS operator command through the COMMNDxx parmlib member. Use the DUMPDS ADD command within the COMMNDxx parmlib member to ensure that all interaction with the dump data set occurs through the DUMPDS command.

For example, to specifically add data set SYS1.DUMP05, enter:

| COM= 'DUMPDS ADD,DSN=05' |

• During system initialization, in the DUMP parameter in the IEASYSxx parmlib member.

Specify DUMP=NO in the IEASYSxx parmlib member. Otherwise, all available data sets will be allocated before the COMMNDxx parmlib member is processed.

The data sets are on direct access only. The maximum number of SYS1.DUMPxx data sets an installation can have is 100. The direct access data set must be on a permanently resident volume; that is, the data set must be allocated and cataloged. These dump data sets cannot be shared by more than one system.

All dump data sets should not be on the same pack. A pack should contain enough storage to allow the dump data sets to allocate secondary extent space, if needed.

For more information, see the following references:

• See z/OS MVS Initialization and Tuning Reference for information about the IEACMDxx and IEASYSxx parmlib member.

• See z/OS MVS System Commands for information about using the DUMPDS command.

Controlling SYS1.DUMPxx data sets

After system initialization, use the following to change and control these data sets:

• Copy the dump from the SYS1.DUMPxx data set to another data set; then clear the SYS1.DUMPxx data set, so that it can be used for another dump. You can use IPCS to format and view or print the copied dump, as described in the following topic.

• Use the DUMPDS operator command to:
  – Add more SYS1.DUMPxx data sets on direct access for SVC dumps.
  – Delete SYS1.DUMPxx data sets for SVC dumps.
  – Clear a SYS1.DUMPxx data set containing a dump by writing an EOF mark as the first record. An EOF mark as the first record makes the data set available for another dump.

A reIPL is not necessary when adding, deleting, or clearing a data set with the DUMPDS operator command.

• Use the REPLY command to system message IEA793A to cancel a dump.

• Use a post dump exit routine to copy the dump to another data set. IEAVTSEL is an SVC dump post dump exit name list that lists the module names of installation exit routines to be given control when dump processing ends.

For more information, see the following references:

• See z/OS MVS Installation Exits for more information about the IEAVTSEL post dump exit name list.

• See z/OS MVS IPCS Commands for the IPCS COPYDUMP subcommand.

• See z/OS MVS System Commands for the DUMPDS and REPLY operator commands.
Obtaining an SVC dump

Obtain an SVC dump by:

- Using a SDUMP or SDUMPX macro in an authorized program.
- Entering the DUMP or SLIP operator command.
- Setting a SLIP in the IEASLPxx parmlib member.

When z/OS takes an SVC dump, it copies data into the DUMPSRV owned data spaces and high virtual storage. The collection of data can introduce an unusually heavy burden on storage resources. The virtual storage load remains until the dump is written out to a target data set on DASD. The data set can be:

- SVC dump data set that is specified on the DCB parameter of the SDUMP or SDUMPX macro.
- Pre-allocated SYS1.DUMPxx data set, or automatically allocated dump data set.

Use the DUMPDS operator command to manage the pre-allocated and automatically allocated data sets.

When an SVC dump occurs, if normal auxiliary storage use rises above 30%, the system might experience severe performance problems. The system might also experience an O3C wait state, which indicates that the system ran out of available paging slots. You can use the MAXSPACE and AUXMGMT options on the CHNGDUMP SET, SDUMP command to manage the burden of taking SVC dumps on a system. Using the options might not be sufficient to eliminate the problems that are associated with the restricted auxiliary (paging) storage.

- The MAXSPACE value restricts the virtual storage available to the DUMPSRV address space. When you use MAXSPACE, the installation must tune for the worst case usage of real and auxiliary storage. The following rules apply:
  
  If the installation does not have a history that can be drawn upon, see “Allocating SYS1.DUMPxx data sets with secondary extents” on page 12 for help in determining a maximum data set size. Use a multiple of the data set size to determine a MAXSPACE value. The installation must predict the size of the largest dump that it can configure.

  The paging resources for the affected systems must also be increased to accommodate the additional load that is represented by the MAXSPACE value. The minimum value for defining the additional auxiliary storage capacity must be three times the MAXSPACE value. Adhering to the MAXSPACE guideline can maintain utilization within 30%.

- When you specify the AUXMGMT=ON parameter, the installation disregards first failure data capture (FFDC) to maintain system availability. The following rules apply:
  
  - No new dumps are allowed when auxiliary storage usage reaches 50%. New dumps can be initiated after the auxiliary storage usage drops below 35%.
  - Current SDUMP data capture stops when auxiliary storage usage exceeds 68%, and generates a partial dump.

For more information about setting the MAXSPACE or AUXMGMT value, see the CHNGDUMP command in z/OS MVS System Commands.

Requesting dumps from multiple systems

In a sysplex, you probably need dumps from more than one system to collect all of the problem data. These dumps must be requested at the same time. To request multiple dumps, use the following procedures on any of the systems that might be part of the problem:

- Enter a DUMP command with a REMOTE parameter.
- Issue a SDUMPX macro with a REMOTE parameter.
- Create a SLIP trap in an IEASLPxx parmlib member in the shared SYS1.PARMLIB or in the parmlib on each system.
Sometimes you cannot predict which system has the problem. Use a ROUTE operator command to activate the traps on all systems with similar configurations. Each trap must include a REMOTE parameter to dump all the other systems that might be involved.

To help you set the requests, the commands and macro can contain the wildcard characters * and ?. Use wildcard characters when an installation has names that form patterns to the systems in the sysplex and to the jobs for associated work.

For example, use wildcard characters * and ? to specify job names. Use TRANS? for the job names TRANS1, TRANS2, and TRANS3 and TRANS* for TRANS1, TRANS12, and TRANS123.

**Issuing a macro for SVC dump**

To request an SVC dump in an authorized program, use an SDUMP or SDUMPX macro. The system writes the dump in a SYS1.DUMPxx data set or, if specified in the macro, in a user-supplied data set.

For example, to dump the default contents listed in “Contents of SVC dumps” on page 23 to a SYS1.DUMPxx data set, enter the following command:

```
SDUMPX
```

If the dump is written to a user-supplied SVC dump data set, the program provides a data control block (DCB) for the data set, opens the DCB before issuing the SDUMP or SDUMPX macro, and closes the DCB after the dump is written. For a synchronous dump, the close should occur when the system returns control to the requester. For a scheduled dump, the close should occur when the ECB is posted or when the SRB is scheduled.

As another example, to write a synchronous dump to a data set whose DCB address is in register 3, you would specify the following command:

```
SDUMPX DCB=(3)
```

See *z/OS MVS Programming: Authorized Assembler Services Guide* for information about requesting a scheduled SVC dump and a synchronous SVC dump.

**Operator activities**

From a console with master authority, the operator can enter either of the following commands:

- DUMP operator command.

The following DUMP operator command will write an SVC dump:

```
DUMP COMM=(MYDUMP1 5-9-88)
```

- To a SYS1.DUMPxx data set
- With a dump title of “MYDUMP1 5-9-88”
- With the default contents listed in “Contents of SVC dumps” on page 23
- For a job named MYJOB1

The system will respond with the message:

```
* 23 IEE094D SPECIFY OPERAND(S) FOR DUMP COMMAND
```

Ask the operator to reply:

```
REPLY 23 , JOBNAME=MYJOB1
```

Note that if the operator replies REPLY 23 , U to IEE094D, the system dumps the current address space, which is the master scheduler address space. The operator must use an ASID, JOBNAME, or TSONAME parameter in the reply to obtain other dumps.

Use the DUMPDS command to produce a scheduled SVC dump.
• SLIP operator command with an ACTION option of STDUMP, SVCD, SYNCVSVD, or TRDUMP.

For example, the following SLIP operator command will write an SVC dump:

- To a SYS1.DUMPxx data set
- When a program check interruption occurs in a job named MYJOB1
- With the default contents shown in “Contents of SVC dumps” on page 23

```
SLIP SET, ACTION=SVCD, ERRTYP=PROG, JOBNAME=MYJOB1, END
```

The SLIP command produces a scheduled SVC dump.

**Operator command in an IEASLPxx parmlib member**

The installation can also place SLIP operator commands in IEASLPxx parmlib members to produce an SVC dump. When a command is needed, the operator dynamically sets the IEASLPxx member containing the needed SLIP command. The installation can place SLIP commands that request different types of SLIP traps in different IEASLPxx members.

See [z/OS MVS System Commands](https://www.ibm.com/support/docview.wss?uid=ssg1s0026279) for details about the DUMP and SLIP operator commands. See [z/OS MVS Initialization and Tuning Reference](https://www.ibm.com/support/docview.wss?uid=swg27020782) for information about the IEASLPxx member.

**Operator command in an IEADMCxx parmlib member**

IEADMCxx enables you to supply DUMP command parameters through a parmlib member. IEADMCxx enables the operator to specify the collection of dump data by issuing a DUMP command, indicating the name of the parmlib member and any symbolic substitution variables.

Since z/OS Release 2, a number of sample DUMP command parmlib members are delivered in SYS1.SAMPLIB. Modifications to, for example, system names, address space names, and so on, are potentially required to deal with each installation’s specific requirements. In some cases, substitution variables are supplied to provide an example of how an installation could use them.

**Note:** The length of the sample substitution variable name might not suffice for the values that are actually used at a particular site. For example, &job in IEADMCAS can only accommodate job names that are 4 characters or less. To accommodate up to eight characters, change the variable to something like &thisjob.

Therefore, to take advantage of these members, save a modified copy into a data set in your parmlib concatenation.

Table 7 on page 18 summarizes the sample dump commands that z/OS supplies in SYS1.SAMPLIB.

<table>
<thead>
<tr>
<th>Member Name</th>
<th>Suspected Problem Area</th>
<th>Areas Dumped</th>
<th>Symbolics Used</th>
<th>Remote Option Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ieadmcar</td>
<td>APPC</td>
<td>APPC transaction environment, including RRS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ieadmcas</td>
<td>Shared Tape</td>
<td>Allocation Autoswitch and XCF, with affected job</td>
<td>&amp;job</td>
<td>Y</td>
</tr>
<tr>
<td>Ieadmcca</td>
<td>Catalog</td>
<td>Catalog address space and associated areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ieadmcnn</td>
<td>Console</td>
<td>CONSOLE address space and its data spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ieadmccp</td>
<td>CP/SM</td>
<td>CICSplex SM environment on all systems in the sysplex. This includes the CAS, CMAS and EYU address spaces.</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Ieadmcd2</td>
<td>DB2® distributed transactions</td>
<td>DB2/RRS environment</td>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>
Table 7. Sample operator DUMP command members in SYS1.SAMPLIB (continued)

<table>
<thead>
<tr>
<th>Member Name</th>
<th>Suspected Problem Area</th>
<th>Areas Dumped</th>
<th>Symbolics Used</th>
<th>Remote Option Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEADMCJ2</td>
<td>JES2</td>
<td>JES2/XCF environment on current and specified system</td>
<td>&amp;SYSTM</td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCLC</td>
<td>Logger/CICS</td>
<td>System Logger, RLS and CICS*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEADMCLG</td>
<td>Logger/GRS</td>
<td>System Logger and GRS on all systems in the sysplex</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCLS</td>
<td>General Logger Problem</td>
<td>Logger, XCF, ALLOC, CATALOG, GRS, DFHS, and SMS along with specified structure, on all systems in the sysplex.</td>
<td>&amp;STRNAME &amp;STRNAME2</td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCLX</td>
<td>Logger/XCF</td>
<td>System Logger and XCF on all systems in the sysplex</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCOE</td>
<td>OMVS</td>
<td>OMVS</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCRY</td>
<td>RRS</td>
<td>RRS and the System Logger on all systems in the sysplex</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCSR</td>
<td>RRS</td>
<td>RRS and its data spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEADMCSQ</td>
<td>IMS</td>
<td>IMS Shared Queues environment (IMS Control region, CL/I SAS Region, DBRC Region, and all of the CQS address spaces connected to the shared queues)</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCTA</td>
<td>TCP/IP</td>
<td>TCP/IP, along with the specified application</td>
<td>&amp;tcp &amp;appl</td>
<td></td>
</tr>
<tr>
<td>IEADMCTC</td>
<td>TCP/IP</td>
<td>TCP/IP, along with the Comm Server address space</td>
<td>&amp;tcp</td>
<td></td>
</tr>
<tr>
<td>IEADMCTI</td>
<td>TCP/IP</td>
<td>TCP/IP and its data space</td>
<td>&amp;tcp</td>
<td></td>
</tr>
<tr>
<td>IEADMCTO</td>
<td>TCP/IP</td>
<td>TCP/IP and OMVS</td>
<td>&amp;tcp</td>
<td></td>
</tr>
<tr>
<td>IEADMCVC</td>
<td>Comm Server</td>
<td>VTAM® and TCP/IP, with the TCPIP and VTAM data spaces</td>
<td>&amp;tcp &amp;net</td>
<td></td>
</tr>
<tr>
<td>IEADMCVG</td>
<td>VTAM GR</td>
<td>VTAM Generic Resources environment, with its CF structure</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMCTV</td>
<td>Comm Server</td>
<td>VTAM and TCP/IP (address spaces only)</td>
<td>&amp;tcp &amp;net</td>
<td></td>
</tr>
<tr>
<td>IEADMVVV</td>
<td>VTAM</td>
<td>VTAM and the VIT data space</td>
<td>&amp;net</td>
<td></td>
</tr>
<tr>
<td>IEADMWL</td>
<td>WLM</td>
<td>WLM on all systems in the sysplex</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMWS</td>
<td>Web server</td>
<td>HTTP web server with OMVS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEADMWT</td>
<td>Web server</td>
<td>HTTP web server and TCP/IP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEADMXI</td>
<td>IRLM</td>
<td>XCF and IRLM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEADMX1</td>
<td>IRLM</td>
<td>XCF and IRLM on all systems in the sysplex</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>IEADMZM</td>
<td>CEA</td>
<td>CEA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. When specifying parmlib members containing symbolic parameters, you must specify the symbolic and substitution value using the SYMDEF keyword.
2. The dump command indicated by each row with a “Y” in the “Remote Option Used” column results in a multi-system dump.
Making a dump data set available

An SVC dump is taken to an SVC dump data set, either specified on the DCB parameter of the SDUMP or SDUMPX macro, available as SYS1.DUMPxx, or automatically allocated. SVC dump processing issues message IEA793A when the dump has been captured but there are no available dump data sets. When a SYS1.DUMPxx data set is not available, the operator has the option either of deleting the captured dump by replying D or making another dump data set available to SVC dump processing. To make another dump data set available, the operator uses the DUMPDS command.

For example, you can use a DUMPDS command to make a dump data set available to SVC dump.

- System message:

  * 16 IEA793A NO SVC DUMP DATA SETS AVAILABLE FOR DUMPID=dumpid FOR JOB (*MASTER*).  
  * 16 IEA793A USE THE DUMPDS COMMAND OR REPLY D TO DELETE THE CAPTURED DUMP

- Operator reply:

  DUMPDS ADD, DSN=02

See z/OS MVS System Commands for information about the DUMPDS command. See z/OS MVS System Messages, Vol 6 (GOS-IEA) for information about message IEA793A.

Determining current SVC dump options and status

An operator can determine the current dump options and the SYS1.DUMPxx data sets that contain SVC dumps.

**Dump mode and options**

Use a DISPLAY DUMP operator command to get the dump mode and options in effect for SVC dumps and SYSABEND, SYSMDUMP, and SYSUDUMP dumps. The system displays the mode and options in message IEE857I.

For example, to determine the mode and options, enter:

```
DISPLAY DUMP,OPTIONS
```

If the options listed are not the ones desired, have the operator use a CHNGDUMP operator command to change them.

See z/OS MVS System Commands for the DISPLAY for more information about dump modes. See z/OS MVS System Messages, Vol 7 (IEB-IEE) for more information about IEE857I.

**Status of SYS1.DUMPxx data sets**

Use a DISPLAY DUMP operator command to get the status of all defined SYS1.DUMPxx data sets on direct access. The system displays the status in message IEE852I or IEE856I. The message indicates the full and available data sets.

For example, to determine the status of SYS1.DUMPxx data sets, enter:

```
DISPLAY DUMP,STATUS
```

See z/OS MVS System Commands for information about the CHNGDUMP and DISPLAY commands. For a description of these messages, see MVS System Messages.

**Finding SVC dumps**

An operator can search the current SYS1.DUMPxx data sets for the SVC dump for a particular problem. To select the dump, use the title and time or use the dump symptoms. The operator can also find a dump that has been captured in virtual storage but has not been written to a data set.
**Title and time of SVC dump(s)**

Use one of the following to get the titles and times for SVC dumps:

- A DISPLAY DUMP operator command. The system displays the titles and times in message IEE853I.

  You can use the DISPLAY command to find title and time information.

  - To see the titles and times for the dumps in SYS1.DUMP08 and SYS1.DUMP23, without displaying any automatically allocated dump data sets, enter:

    ```
    DISPLAY DUMP,TITLE,DSN=(08,23)
    ```

  - To display the titles of the most recently automatically allocated dump data set and all pre-allocated dump data sets, enter:

    ```
    DISPLAY DUMP,TITLE
    ```

    or:

    ```
    DISPLAY DUMP,TITLE,DSN=ALL
    ```

  - To display the titles of the last 5 most recently allocated dump data sets, enter:

    ```
    DISPLAY DUMP,TITLE,AUTODSN=5
    ```

  - To see the dump titles for all captured dumps, enter:

    ```
    DISPLAY DUMP,TITLE,DUMPID=ALL
    ```

- An IPCS SYSDSCAN command entered at a terminal by a TSO/E user. IPCS displays the titles and times at the terminal.

  For example, to use IPCS to find the dump titles and times for the dumps in SYS1.DUMP08 and SYS1.DUMP23, enter the following IPCS command:

  ```
  SYSDSCAN 08
  SYSDSCAN 23
  ```

  See [z/OS MVS IPCS Commands](https://www.ibm.com/support/knowledgecenter/en/S⽊S1D/ acquire/newuse/ICHSN000000.html) for information about SYSDSCAN.

  If a data set listed in either command is empty or undefined, the system issues a message to tell why the title is not available.

**Symptoms from SVC dumps**

Use a DISPLAY DUMP operator command to get the symptoms from SVC dumps in SYS1.DUMPxx data sets on direct access or from SVC dumps that have been captured in virtual storage. The system displays the following symptoms in message IEE854I:

- Dump title or a message telling why the title is not available
- Error id consisting of a sequence number, the processor id, the ASID for the failing task, and the time stamp
- System abend code
- User abend code
- Reason code
- Module name
- Failing CSECT name
- Program status word (PSW) at the time of the error
- Interrupt length code in the system diagnostic work area (SDWA)
- Interrupt code in the SDWA
- Translation exception address in the SDWA
• Address of the failing program in the SDWA
• Address of the recovery routine in the SDWA
• Registers at the time of the error saved in the SDWA

For example, you can issue DISPLAY DUMP to view various types of symptoms:

• To see symptoms from the dump in the SYS1.DUMP03 data set without displaying any automatically allocated data sets, enter:

  ```
  DISPLAY DUMP,ERRDATA,DSN=03
  ```

• To see symptoms from the most recently automatically allocated dump data set and all pre-allocated dump data sets, enter:

  ```
  DISPLAY DUMP,ERRDATA
  ```
  or:

  ```
  DISPLAY DUMP,ERRDATA,DSN=ALL
  ```

• To see symptoms from the last 5 most recently allocated dump data sets, enter:

  ```
  DISPLAY DUMP,ERRDATA,AUTODSN=5
  ```

• To see symptoms from the captured dump identified by DUMPID=005, enter:

  ```
  DISPLAY DUMP,ERRDATA,DUMPID=005
  ```

Using the DISPLAY DUMP,ERRDATA command (see Figure 4 on page 22), you can retrieve basic information about the dump without having to format the dump or read through the system log. Message IEE854I displays the error data information, including the PSW at the time of the error, the system abend code and reason code, and the module and CSECT involved.

```plaintext
D D,ERRDATA
IEE854I 13.01.25 SYS1.DUMP ERRDATA 745
SYS1.DUMP DATA SETS AVAILABLE=001 AND FULL=001
CAPTURED DUMPS=0000, SPACE USED=00000000M, SPACE FREE=00000500M
DUMP00 TITLE=ABDUMP ERROR,COMPON=ABDUMP,COMPID=5752-SCDMP,
  ISSUER=IEAVTABD
  DUMP TAKEN TIME=13.01.02 DATE=09/27/1996
ERRORID=SE006010 CPU0000 ASID0010 TIME=13.06.55
SYSTEM ABEND CODE=01 REASON CODE=00000001
MODULE=IGC0101C CSECT=IEAVTABD
PSW AT TIME OF ERROR=070C0000 823FE0F6 ILC=2 INT=01
TRANSLATION EXCEPTION ADDR=008E1094
ABENDING PROGRAM ADDR=****** RECOVERY ROUTINE=ADRECOV
GPR 0-3 00000000 7F6EBAE4 023FFFF6 023F2BFF
GPR 4-7 008FD088 023FEFF7 823FDFF8 7F6EC090
GPR 8-11 00000048 7F6EC938 7F6EBA68 7F6EBA68
GPR12-15 7F6EB538 7F6EB538 00000000 00000000
NO DUMP DATA AVAILABLE FOR THE FOLLOWING EMPTY SYS1.DUMP DATA SETS: 01
```

Figure 4. Example: Output from DISPLAY,DUMP ERRDATA command

See z/OS MVS System Commands for information about the DISPLAY operator command.

---

**Printing, viewing, copying, and clearing a pre-allocated or SYS1.DUMPxx data set**

SVC dumps are unformatted when created. Use IPCS to format a dump and then view it at a terminal or print it.

After the dump has been copied to a permanent data set, use a DUMPDS operator command to clear the data set so that the system can use the data set for another dump. Then use IPCS to view the copy.
You can copy a dump that was written to tape so that you can view the dump through IPCS more efficiently.

For a pre-allocated data set or a SYS1.DUMPxx data set, the JCL shown in Figure 5 on page 23 does the following:

- Uses the SVC dump in the SYS1.DUMP00 data set. The IPCSDUMP DD statement identifies this data set.
- Copies the dump from the SYS1.DUMP00 data set to the data set identified in the DUMPOUT DD statement. To use this example, change the DUMPOUT DD statement to give the DSNAMES for the desired location.
- Clears the SYS1.DUMP00 data set so that it can be used for a new dump.
- Deletes the IPCS dump directory in the DELETE(DDIR) statement. This statement uses the USERID of the batch job in the directory identification.
- Allocates the dump directory through the BLSCDDIR statement. The default is volume VSAM01. The example shows VSAM11. Override the default volume with the desired volume.
- Formats the dump using the IPCS subcommands in LIST 0. To use this example, replace the LIST 0 command with the desired IPCS subcommands or a CLIST. See z/OS MVS IPCS User’s Guide for CLISTs.

```
//IPCSJOB JOB
//IPCS EXEC PGM=IKJEFT01,DYNUMBR=75,REGION=1500K
//SYSPROC DD DSN=SYS1.SBLSCLI0,DISP=SHR
//IPCSDUMP DD DSN=SYS1.DUMP00,DISP=SHR
//DUMPOUT DD DSN=GDG.DATA.SET(+1),DISP=SHR
//SYSUDUMP DD SYSOUT=*    
//IPCSTOC DD SYSOUT=*    
//IPCSPRNT DD SYSOUT=*    
//SYSTSPRT DD SYSOUT=*    
//SYSTSTIN DD *    
DELETE(DDIR) PURGE CLUSTER    
BLSCDDIR VOLUME(VSAM11)
IPCS NOPARM
 SETDEF DD(IPCSDUMP) LIST NOCONFIRM
 LIST 0 COPYDUMP INFILE(IPCSDUMP) OUTFILE(DUMPOUT) CLEAR NOPRINT NOCONFIRM
END
/*
```

Figure 5. Example: JCL to print, copy, and clear an SVC dump data set

### Contents of SVC dumps

Unlike ABEND dumps, SVC dumps do not have a parmlib member that establishes the dump options list at system initialization. The IBM-supplied IEACMD00 parmlib member contains a CHNGDUMP operator command that adds the local system queue area (LSQA) and trace data (TRT) to every SVC dump requested by an SDUMP or SDUMPX macro or a DUMP operator command, but not for SVC dumps requested by SLIP operator commands.

The contents of areas in an SVC dump depend on the dump type:

- **Scheduled SVC dump:** The current task control block (TCB) and request block (RB) in the dump are for the dump task, rather than for the failing task. For additional address spaces in the dump, the TCB and RB are for the dump task.
- **Synchronous SVC dump:** The current TCB and RB in the dump are for the failing task.

See z/OS MVS IPCS Commands for examples of IPCS output formatted from SVC dumps.

### Customizing SVC dump contents

You can customize the contents of an SVC dump to meet the needs of your installation. For example, you might want to add areas to be dumped, reduce the dump size, or dump Hiperspaces. In most cases, you
will customize the contents of an SVC dump or summary dump through the SDATA parameter of the
SDUMP or SDUMPX macro or through operator commands.

**Reducing dump size:** To obtain a smaller dump that does not have all the usual defaults, code a
NODEFAULTS option in the SDATA parameter of the SDUMP or SDUMPX macro. With the NODEFAULTS
option, the dump contains:

- Certain default system areas needed by IPCS for dump analysis
- Areas requested on the SDUMP or SDUMPX macro

**Hiperspaces:** SVC dumps do not include Hiperspaces. To include Hiperspace data in an SVC dump, you
have to write a program to copy data from the Hiperspace into address space storage that is being
dumped.

**Adding areas:** If the dump, as requested, will not contain all the needed areas, see one of the following
for ways to add the areas:

- “Customized contents using the SDATA parameter” on page 24
- “Contents of summary dumps in SVC dumps” on page 28
- “Customizing contents through operator commands” on page 31

**Customized contents using the SDATA parameter**

The IBM-supplied default contents and the contents available through customization are detailed in Table
8 on page 24. The tables show dump contents alphabetically by the parameters that specify the areas in
the dumps. Before requesting a dump, decide what areas will be used to diagnose potential errors. Find
the areas in the tables. The symbols in columns under the dump indicate how the area can be obtained in
that dump. The symbols are:

- **C**
  - Available on the command that requests the dump
- **D**
  - IBM-supplied default contents
- **M**
  - Available on the macro that requests the dump
- **P**
  - Available in the parmlib member that controls the dump options
- **X**
  - Available on the CHNGDUMP operator command that changes the options for the dump type
- **blank**
  - No symbol indicates that the area cannot be obtained.

**Note:** System operator commands and assembler macros use the parameters in the table to specify
dump contents.

The order of the symbols in the following table is not important.

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>SDUMPX Macro or DUMP Command with SDATA Parameter</th>
<th>DUMP Command without SDATA Parameter</th>
<th>SLIP Command ACTION=SVCD or SYNCsvCD</th>
<th>SLIP Command ACTION=STDUMP</th>
<th>SLIP Command ACTION=TRDUMP</th>
<th>DUMP Command SVCDUMPRGN = YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLNUC</td>
<td>The DAT-on and DAT-off nucleuses</td>
<td>M C X</td>
<td>X</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>ALLPSA</td>
<td>Prefixed save area (PSA) for all processors</td>
<td>D M X</td>
<td>D X</td>
<td>D C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>SDATA Parameter Option</td>
<td>Dump Contents</td>
<td>SDUMPX Macro or DUMP Command with SDATA Parameter</td>
<td>DUMP Command without SDATA Parameter</td>
<td>SLIP Command ACTION= SVCD or SYNSVCD</td>
<td>SLIP Command ACTION= STDUMP</td>
<td>SLIP Command ACTION= TRDUMP</td>
<td>DUMP Command SVCNUMPRGN = YES</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------------------------------------</td>
<td>--------------------------------------</td>
<td>----------------------------</td>
<td>----------------------------</td>
<td>-------------------------------</td>
</tr>
</tbody>
</table>
| COUPLE                | Data on cross-system coupling  
**Note:** COUPLE cannot be specified on an SDUMP macro. It can, however, be specified on an SDUMPX macro. | M C X                                      | C                                   | C                                   | C                                   | C                                   | M X                                      |
| CSA                   | Common service area (CSA) (that is, subpools 227, 228, 231, 241) and virtual storage for 64-bit addressable memory objects created using one of the following services:  
• IARV64 REQUEST=GETCOMMON, DUMP=LIKE CSA  
• IARCP64 COMMON=YES, DUMP=LIKECSA  
• IARST64 COMMON=YES, TYPE=PAGEABLE  
**Note:** When CSA is specified without any high CSA parameters, all the CSA storage, including high virtual CSA, is included in the SVC dump. | M C X                                      | D                                   | D C                                 | C                                   | C                                   | C                                |
| DEFAULTS              | Default areas                                                                | M X                                      |                                     |                                      |                                      |                                      | M X                                      |
| GRSQ                  | Global resource serialization control blocks for the task being dumped:  
• Global queue control blocks  
• Local queue control blocks | M C X                                      | X                                   | C                                   | C                                   | C                                   | C                                |
| HCAS (HCSAByASID)      | High CSA area by ASID                                                        | M C X                                      | C                                   | C                                   | C                                   | C                                   | M X                                      |
| HCNO (HCSANoOwner)     | High CSA area for which the owner has ended                                    | M C X                                      | C                                   | C                                   | C                                   | C                                   | M X                                      |
| HCSY (HCSASysOwner)    | High CSA area that belongs to the SYSTEM                                          | M C X                                      | C                                   | C                                   | C                                   | C                                   | M X                                      |
| IO                    | Input/output supervisor (IOS) control blocks for the task being dumped:  
• EXCPD  
• UCB | D                                      |                                      |                                      |                                      |                                      |                                      |                                      |
| LPA                   | Active link pack area (LPA): module names and contents                         | M C X                                      | X                                   | D C                                 | C                                   | C                                   | C                                |
| LSQA                  | Local system queue area (LSQA) allocated for the address space (that is, subpools 203 - 205, 213 - 215, 223 - 225, 229, 230, 233 - 235, 249, 253 - 255), and virtual storage for 64-bit addressable memory objects created using one of the following services:  
• IARV64 REQUEST=GETSTOR, DUMP=LIKE LSQA  
• IARCP64 COMMON=NO, DUMP=LIKEQLSA  
• IARST64 COMMON=NO | D M C X                                      | D X                                   | D C                                 | C                                   | C                                   | C                                |
| NOALL                 | No ALLPSA                                                                    | M X                                      | X                                   | C                                   | C                                   | C                                   | C                                |
| NOALLPSA              | No ALLPSA                                                                    | M X                                      | X                                   | C                                   | D C                                 | D C                                 | C                                |
### Table 8. Customizing SVC dump contents through the SDATA parameter. (continued)

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>SDUMPX Macro or DUMP Command with SDATA Parameter</th>
<th>DUMP Command without SDATA Parameter</th>
<th>SLIP Command ACTION= SVC or SYNCsvcd</th>
<th>SLIP Command ACTION= STDUMP</th>
<th>SLIP Command ACTION= TRDUMP</th>
<th>DUMP Command SVCdumprgn= YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NODEFAULTS</td>
<td>• Minimum default areas needed for IPCS dump analysis</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Areas requested on the SDUMP or SDUMPX macro</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOPSA</td>
<td>No PSA</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOSQA</td>
<td>No SQA</td>
<td>M C X</td>
<td>X</td>
<td>C</td>
<td>D C</td>
<td>D C</td>
<td></td>
</tr>
<tr>
<td>NOSUM</td>
<td>No SUM</td>
<td>M C X</td>
<td>X</td>
<td>C</td>
<td>D C</td>
<td>D C</td>
<td></td>
</tr>
<tr>
<td>NUC</td>
<td>Read/write portion of the control program nucleus (that is, only the non-page -protected areas of the DAT-on nucleus), including:</td>
<td>M C X</td>
<td>X</td>
<td>D C</td>
<td>C</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CVT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• LSQA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PSA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• SQA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Prefixed save areas (PSA) for the processor at the time of the error or the processor at the time of the dump</td>
<td>D M C X</td>
<td>D X</td>
<td>D C</td>
<td>C</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>RGN</td>
<td>Allocated pages in the private area of each address space being dumped, including subpools 0 - 127, 129 - 132, 203 - 205, 213 - 215, 223 - 225, 229, 230, 236, 237, 244, 245, 251 - 255, and virtual storage for 64-bit addressable memory objects created using the following services:</td>
<td>M C X</td>
<td>X</td>
<td>D C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETSTOR, DUMP=LIKERGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETSTOR, SVCdumprgn= YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARCP64 COMMON=NO, DUMP=LIKERGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARST64 COMMON=NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETSTOR, DUMP=LIKELSQLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 COMMON=NO, DUMP=LIKELSQLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SERVERS</td>
<td>Areas added by IEASDUMP. SERVERS exits</td>
<td>M C X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 8. Customizing SVC dump contents through the SDATA parameter. (continued)

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>SDUMPX Macro or DUMP Command with SDATA Parameter</th>
<th>DUMP Command without SDATA Parameter</th>
<th>SLIP Command ACTION= SVCD or SYNC SVC Dump</th>
<th>SLIP Command ACTION= STDUMP</th>
<th>SLIP Command ACTION= TRDUMP</th>
<th>DUMP Command SVC DUMP PRGN =YES</th>
</tr>
</thead>
</table>
| **SQA**                | System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248) and virtual storage for 64-bit addressable memory objects created using one of the following services:  
  • IARV64 REQUEST=GETCOMMON, DUMP=LIKE SQA  
  • IARCP64 COMMON=YES, DUMP=LIKESQA  
  • IARST64 COMMON=YES, TYPE=FIXED  
  • IARST64 COMMON=YES, TYPE=DREF | D M C X                                           | D X                                                | D C                                  | C                                         | C                                         |                          |
| **SUM**                | Summary dump (See “Contents of summary dumps in SVC dumps” on page 28.)                           | D M C X                                           | D X                                                | D C                                  | C                                         | C                                         |                          |
| **SWA**                | Scheduler work area (SWA) (that is, subpools 236 and 237)                                        | M C X                                             | D X                                                | C                                     | C                                         | C                                         |                          |
| **TRT**                | System trace, generalized trace facility (GTF) trace, and master trace, as available              | D M C X                                           | D X                                                | D C                                  | D C                                         | D C                                         |                          |
| Default system data    | Instruction address trace, if available                                                            | D                                                  | D                                                  | D                                     | D                                   | D                                         |                          |
| Default system data    | Nucleus map and system control blocks, including:  
  • ASCB for each address space being dumped  
  • ASVT  
  • Authorization table for each address space  
  • CVT, CVT prefix, and secondary CVT (SCVT)  
  • Entry tables for each address space  
  • GDA  
  • JSAB of each address space being dumped  
  • Linkage stack  
  • Linkage table for each address space  
  • PCCA and the PCCA vector table  
  • TOT  
  • TRVT  
  • UCB | D                                                  | D                                                  | D                                                  | D                                     | D                                   | D                                         |                          |
| Default system data    | DFP problem data, if DFP Release 3.1.0 or a later release is installed                             | D                                                  | D                                                  | D                                     | D                                   | D                                         |                          |
| Default system data    | Storage for the task being dumped and program data for all of its subtasks                       | D                                                  | D                                                  | D                                     | D                                   | D                                         |                          |
| Default system data    | Storage: 4 kilobytes before and 4 kilobytes after the address in the PSW at the time of the error | D                                                  | D                                                  | D                                     | D                                   | D                                         |                          |
| Default system data    | SUBTASKS: Storage for the task being dumped and program data for all of its subtasks             | D                                                  | D                                                  | D                                     | D                                   | D                                         |                          |
The following table describes how HCSAByASID, HCSANoOwner, and HCSASysOwner affect the CSA storage that is captured in an SVC dump:

<table>
<thead>
<tr>
<th>Specified SDATA option or options</th>
<th>CSA storage that is included in the dump</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA</td>
<td>All above the bar and below the bar CSA storage</td>
</tr>
<tr>
<td>CSA, HCSAByASID, HCSANoOwner, HCSASysOwner</td>
<td>All below the bar CSA storage, high virtual CSA storage that is owned by the ASIDs that are included in the dump, high virtual CSA storage for which the owner has ended, and high virtual CSA storage that belongs to the SYSTEM. The dump does not include high virtual CSA storage that is owned by the ASIDs that are excluded from the dump.</td>
</tr>
<tr>
<td>HCSAByASID, HCSANoOwner, HCSASysOwner</td>
<td>All high virtual CSA storage that is owned by the ASIDs that are included in the dump, high virtual CSA storage for which the owner has ended, and high virtual CSA storage that belongs to the SYSTEM. No below the bar CSA storage is included in the dump.</td>
</tr>
<tr>
<td>(Neither CSA nor any of the HCSAxxxx options)</td>
<td>None of the CSA storage is included in the dump.</td>
</tr>
</tbody>
</table>

**Contents of summary dumps in SVC dumps**

Request a summary dump for two reasons:

1. The SUM or SUMDUMP parameters request many useful, predefined areas with one parameter.
2. The system does not write dumps immediately for requests from disabled, locked, or SRB-mode programs. Therefore, system activity destroys much needed diagnostic data. When SUM or SUMDUMP is specified, the system saves copies of selected data areas at the time of the request, then includes the areas in the SVC dump when it is written.

Use SDUMP or SDUMPX macro parameters to request different types of summary dumps, as follows:

- **Disabled summary dump**: This summary dump saves data that is subject to rapid and frequent change before returning control to the scheduled dump requester. Because the system is disabled for this dump, the dump includes only data that is paged in or in DREF storage. Specify BRANCH=YES and SUSPEND=NO on an SDUMP or SDUMPX macro to obtain a disabled summary dump.

- **Suspend summary dump**: This summary dump also saves data that is subject to rapid and frequent change before returning control to the scheduled dump requester. This dump, however, can save pageable data. To obtain a suspend summary dump, do the following:
  - For an SDUMP or SDUMPX macro, specify BRANCH=YES and SUSPEND=YES
  - For an SDUMPX macro, specify BRANCH=NO for a scheduled dump with SUMLSTL parameter

- **Enabled summary dump**: This summary dump does not contain volatile system information. The system writes this summary dump before returning control to the dump requester; the summary information is saved for each address space being dumped. To obtain an enabled summary dump, do the following:
  - For an SDUMP or SDUMPX macro, specify BRANCH=NO.
  - For a SLIP operator command, do not specify an SDATA parameter or specify SUM in an SDATA parameter.
– For a DUMP operator command, do not specify an SDATA parameter or specify SUM in an SDATA parameter. Note that this dump does not contain data that the system creates when it detects a problem; for example, this dump would not contain a system diagnostic work area (SDWA).

In Table 10 on page 29, an S indicates that the area is included in the summary dump for the dump type.

<table>
<thead>
<tr>
<th>Summary dump contents</th>
<th>Disabled</th>
<th>Suspend</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address space identifier (ASID) record</strong> for the address space of the dump task</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td><strong>Control blocks</strong> for the failing task, including:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• For task-mode dump requesters:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Address space control block (ASCB)</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>– Request blocks (RB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– System diagnostic work areas (SDWA) pointed to by the recovery termination management 2 work areas (RTM2WA) associated with the task control block (TCB)</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>– TCB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Extended status block (XSB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• For service request block (SRB)-mode dump requesters:</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>– ASCB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Suspended SRB save area (SSRB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– SDWA used for dump</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>– XSB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control blocks</strong> for the recovery termination manager (RTM):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• RTM2WA associated with all TCBs in the dumped address space</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>• RTM2WA associated with the TCB for the dump requester</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td><strong>Cross memory status record</strong> and, if the dump requester held a cross memory local (CML) lock, the address of the ASCB for the address space whose local lock is held</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Dump header</strong>, mapped by AMDDATA</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>For the AMDDATA mapping, see z/OS MVS Data Areas in the z/OS Internet library (<a href="http://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary">www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary</a>).</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Functional recovery routine (FRR) stack</strong> for the current processor</td>
<td></td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Interrupt handler save area (IHSA)</strong> for the home address space or, if a CML is held, for the address space whose local lock is held</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Logical communication area (LCCA)</strong> for each active processor</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>In dumps requested by AR-mode callers, the LCCA includes the AR mode control blocks</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Physical configuration communication area (PCCA)</strong> for each active processor</td>
<td></td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>
### Table 10. Customizing SVC dump contents through summary dumps (continued)

<table>
<thead>
<tr>
<th>Summary dump contents</th>
<th>Disabled</th>
<th>Suspend</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program call link stack elements (PCLINK) stack elements:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pointed to by PSASEL</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pointed to by the XSB associated with the IHSA in the dump</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Pointed to by the SSRB and XSB for the SRB-mode dump requester</td>
<td>S</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>• Associated with the suspended unit of work</td>
<td>S</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Prefixed save area (PSA) for each active processor</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Save areas of register contents</strong></td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>SDWA associated with the failure of a system routine</td>
<td></td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> The storage ranges and ASIDs requested in parameters on the SDUMP or SDUMPX macro</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Storage:</strong> 4 kilobytes before and 4 kilobytes after:</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>• The address in the program status word (PSW)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• All valid unique addresses in the registers saved in the IHSA shown in the dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• All valid unique addresses in the registers saved in the SDWA shown in the dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Instruction counter values of the external old PSW, program check old PSW, I/O old PSW, and restart old PSW saved in the PSAs of each active processor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> 4 kilobytes before and 4 kilobytes after:</td>
<td></td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• All valid unique addresses in the registers saved in the SDWA shown in the dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• All valid unique addresses in the registers in the dump requester’s register save area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• All valid unique addresses in the PSWs in all SDWAs shown in the dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> 4 kilobytes before and 4 kilobytes after:</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>• All valid unique addresses in the PSWs in the RTM2WAs shown in the dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• All valid unique addresses in the registers in the RTM2WAs shown in the dump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> When a PSWREGS parameter is specified on the SDUMP or SDUMPX macro, 4 kilobytes before and 4 kilobytes after:</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>• The address in the PSW, if supplied in the PSWREGS parameter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The address in the general purpose registers, if supplied in the PSWREGS parameter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The storage dumped is from the primary and secondary address spaces of the program issuing the SDUMP or SDUMPX macro. The control registers, if supplied in the PSWREGS parameter, are used to determine the primary and second address spaces.

If access registers are also provided and the PSW indicates AR ASC mode, the access registers will also be used to locate the data.
Table 10. Customizing SVC dump contents through summary dumps (continued)

<table>
<thead>
<tr>
<th>Summary dump contents</th>
<th>Disabled</th>
<th>Suspend</th>
<th>Enabled</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supervisor control blocks:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Current linkage stack</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>• Primary address space number (PASN) access list</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Work unit access list</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vector Facility control blocks:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global, CPU, and local work/save area vector tables (WSAVTG, WSAVTC, and WSAVTL)</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and work/save areas pointed to by addresses in the tables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XSB associated with the IHSA in the dump</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
</tbody>
</table>

For information about control blocks listed in the above table, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

Customizing contents through operator commands

The dump options list for SVC dumps can be customized through a DUMP operator command by all the ways shown in Table 11 on page 32.

**Note:** The contents of SVC dumps requested by SLIP operator commands are controlled only by the SLIP operator command. They are not affected by the IEACMD00 parmlib member or the CHNGDUMP command.

Nucleus areas in dumps: Dump options control the parts of the nucleus that appear in a dump. A diagnostician seldom needs to analyze all the nucleus. An installation can eliminate nucleus areas from dumps. If the IBM-supplied defaults are used:

- SVC dump for a SLIP operator command with ACTION=SVCD contains the read/write DAT-on nucleus
- SVC dump for an SDUMP or SDUMPX macro contains the nucleus map and certain control blocks

If no nucleus changes have been made, an installation should obtain one copy of the DAT-off nucleus to use with all dumps. To obtain this nucleus, enter a DUMP operator command with SDATA=ALLNUC and no other SDATA options. The nucleus does not change from one IPL to another, so one dump can be used again and again.

DAT, dynamic address translation, is the hardware feature that enables virtual storage. In the DAT-on part of the nucleus, the addresses are in virtual storage; in the DAT-off part of the nucleus, the addresses are in central storage.
### Table 11. Customizing SVC dump contents through operator commands

<table>
<thead>
<tr>
<th>Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| **Use SDATA=NODEFAULTS on SDUMP or SDUMPX macro** | **Change occurs:** At dump request  
**What changes:** Excludes the following SDATA default options currently in effect:  
- ALLPSA  
- SQA  
- SUMDUMP  
- IO  
- From all CHNGDUMP operator commands entered through the IEACMD00 parmlib member or through the console  
Exclusion is only for the dump being requested.  
Note that certain default system areas are not excluded; these areas are required for IPCS dump analysis.  
The CHNGDUMP operator command can override the NODEFAULTS option. | To minimize the amount of default data in the dump, code in the program:  
**SDUMP**  
**SDATA=NODEFAULTS** |
| **Replacing CHNGDUMP operator command in IEACMD00 parmlib member** | **Change occurs:** At system initialization  
**What changes:** This command establishes the IBM-supplied dump options for SVC dumps for SDUMP or SDUMPX macros and DUMP operator commands; see “Contents of SVC dumps” on page 23 for the list. | To add the link pack area (LPA) to all SVC dumps for SDUMP or SDUMPX macros and DUMP operator commands, while keeping the local system queue area (LSQA) and trace data, add the following command to IEACMD00:  
**CHNGDUMP SET, SDUMP=(LPA)** |
### Table 11. Customizing SVC dump contents through operator commands (continued)

<table>
<thead>
<tr>
<th>Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| **Entering CHNGDUMP operator command with SDUMP parameter on a console with master authority** | Change occurs: Immediately when command is processed  
What changes:  
**For the ADD mode:** CHNGDUMP options are added to the current SVC dump options list and to any options specified in the macro or operator command that requested the dump. The options are added to all SVC dumps for SDUMP or SDUMPX macros and DUMP operator commands until another CHNGDUMP SDUMPX operator command is entered.  
**For the OVER mode:** CHNGDUMP options are added to the current SVC dump options list. The system ignores any options specified in the macro or operator command that requested the dump. The options override all SVC dumps for SDUMP or SDUMPX macros and DUMP operator commands until a CHNGDUMP SDUMPX,ADD operator command is entered.  
**For the DEL option:** CHNGDUMP options are deleted from the SVC dump options list.  
When more than one CHNGDUMP operator command with SDUMPX is entered, the effect is cumulative. | To add the LPA to all SVC dumps for SDUMP or SDUMPX macros and DUMP operator commands until changed by another CHNGDUMP SDUMP, enter:  
CHNGDUMP SET, SDUMP=(LPA)  
To add the CHNGDUMP SDUMPX options list to all SVC dumps:  
CHNGDUMP SET, SDUMPX, ADD  
To override all SVC dumps with the CHNGDUMP SDUMPX options list:  
CHNGDUMP SET, SDUMPX, OVER  
To remove LPA from the SDUMPX options list:  
CHNGDUMP DEL, SDUMP=(LPA) |
| **Using an operator command parameter.**  
Parameters on the DUMP operator command specify the contents for the dump being requested. | Change occurs: At dump request  
What changes: The DUMP operator command parameter options are added to the dump options list, but only for the dump being requested. | To add ALLNUC to this SVC dump, enter:  
DUMP COMM=(MYDUMP1 5-9-88)  
The system issues a message:  
* 23 IEE094D SPECIFY OPERAND(S) FOR DUMP COMMAND  
Enter in reply:  
REPLY 23, JOBNAME=MYJOB1, SDATA=(ALLNUC), END |

---

**Tailoring SVC dumps**

Sometimes servers retain client-related data in address spaces and dataspaces other than the client’s, which means this data will not be in the dump. For this reason, server code can modify the contents of an SVC dump to provide additional problem determination data by creating a tailored SVC dump exit. This feature allows a requestor to specify a dump request without identifying related server address, dataspaces, and storage areas, which could be unknown and dynamic in nature.

---

SVC dump 33
The server code provider can create these SVC dump exits without modifying module IEAVTSXT. The CSVDYNEX macro identifies the exit load module and associates it with the IEASDUMP.SERVER resource. The exit is allowed to scan the current dump request and determines if data should be added to the dump. The data is added to the dump by identifying it in the appropriate SDMSE_OUTPUT area. For additional details, see IEASDUMP.SERVER dynamic exit processing in z/OS MVS Programming: Authorized Assembler Services Guide.

The tailored SVC dump exits are not called in any particular order. To ensure that the current requests are presented to an exit, the dump request is updated between exit invocations. If an exit adds data to the dump, every exit is re-invoked until no additional changes are made. Because of the additional processing required, tailored SVC dump exits do not receive control by default for SDUMPX macro requests. To cause the exit processing to take place, you must specify SDATA=SERVERS in the SDUMPX macro. SDATA=SERVERS is in force for all operator Dump and SLIP SVC dump requests.

### Analyzing summary SVC dumps

The SUMDUMP or SUM option on the SDUMP or SDUMPX macro causes SVC dump to capture a summary dump. Two types of information are captured in summary dumps. First, index data for storage is captured. This index data can be formatted using the IPCS VERBX SUMDUMP command. The second type of information captured is the storage itself. Storage captured by summary dump processing can be viewed using IPCS by specifying the SUMDUMP option (for example, IPCS LIST 00003000 SUMMARY). IBM strongly recommends that you view the SUMDUMP output prior to investigating the usual portions of the dump. The SUMDUMP option provides different output to SDUMPX branch entries and SVC entries to SDUMP. For example, data included for branch entries to SDUMPX include PSA, LCCA, and PCCA control blocks, and data recorded for SVC entries to SDUMPX include RTM2WA control blocks. Each summary dump index record, when formatted using the IPCS VERBEXIT SUMDUMP command, is displayed as “---- tttt---- range-start range-end range-asid range-attributes”. The range-attributes include a value of INCOMP, which means that some or all of the areas represented by the specified range may not be in the dump.

Figure 6 on page 34 is an example format using the IPCS VERBX SUMDUMP command. The summary dump is formatted by the IPCS VERBXSUMDUMP subcommand and has an index which describes what the summary contains. Summary dumps are not created for dumps taken with the DUMP command. Only dumps created by the SDUMP or SDUMPX macro contain summary dumps.

<table>
<thead>
<tr>
<th>STORAGE TYPE</th>
<th>RANGE START</th>
<th>RANGE END</th>
<th>ASID</th>
<th>ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGISTER AREA--</td>
<td>0135F000</td>
<td>01363FFF</td>
<td>001E (COMMON)</td>
<td></td>
</tr>
<tr>
<td>REGISTER AREA--</td>
<td>00000001_7F5AD000</td>
<td>00000001_7F5B0FFF</td>
<td>001E</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6. Example: Format of IPCS VERBX SUMDUMP command

**Note:** During SVC dump processing, the system sets some tasks in the requested address space non-dispatchable; non-dispatchable tasks in the dump may have been dispatchable at the time of the problem.

Figure 7 on page 35 is a partial example of a summary dump using the IPCS VERBX SUMDUMP command.
<table>
<thead>
<tr>
<th>STORAGE TYPE</th>
<th>RANGE START</th>
<th>RANGE END</th>
<th>ASID ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMLSTA RANGE --</td>
<td>023BCD70</td>
<td>023BCD7F 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>SMLSTA RANGE --</td>
<td>017E8000</td>
<td>017E8FFF 0001</td>
<td>COMMON</td>
</tr>
<tr>
<td>SMLSTA RANGE --</td>
<td>02166000</td>
<td>02167FFF 0001</td>
<td>COMMON</td>
</tr>
<tr>
<td>PSA</td>
<td>00000000</td>
<td>00001FFF 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>PCCA</td>
<td>00F43000</td>
<td>00F4324F 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>LCCA</td>
<td>00F82000</td>
<td>00F82A47 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>LCCX</td>
<td>021C7000</td>
<td>021C771F 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>INT HANDLER DUCT</td>
<td>0000E000</td>
<td>00010FFF 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>I.H. LINKAGE STK</td>
<td>00FC4000</td>
<td>00FC6FFF 001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER AREA --</td>
<td>7FFFE000</td>
<td>7FFFEFFF 001E</td>
<td>COMMON</td>
</tr>
</tbody>
</table>

Figure 7. Example: IPCS VERBX SUMDUMP command

To examine the storage shown in Figure 7 on page 35, invoke the IPCS LIST command, as shown in Figure 8 on page 35.

```
IPCS LIST 00FC4000. SUMDUMP LEN(256) DISPLAY
****************************** TOP OF DATA ***********************************
LIST 00FC4000 ASID(X'001E') SUMDUMP LENGTH(X'0100')
AREA
ASID(X'001E') SUMDUMP ADDRESS(FC4000.) KEY(00)
00FC4000. 7f6bff00 7f6bff00 02259010 00000000 |",,1",}........|
00FC4010. 02250000 02250000 00000004 00000001 |..}.............|
00FC4020. 00000000 00FC3E10 00000000 00000000 |................|
00FC4030. 00000000 00000000 00000000 00800000 |................|
00FC4040. 06102000 00000000 00000000 00000000 |................|
00FC4050 LENGTH(X'10')==>All bytes contain X'00'
00FC4060. 00000000 02247CB8 00000000 00000000 |......@.........|
00FC4070. 02258040 0000164E 00008000 00000000 |... ...+........|
00FC4080 LENGTH(X'80')==>All bytes contain X'00'
****************************** END OF DATA ***********************************
```

Figure 8. Example: Examining storage

For more information about the record ID values, see the SMDLR and SMDXR control blocks in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

**SUMDUMP output for SVC-Entry SDUMPX**

For an SVC entry, the storage captured in a summary dump can contain information that is not available in the remainder of the SVC dump if options such as region, LSQA, nucleus, and LPA were not specified in the dump parameters.

For each address space dumped, a summary dump index record is written with the ASID, plus the jobname and stepname for the last task created in the address space. The SUMDUMP output contains RTM2 work areas for tasks in address spaces that are dumped. Many of the fields in the RTM2WA provide valuable debugging information.

The summary dump data is dumped in the following sequence:

1. The ASID record is dumped for the address space.
2. The SMLIST/SMLSTA/SMLSTL/SMLIST64 ranges and the PSWREGS, parameter list and data ID, data are dumped next. These contain information that is helpful in debugging the problem, and should be examined carefully.
3. All RTM2 work areas pointed to by all TCBs in this address space are dumped.
4. An address range table is built containing the following ranges, pointed to by the RTM2WA:
   - 4K before and after the PSW at the time of error (RTM2NXT1)
   - 4K before and after each register at the time of error (RTM2EREG).

Duplicate storage is eliminated from this address range table to reduce the amount of storage dumped.

**SUMDUMP output for branch-entry SDUMPX**

For branch entry to SDUMP, there are two types of summary dumps:

- **Disabled summary dump** - which performs the summary dump with the system disabled for interruptions. This means that all data to be dumped must be paged in at the time of the summary dump.

- **Suspend summary dump** - which is taken in two parts. The first part is similar to the disabled summary dump and dumps some of the global system control blocks. The second part runs with the system enabled for interruptions. This allows data to be dumped that is currently paged out, but was going to be modified by the recovery routine that requested SVC dump processing.

The SUMDUMP output for a branch entry to SVC dump might not match the data that is at the same address in the remainder of the dump. The reason for this is that SUMDUMP is taken at the entry to SVC dump while the processor is disabled for interruptions. The system data in the remainder of the dump is often changed because other system activity occurs before the dump is complete. The SUMDUMP output follows a header that contains the ASID of the address space from which the data was obtained.

The following conditions can occur that prevent SDUMPX from taking a disabled or suspend summary dump:

- The system is not able to obtain the necessary locks to serialize the real storage buffer (RSB).
- The system is in the process of modifying the storage queues and cannot satisfy the request for a RSB.
- No frames are available for a RSB.
- SVC dump encounters an error while holding serialization for the RSB.
- A critical frame shortage causes the system to steal the pages of the RSB.
- The SVC dump timer disabled interruption exit determines that SVC dump has failed and frees the RSB.

**Analyzing disabled summary dumps**

For **disabled summary dumps**, records are dumped in the following order:

1. If a suspend summary dump was requested but could not be taken, the system attempts to obtain a disabled summary dump. If this occurs, an error record is written to that effect. If the system is unable to obtain a suspend summary dump and a disabled summary dump, then no summary data is available for the dump.
2. The XMEM ASID record is written that gives the ASID that is home, primary, secondary, and CML (if the CML lock is held).
3. The SUMLIST/SUMLSTA/SUMLSTL/SUMLIST64 address ranges and the PSWREGS data are dumped.
4. The PSA, PCCA, LCCA, and LCCX for each processor are dumped.
5. The current PCLINK stack (pointed to by PSASEL) is dumped (if it exists).
6. If this is a SLIP request for a dump (ACTION=SVCD), then the SLIP reg/PSW area (pointed to by the SUMDUMP parameter list SDURGPSA) is dumped.

   The following address ranges are added to the address range table:
   - 4K before and after the PSW address at the time of the SLIP trap.
   - 4K before and after each address in the registers at the time of the SLIP trap.

Duplicate storage is eliminated from this address range table to reduce the amount of data written to the dump data set.
Note that if the primary and secondary ASIDs are different, the above address ranges are added to the table for both ASIDs.

7. The IHSA is dumped along with its associated XSB and PCLINK stack. The PSW and register addresses from the IHSA are added to the range table. This causes 4K of storage to be dumped around each address.

8. The caller's SDWA is dumped, if one exists. The PSW and register addresses from the SDWA are added to the range table. This causes 4K of storage to be dumped around each address.

9. The addresses in the address range table are dumped.

10. The super FRR stacks are dumped.

11. The global, local, and CPU work save area (WSA) vector tables are dumped. The save areas pointed to by each of these WSA vector tables are also dumped.

12. 4K of storage on either side of the address portion of the I/O old PSW, the program check old PSW, the external old PSW, and the restart old PSW saved in the PSA for all processors, are dumped.

Analyzing suspend summary dumps

For **suspend summary dumps**, records are dumped in the following order:

1. The ASID: the PSA, PCCA, LCCA records, the IHSA, XSB, and the PCLINK stack, are all dumped with the system disabled in the same way they are dumped in steps 2, 4, and 5 for the disabled summary dump.

   At this point, an SRB is scheduled to the DUMPSRV address space and the current unit of work (SDUMP's caller) is suspended by using the STOP service. Data dumped at this point does not have to be paged in because the system is enabled. Cross memory functions are used to gain access to data in the caller's address space.

2. The SUMLIST/SUMLSTA/SMULSTL/SMULST64 address ranges and the PSWREGS data are dumped.

3. The caller's ASCB is dumped.

4. The suspended unit of work (SVC dump's caller) is dumped. This is either a TCB or an SSRB. The related PCLINK stacks are also dumped.

5. For TCB mode callers, the caller's SDWA is dumped. The PSW and register addresses from the SDWA are added to the range table. This causes 4K of storage to be dumped around each address. All RTM2 work areas pointed to by this TCB and any associated SDWAs are all dumped.

   For SRB mode callers, the SDWA is dumped. The PSW and register addresses from the SDWA are added to the range table. This causes 4K of storage to be dumped around each address. Also, the caller's register save area is added to the range table and the storage dumped.

   Duplicate storage is eliminated from the address range table to reduce the amount of storage dumped.

6. After all the storage is saved in a virtual buffer in the DUMPSRV address space, the caller’s unit of work is reset by using the RESET service. This allows SVC dump to complete and return to the caller. When SVC dump processing completes in the address space to be dumped, whatever processing was taking place in that address space when it was interrupted by SVC dump resumes. The rest of the dump is then scheduled from the DUMPSRV address space.

Analyzing an SVC dump

This section shows you how to use IPCS to analyze an SVC dump. You would analyze an SVC dump because of one of the following:

- Dump output from the IPCS STATUS FAILDATA subcommand did not contain data for the abend being diagnosed.
- The problem involved multiple abends.
- The dump was taken but does not contain abend-related information.
This section contains the following topics, which, if followed in order, represent the procedure for analyzing an SVC dump:

- “Formatting the SVC dump header” on page 38
- “Looking at the dump title” on page 39
- “Displaying the incident token, time and type of dump” on page 40
- “Locating error information” on page 41
- “Analyze TCB structure” on page 43
- “Examining the LOGREC buffer” on page 45
- “Examining the system trace” on page 46
- “Looking at the registers” on page 47
- “Other useful reports for SVC dump analysis” on page 48
- “Reading the SDUMPX 4K SQA buffer” on page 48

Specifying the source of the dump

The first step in analyzing the dump is to specify the source of the dump that IPCS should format. In the IPCS dialog (see Figure 9 on page 38), choose option 0 (DEFAULTS) and specify the name of the SVC dump data set on the “Source” line.

--------------- IPCS Default Values -----------------------------

You may change any of the defaults listed below.
If you change the Source default, IPCS will display the current default Address Space for the new source and will ignore any data entered in the Address Space field.

Source ==> DSN('D46IPCS.SVC.CSVLLA.DUMP002')
Address Space ==> Ignored if Source is changed.
Message Routing ==> NOPRINT TERMINAL
Message Control ==> FLAG(WARNING)
Display Content ==> NOMACHINE REMARK REQUEST NOSTORAGE SYMBOL

Press ENTER to update defaults.
Use the END command to exit without an update.

Figure 9. IPCS Default Values menu

Press Enter to register the new default source name. Then, press PF3 to exit the panel.

You can also use the SETDEF subcommand to specify the source. For the dump in the preceding example, enter:

SETDEF DNAME('D46IPCS.SVC.CSVLLA.DUMP002')

IPCS does not initialize the dump until you enter the first subcommand or IPCS dialog option that performs formatting or analysis. At that time IPCS issues message BLS18160D to ask you if summary dump data can be used by IPCS. The summary dump data should always be used for an SVC dump because it is the data captured closest to the time of the failure. If you do not allow IPCS to use summary dump data, other data captured later for the same locations will be displayed, if available. Such data is less likely to be representative of the actual data at these storage locations at the time of the failure.

Formatting the SVC dump header

The SVC dump header contains the following information:

- SDWA or SLIP data
- Dump title, error identifier, and time of the dump
- Requestor of dump
This information describes the type of SVC dump and can tell you if the dump is a CONSOLE dump or a dump caused by the SLIP command. You would analyze these dumps differently.

Format data in the header of an SVC dump using the following IPCS subcommands:

- LIST TITLE
- STATUS FAILDATA
- STATUS REGISTERS
- STATUS WORKSHEET

The following sections give examples of how to use these IPCS subcommands (or IPCS dialog options, where applicable) to obtain the desired information.

**Looking at the dump title**

The dump title tells you the component name, component identifier, and module name. You can find the dump title using the following IPCS subcommands:

- LIST TITLE
- STATUS WORKSHEET

You can also obtain the STATUS WORKSHEET report through option 2.3 of the IPCS dialog. First, choose option 2 (ANALYSIS) from the primary option menu, as shown in Figure 10 on page 39.

```
-------------------- z/OS 01.02.00 IPCS PRIMARY OPTION MENU --------------------
OPTION ===> 2

0 DEFAULTS - Specify default dump and options
1 BROWSE - Browse dump data set
2 ANALYSIS - Analyze dump contents
3 SUBMIT - Submit problem analysis job to batch
4 COMMAND - Enter subcommand, CLIST or REXX exec
5 UTILITY - Perform utility functions
6 DUMPS - Manage dump inventory
T TUTORIAL - Learn how to use the IPCS dialog
X EXIT - Terminate using log and list defaults

Enter END command to end the IPCS dialog.
```

**Figure 10. IPCS primary option menu**

Then, choose option 3 (WORKSHEET) from the analysis of dump contents menu, as shown in Figure 11 on page 39.

```
-------------------- IPCS MVS ANALYSIS OF DUMP CONTENTS --------------------
OPTION ===> 3
To display information, specify the corresponding option number.

1 SYMPTOMS - Symptoms
2 STATUS - System environment summary
3 WORKSHEET - System environment worksheet
4 SUMMARY - Address spaces and tasks
5 CONTENTION - Resource contention
6 COMPONENT - MVS component data
7 TRACE - Trace formatting
8 STRDATA - Coupling Facility structure data

Enter END command to terminate MVS dump analysis.
```

**Figure 11. IPCS MVS analysis of dump contents menu**

IPCS displays a new panel with information similar to that in Figure 12 on page 40. The dump title is labelled at the top of the STATUS WORKSHEET report. The dump title is “Compon=Program Manager Library-Lookaside, Compid=SC1CJ, Issuer=CSVLLBLD.” See z/OS MVS Diagnosis: Reference for an explanation of dump titles.
MVS Diagnostic Worksheet

CPU Model 2064 Version FF Serial no. 131512 Address 01
Date: 02/15/2001 Time: 20:33:34.680912 Local

Original dump dataset: SYS1.DUMP06
Information at time of entry to SVCDUMP:
HASID 001B PASID 001B SASID 001B PSW 070C1000 8001AE5A
CML ASCB address 00000000 Trace Table Control Header address 7FFE3000
Dump ID: 001 Error ID: Seq 00019 CPU 0041 ASID X'001E' Time 20:33:33.5

Figure 12. STATUS WORKSHEET subcommand sample output — dump title

STATUS WORKSHEET also displays the error ID. In Figure 12 on page 40, the dump ID is 001, error ID is sequence number 00051, ASID=X'001B', and processor 0000. Use this dump ID to match messages in SYSLOG and LOGREC records to the dump.

Displaying the incident token, time and type of dump

The IPCS subcommand STATUS SYSTEM identifies the following types if information. The IPCS dialog does not have a menu option for STATUS SYSTEM. Instead you must enter the subcommand.

- The time of the dump
- The program requesting the dump
- An incident token that associates one or more SVC dumps requested for a problem on a single system or on several systems in a sysplex

Figure 13 on page 41 is an example of a STATUS SYSTEM report. For a scheduled SVC dump, the following identifies the dump:

Program Producing Dump: SVCDUMP
Program Requesting Dump: IEAVTSDT

A dump requested by a SLIP or DUMP operator command is always a scheduled SVC dump.

For a synchronous SVC dump, the following identifies the dump:

Program Producing Dump: SVCDUMP
Program Requesting Dump: cccccccc

Where cccccccc is one of the following:

- The name of the program running when the system detected the problem
- SVCDUMP, if the system could not determine the failing task

A SYSMDUMP ABEND dump is always a synchronous SVC dump.
SYSTEM STATUS:
Nucleus member name: IECANUC01
I/O configuration data:
IODF data set name: SYS0.IODF43
IODF configuration ID: CONIG00
EDT ID: 00
Sysplex name: SYSPL1
TIME OF DAY CLOCK: B566EA85 A0750707 02/15/2001 20:33:34.680912 local
TIME OF DAY CLOCK: B567202A 89750707 02/16/2001 00:33:34.680912 GMT
Program Producing Dump: SVCDUMP
Program Requesting Dump: IECATSDT
Incident token: SYSPL1 S4 06/23/1993 12:43:54.697367 GMT

Figure 13. Sample output from the STATUS SYSTEM subcommand

SYSTEM STATUS for an SVC dump contains an incident token. The request for the dump specifies the incident token or the system requesting the dumps provides it. The incident token consists of:

- The name of the sysplex
- The name of the system requesting the multiple dumps
- The date in Greenwich Mean Time (GMT)
- The time in GMT

Locating error information

Use the IPCS subcommand STATUS FAILDATA to locate the specific instruction that failed and to format all the data in an SVC dump related to the software failure. This report gives information about the CSECT involved in the failure, the component identifier, and the PSW address at the time of the error.

Note: For SLIP dumps or CONSOLE dumps, use SUMMARY FORMAT or VERBEXIT LOGDATA instead of STATUS FAILDATA.

Choose option 4 (COMMAND) from the IPCS primary option menu (see Figure 14 on page 41) and enter the following command. Use the PF keys to scroll up and down through the report. The following sections describe parts of the report.

------------------------- IPCS Subcommand Entry -------------------------------
Enter a free-form IPCS subcommand, CLIST, or REXX exec invocation below:

===> STATUS FAILDATA

Figure 14. IPCS Subcommand Entry menu

Identifying the abend and reason codes: As Figure 15 on page 41 shows, under the heading “SEARCH ARGUMENT ABSTRACT”, you will find the abend code and, if provided, an abend reason code.

In Figure 15 on page 41, the abend code is X'FF0' with no reason code. See z/OS MVS System Codes for a description of the abend code and reason code.
The following IPCS reports also provide the abend and reason codes:

- VERBEXIT LOGDATA
- STATUS WORKSHEET
- VERBEXIT SYMPTOMS

**Finding the system mode:** As Figure 16 on page 42 shows, below the “SEARCH ARGUMENT ABSTRACT” section is information describing the system mode at the time of the error.

```
Home ASID: 001B    Primary ASID: 001B    Secondary ASID: 001B
PKM: 8000          AX: 0001              EAX: 0000

RTM was entered because a task requested ABEND via SVC 13.
No locks were held.
No super bits were set.
```

**Figure 16. System mode information in the STATUS FAILDATA report**

The line that starts with “The error occurred...” tells you if the failure occurred in an SRB or TCB. In the example in Figure 16 on page 42, the error occurred while an SRB was in control, which means you need to look under the heading SEARCH ARGUMENT ABSTRACT (see Figure 15 on page 41) to find the CSECT and load module names. This is the module in which the abend occurred.

If an SRB service routine was in control, look under the heading SEARCH ARGUMENT ABSTRACT for the CSECT and load module names. This is the failing module.

In output from a SUMMARY FORMAT subcommand, look for the RB for the abending program. The RB has an RTPSW1 field that is nonzero.

In a dump requested by a SLIP operator command, use a STATUS CPU REGISTERS subcommand to see data from the time of the problem.

If the error had occurred while a TCB was in control, you would find the failing TCB by formatting the dump using the IPCS subcommand SUMMARY TCBERROR. See “Analyze TCB structure” on page 43.

**Identifying the failing instruction:** The STATUS FAILDATA report also helps you find the exact instruction that failed. This report provides the PSW address at the time of the error and the failing instruction text. Note that the text on this screen is not always the failing instruction text. Sometimes the PSW points to the place where the dump was taken and not the place where the error occurred.

In Figure 17 on page 43, the PSW at the time of the error is X'11E6A3C' and the instruction length is 4-bytes; therefore, the failing instruction address is X'11E6A38'. The failing instruction is 927670FB.
OTHER SERVICEABILITY INFORMATION

Recovery Routine Label: CSVLEBLD
Date Assembled: 00245
Module Level: HBB7705
Subfunction: LIBRARY-LOOKASIDE

Time of Error Information

PSW: 070C0000 811E6A3C  Instruction length: 04   Interrupt code: 0004
Failing instruction text: E0009276 70F8S030 70F8D7F7

Figure 17. Time of error information in the STATUS FAILDATA report

The failing instruction text displayed in this report is always 12 bytes, 6 bytes before and 6 bytes after the PSW address. In this example, the failing instruction, 927670FB, is an MVI of X'76' to the location specified by register 7 + X'FB'.

Register 7 at the time of the error, shown under Registers 0-7 above, contained a X'00000017'. The attempted move was to storage location X'112'. The first 512 bytes of storage are hardware protected. Any software program that tries to store into that area without authorization will receive a protection exception error and a storage protection exception error.

See z/Architecture Principles of Operation for information about machine language operation codes, operands, and interruption codes.

To find the module that abnormally terminated and the offset to the failing instruction, use the WHERE command. WHERE can identify the module or CSECT that the failing PSW points to.

Analyze TCB structure

If a TCB was in control at the time of the error, use the IPCS subcommand SUMMARY TCBERROR to look at the TCB information and find the failing component. SUMMARY TCBERROR summarizes the control blocks for the failing address space. (To see all the fields in the control blocks, use SUMMARY FORMAT.) Scan the completion codes (field CMP) for each TCB to find the correct TCB. This report displays RBs from newest to oldest.

Figure 18 on page 44 is an example of SUMMARY TCBERROR output. In this example the TCB at address 008E9A18 has a completion code of X'0C1.' The error occurred under this TCB. Once you have identified the failing TCB, you can follow the RB chain to the failing program.
In this example, the most current RB is the SVRB at address 008FD7A8. This is the SVC dump's RB. The ESTAE's RB is the PRB at 008E9750. The ESTAE issued an SVC 33. The RB for the recovery termination manager (RTM) is the SVRB at 008FD638. RTM issued an SVC C to attach the ESTAE. The X'0C1' abend occurred under the SVRB at 008FD4C8. The last interrupt was a 1 at the address indicated in the old PSW field (OPSW). The next RB in the chain shows an SVC X'53' (SMFWT) had been issued. This is the code the X'0C1' occurred in.

For a scheduled dump, the abnormally terminating TCB can generally be found by scanning for a nonzero completion code. If there is no code, scan the system trace for the abend. The trace identifies the ASID number and TCB address for each entry. See “Examining the system trace” on page 46.

Use the STATUS or the STATUS REGS subcommand to find the data set name and the module name of the SVC dump requester.

---

Figure 18. Example: the SUMMARY TCBERROR report
Examining the LOGREC buffer

Use the IPCS subcommand VERBEXIT LOGDATA to view the LOGREC buffer in a dump. This report might repeat much of the information contained in the STATUS FAILDATA report, but it helps to identify occasions when multiple error events caused the software failure.

The following sample output, from the VERBEXIT LOGDATA subcommand, shows how multiple errors can appear in the LOGREC buffer. Abend X'0D5' is the first abend and X'058' is the second. Always check for multiple errors in the VERBEXIT LOGDATA report that are in the same address space or a related address space and are coincident with or precede the SVC dump.

```
TYPE: SOFTWARE RECORD      REPORT: SOFTWARE EDIT REPORT         DAY.YEAR
SCP: VS 2 REL 3            REPORT DATE: 320.17
MODEL: 2964                ERROR DATE: 229.17
SERIAL: 01F167             HH:MM:SS.TH
JOBNAME: LSCMSTR
ERRORID: SEQ=01196  CPU=0042  ASID=000C  TIME=13:27:59.6
SEARCH ARGUMENT ABSTRACT
  PIDS/####SC1C5 RIDS/NUCLEUS#L RIDS/IEAVEDS0 AB/S00D5 PRCS/00000021 REGS/0F120
  RIDS/IEAVEDSR#R

SYMPTOM             DESCRIPTION
-----------------             -----------------
  PIDS/####SC1C5      PROGRAM ID: ####SC1C5
  RIDS/NUCLEUS#L      LOAD MODULE NAME: NUCLEUS
  RIDS/IEAVEDS0       CSECT NAME: IEAVEDS0
  AB/S00D5            SYSTEM ABEND CODE: 00D5
  PRCS/00000021       ABEND REASON CODE: 00000021
  REGS/0F120          REGISTER/PSW DIFFERENCE FOR R0F: 120
  RIDS/IEAVEDSR#R     RECOVERY ROUTINE CSECT NAME: IEAVEDSR

OTHER SERVICEABILITY INFORMATION

  RECOVERY ROUTINE LABEL: IEAVEDS0
  DATE ASSEMBLED: 08/23/89
  MODULE LEVEL: UY41669
  SUBFUNCTION: DISPATCHER

TIME OF ERROR INFORMATION

  PSW: 44040000 80000000 00000000 00FEFC56
  INSTRUCTION LENGTH: 04, INTERRUPT CODE: 0021
  FAILING INSTRUCTION TEXT: 1008B777 1008B225 000007FE
  TRANSLATION EXCEPTION IDENTIFICATION: 00000041
  BREAKING EVENT ADDRESS: 00000000_00FF650E
  AR/GR 0-1 00000000/00000000_00000041 00000000/00000000_00F90AC0
  AR/GR 2-3 00000000/00000000_00000000 00000000/00000000_00000000
  AR/GR 4-5 00000000/00000000_00000000 00000000/00000000_008DE18B
  AR/GR 6-7 00000000/00000000_00000000 00000000/00000000_008DE18B
  AR/GR 8-9 00000000/00000000_00F97280 00000000/00000000_0103AB6A
  AR/GR 10-11 00000000/00000000_00FF6510 00000000/00000000_00000F26
  AR/GR 12-13 00000000/00000000_00000000 00000000/00000000_00000000
  AR/GR 14-15 00000000/00000000_00000000 00000000/00000000_00000000

  HOME ASID: 000C  PRIMARY ASID: 000C  SECONDARY ASID: 000C
  PKM: 0000  AX: 0001

RTM WAS ENTERED BECAUSE OF A PROGRAM CHECK INTERRUPT.
THE ERROR OCCURRED WHILE A LOCKED OR DISABLED ROUTINE WAS IN CONTROL.
NO LOCKS WERE HELD.
SUPER BITS SET: PSADISP - DISPATCHER
```

SVC dump
This sample output was created on a currently supported z/OS release and at least one high half (bits 0-31) of the 64-bit GR from GRs 0-15 is not 0. The VERBEXIT LOGDATA report might show less data under different conditions.

When viewing the VERBEXIT LOGDATA report, skip the hardware records to view the software records. Search for the first software record.

The field “ERRORID=” gives the error identifier for the software failure. The error identifier consists of the sequence number, ASID, and time of the abend. By matching this identifier with error identifiers from other reports, you can tell if this is the same abend you have been analyzing or if it is a different abend. See “Interpreting software records” on page 529 for more information.

Examining the system trace

The system trace table describes the events in the system leading up to the error. The trace table is helpful when the PSW does not point to the failing instruction, and to indicate what sequence of events preceded the abend.

IPCS option 2.7.4 formats the system trace. The report is long. IBM recommends scrolling to the end of the report, then backing up to find the trace entry for the abend. Type an M on the command line and press F8 to scroll to the bottom of the report.

After you find the entry for the abend, start at the PSW where the dump was taken and track the events in the table to find where the failing instruction is in the code.

The system trace report marks important or significant entries with an asterisk. In Figure 19 on page 47, *SVC D in the Ident CD/D column identifies the PSW where the program took the dump. Prior to the SVC D are three PGM (program check) entries. PGM 001 has an asterisk next to it, indicating that the program check was unresolved. The next entry, RCVY PROG, identifies a recovery program that failed because it issued the SVC D a few entries later. See Chapter 8, “System trace,” on page 155 to recognize significant entries in the system trace table.

46 z/OS: MVS Diagnosis: Tools and Service Aids
Looking at the registers

Use the IPCS subcommand STATUS REGISTERS to display the registers for the TCBs and RBs. SUMMARY REGS gives the same information in a different format. This report identifies the PSW, ASID and register values just as the STATUS FAILDATA report, but STATUS REGISTERS also gives the control register values.

Figure 20. Sample of the STATUS REGISTERS report

The example output in Figure 20 on page 47 shows the address in the PSW is X'0FE5FC', the ASID is X'1B', and the failing instruction is located in offset X'5FC' in the CSECT IEAVESVC in the module IENUC01 in the nucleus. You can now browse the dump at this location and look at the specific failing instruction. You could also use the information about the registers to find out more about the error if the address in the PSW does not point to the failing instruction.

This report identifies the PSW, ASID and register values just as the STATUS FAILDATA report. However, as Figure 21 on page 48 shows, STATUS REGISTERS also gives the control register values.
CPU STATUS:
PSW=070C4000 00FC5C96
(Running in AR, key 0, AMODE 24, DAT ON)
DISABLED FOR PER
ASID(X'001E') FC5C96. STRUCTURE(Cvt)+06 IN READ/WRITE NUCLEUS
ASID(X'001E') FC5C96. IEANUC01.IEAVCT+0116 IN READ/WRITE NUCLEUS
ASID(X'001E') FC5C96. STRUCTURE(dcb)+0152 IN READ/WRITE NUCLEUS
ASID(X'001E') FC5C96. STRUCTURE(dcb)+015A IN READ/WRITE NUCLEUS
ASCB30 at F90B80, JOB(ORANGE), for the home ASID
ASXB30 at 6FDE90 and TCB30D at 6E7A68 for the home ASID
HOME ASID: 001E PRIMARY ASID: 001E SECONDARY ASID: 001E

General purpose register values
0-1 00000000_00000020 00000000_84058000
2-3 00000000_00000000 00000001_00004000
4-5 00000000_01F9B9A8 00000000_01F9B9A8
6-7 00000000_00000000 00000000_01F9BE10
8-9 00000000_00000000 00000000_FFFFFFFC
10-11 00000000_00000000 00000000_00FDAC58
12-13 00000000_01560410 00000000_01560410
14-15 00000000_01560410 00000000_01560410

Access register values
0-3 00000000 00000000 00000000 00000000
4-7 00000000 00000000 00000000 00000000
8-11 00000000 00000000 00000000 00000000
12-15 00000000 00000000 00000000 00000000

Control register values
Left halves of all registers contain zeros
0-3 5F29EE40 0374C007 008D0A40 00C0001E
4-7 00000000 00000000 00000000 00000000
8-11 00020000 00000000 00000000 00000000
12-15 0294EE43 0374C007 DF882A2F 7F5CD4B0

Figure 21. Sample of the STATUS REGISTERS report run in z/Architecture mode

Other useful reports for SVC dump analysis

To collect further SVC dump data, use any of the following commands.

<table>
<thead>
<tr>
<th>IPCS subcommand</th>
<th>Information in the report</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS CPU REGISTERS DATA CONTENTION</td>
<td>Data about the abend, current ASID, and task.</td>
</tr>
<tr>
<td>SUMMARY FORMAT</td>
<td>All fields in the TCBs and the current ASID.</td>
</tr>
<tr>
<td>TCBEXIT IEAVTFMT 21C.%</td>
<td>The current FRR stack.</td>
</tr>
<tr>
<td>LPAMAP</td>
<td>The entry points in the active LPA and PLPA.</td>
</tr>
<tr>
<td>VERBEXIT NUCMAP</td>
<td>A map of the modules in the nucleus when the dump was taken.</td>
</tr>
<tr>
<td>VERBEXIT SUMDUMP</td>
<td>The data dumped by the SUMDUMP option on the SDUMPX macro.</td>
</tr>
<tr>
<td>VERBEXIT MTRACE</td>
<td>The master trace table.</td>
</tr>
<tr>
<td>VERBEXIT SYMPTOMS</td>
<td>The primary and secondary symptoms if available.</td>
</tr>
</tbody>
</table>

Note: Use the VERBEXIT SYMPTOMS subcommand last in your SVC dump analysis. Other subcommands can add symptoms to the dump header record. This ensures VERBEXIT SYMPTOMS provides all symptoms available from the dump.

Reading the SDUMPX 4K SQA buffer

The following SVC dumps contain problem data in an SDUMPX 4K system queue area (SQA) buffer:
- An SVC dump requested by a SLIP operator command
- Other SVC dumps, when indicated in the explanation of the dump title.
- An SVC dump requested by an SDUMP or SDUMPX macro with a BUFFER=YES parameter
To obtain the buffer, use the following IPCS subcommand:

```
LIST 0 DOMAIN(SDUMPBUFFER) LENGTH(4096)
```

Table 12 on page 49 describes the fields in the SQA buffer and should be used for diagnosis.

### Table 12. Fields in SQA buffer

<table>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>The characters, TYPE</td>
</tr>
<tr>
<td>4 (4)</td>
<td>4</td>
<td>RTM/SLIP processing environment indicator:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- X'00000001': RTM1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- X'00000002': RTM2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- X'00000003': MEMTERM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- X'00000004': PER</td>
</tr>
<tr>
<td>8 (8)</td>
<td>4</td>
<td>The characters, CPU</td>
</tr>
<tr>
<td>12 (C)</td>
<td>4</td>
<td>Logical processor identifier (CPUID)</td>
</tr>
<tr>
<td>16 (10)</td>
<td>4</td>
<td>The characters, REGS</td>
</tr>
<tr>
<td>20 (14)</td>
<td>64</td>
<td>General purpose registers 0 through 15 at the time of the event</td>
</tr>
<tr>
<td>84 (54)</td>
<td>4</td>
<td>The characters, PSW</td>
</tr>
<tr>
<td>88 (58)</td>
<td>8</td>
<td>The program status word (PSW) at the time of the event</td>
</tr>
<tr>
<td>96 (60)</td>
<td>4</td>
<td>The characters, PASD</td>
</tr>
<tr>
<td>100 (64)</td>
<td>2</td>
<td>The primary address space identifier (ASID) at the time of the event</td>
</tr>
<tr>
<td>102 (66)</td>
<td>4</td>
<td>The characters, SASD</td>
</tr>
<tr>
<td>106 (6A)</td>
<td>2</td>
<td>The secondary ASID at the time of the event.</td>
</tr>
<tr>
<td>108 (6C)</td>
<td>4</td>
<td>The characters, ARS</td>
</tr>
<tr>
<td>112 (70)</td>
<td>64</td>
<td>Access registers 0 through 15 at the time of the event.</td>
</tr>
<tr>
<td>176 (80)</td>
<td>4</td>
<td>The characters, G64H</td>
</tr>
<tr>
<td>180 (84)</td>
<td>64</td>
<td>High halves of general purpose registers 0 through 15 at the time of the event</td>
</tr>
<tr>
<td>244 (F4)</td>
<td>variable</td>
<td>One of the following, as indicated by the RTM/SLIP processing environment indicator at offset 4 of the buffer:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The system diagnostic work area (SDWA), if offset 4 is 1 (RTM1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The recovery termination manager 2 (RTM2) work area (RTM2WA), if offset 4 is 2 (RTM2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The address space control block (ASCB), if offset 4 is 3 (MEMTERM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The PER interrupt code and PER address, if offset 4 is 4 (PER)</td>
</tr>
<tr>
<td>4076 (FEC)</td>
<td>4</td>
<td>The characters, P16</td>
</tr>
<tr>
<td>4080 (FF0)</td>
<td>16</td>
<td>The 16-byte program status word (PSW) at the time of the event.</td>
</tr>
</tbody>
</table>
SVC dump
Chapter 3. Transaction dump

A transaction dump provides a representation of the virtual storage for an address space when an error occurs. Typically, an application requests the dump from a recovery routine when an unexpected error occurs. Transaction dumps are requested as follows:

- **Synchronous transaction dump:**
  
  The requester's IEATDUMP macro invocation issues an instruction to obtain the dump under the current task. IEATDUMP returns control to the requester and is available once the dump data has been written into a dump data set.

Each Transaction dump also contains a summary dump, if requested. The summary dump supplies copies of selected data areas taken at the time of the request. Specifying a summary dump also provides a means of dumping many predefined data areas simply by specifying one option. This summary dump data is not mixed with the Transaction dump because in most cases it is chronologically out of step. Instead, each data area selected in the summary dump is separately formatted and identified. IBM recommends that you request summary dump data.

This section includes information system programmers need to know about Transaction dump and Transaction dump processing:

- “Choices for IEATDUMP Data Sets” on page 52
- “Obtaining transaction dumps” on page 54
- “Printing, viewing, copying, and clearing a dump data set” on page 54
- “Contents of transaction dumps” on page 55

See z/OS MVS Programming: Authorized Assembler Services Guide for information any programmer needs to know about programming the IEATDUMP macro to obtain a Transaction Dump:

- Deciding when to request a Transaction dump
- Understanding the types of Transaction Dumps that MVS produces
- Designing an application program to handle a specific type of Transaction dump
- Identifying the data set to contain the dump
- Defining the contents of the dump
- Suppressing duplicate Transaction dumps using dump analysis and elimination (DAE)

### Planning data sets for transaction dumps

Transaction dump processing stores data in dump data sets that you preallocate manually, or that are allocated automatically, as needed. The output dump data set has the attributes of RECFM=FB and LRECL=4160.

### Planning data set management for transaction dumps

For transaction dumps, use extended format sequential data sets because they have the following characteristics:

- Greater capacity than sequential data sets
- Striping and compression support.

For more information on extended format sequential data sets, see “Choosing SVC dump data sets” on page 13.
Sequential data sets can use large format data sets (DSNTYPE=LARGE).

Extended format sequential data sets can be placed in either track-managed space or cylinder-managed space. Transaction dump fully supports placing dump data sets in cylinder-managed space.

Using preallocated dump data sets

To specify a pre-allocated data set, specify the DDNAME parameter that identifies a data set. The data set must contain sufficient space in one or more extents for the entire dump to be written. DDNAME does not have a 2GB size restriction for the size of the dump. If the data set does not contain sufficient space, a partial dump is returned.

Setting up allocation authority

To allocate dump data sets automatically, the caller’s and/or DUMPSRV address space must have authority to allocate new data sets. Do the following:

1. **Associate the caller’s and/or DUMPSRV address space with a user ID.**

   If you have RACF Version 2 Release 1 installed, use the STARTED general resource class to associate the caller or DUMPSRV with a user ID. For this step, the RACF started procedures table, ICHRIN03, must have a generic entry.

   If you have an earlier version of RACF, use the RACF started procedures table, ICHRIN03.

2. **Authorize caller’s or DUMPSRV user ID to create new dump data sets using the naming convention in the following topic.**

   With the high-level qualifier of SYS1, the data sets are considered *group* data sets. You can assign CREATE group authority to the caller’s user ID within that group.

See the following references for more information:

- *z/OS Security Server RACF Security Administrator’s Guide* for information on using the STARTED general resource class and on controlling creation of new data sets.

Choices for IEATDUMP Data Sets

Transaction dump processing supports both pre-allocated and automatically allocated dump data sets. The dump is allocated from the generic resource SYSALLDA. IEATDUMP processes the dump data sets in the following ways:

- For pre-allocated data sets, IEATDUMP writes to the data set without first capturing the dump into a data space. The dump can contain more than 2 GB if the data set capacity permits.
- For automatically allocated data sets, IEATDUMP processes the dump data sets depending on whether the dump section number symbol &DS. is used on the end of the data set name pattern:
  - If &DS. is not used on the end of the data set name pattern, IEATDUMP captures the dump and stores it in a data space; the data set is then allocated with the space required to contain the captured data; and the dump is written to disk. The dump cannot exceed 2 GB. If dynamic allocation fails, message IEA820I is issued, and the dump is deleted.
  - If &DS. is used on the end of the data set name pattern, IEATDUMP does not first capture the dump to a data space. Instead, IEATDUMP writes the dump directly to disk. If the size limit of the data set is reached, IEATDUMP allocates another dump with a higher value for &DS. Each data set has an extent size of 500 M that can be changed using ACS routines. These extents are written to until the disk runs out of space or no more extents can be created. At that time, a new data set in the sequence is created. Multi-data set IEATDUMPs utilize up to 999 data sets. The maximum size depends on the amount of space on the volumes where these data sets get allocated. Before IPCS can process the data, you must combine all the data sets into one data set using IPCS COPYDUMP.
Naming automatically allocated dump data sets

The application has control of the name of the data sets created by the automatic allocation function, and you can select a name-pattern to allow for dump data set organization according to your needs. The name is determined through an installation-supplied pattern on the DSN(AD) keyword in the IEATDUMP macro.

Names must conform to standard MVS data set naming conventions and are limited to 44 characters, including periods used as delimiters between qualifiers. A set of symbols is available so that you can include the following kinds of information in the names of your automatically allocated dump data sets:

- System name
- Sysplex name
- Job name
- Local and GMT time and date
- Dump section number

For a complete list of the symbols you can use, see the explanation of DUMPDS NAME= in z/OS MVS System Commands.

Note:

1. The &SEQ. symbol is not supported for IEATDUMPs.
2. You can use the &DS. symbol for splitting the dump between several data sets. When the &DS. symbol is added to the end of the DSN name pattern, the transaction dump data can be placed into as many as 999 automatically-allocated 500M-extent data sets. Note that you must combine all the data sets into one data set using IPCS COPYDUMP before IPCS can process the data.

When determining the pattern for the dump data set names, consider any automation tools you may have at your installation that work on dump data sets.

Figure 22 on page 53 describes a SPFUSER name pattern. Note that the symbols are resolved into date and time, so they are preceded by an alphabetic character to conform to MVS data set name requirements. Also, the symbol starts with an ampersand (&) and ends with a period (.), resulting in a name pattern that has double periods when a symbol finishes a qualifier. One period ends the symbol, and the second serves as the delimiter between qualifiers of the generated data set name.

```
APPL . TDUMP . D &DATE. . T &TIME. . &SYSNAME. . &JOBNAME.
```

Figure 22. SPFUSER name pattern for automatically allocated dump data set

Automatically allocated dump data sets are not added to the system's sysplex dump directory, as it is for SVC dumps.

Communication from the system

The system communicates about automatic allocation of dump data sets using three messages:

- IEA827I is issued when a complete or partial dump multi-data set dump is taken. IEA827I is an informational message, it will not be issued highlighted.
• IEA822I is issued when a complete or partial dump is taken. IEA822I is an informational message, it is not issued highlighted.

• IEA820I is issued once per Transaction dump when the dump cannot be taken or allocation fails. IEA820I is an informational message, it will not be issued highlighted.

## Obtaining transaction dumps

Obtain a Transaction dump by issuing a IEATDUMP macro in an authorized or unauthorized program.

In a sysplex, authorized applications might need dumps from more than one address space to collect all of the problem data. These dumps need to be requested at the same time. To request these multiple dumps, issue a IEATDUMP macro with a REMOTE parameter specifying the other address spaces involved in the problem. To help you set up these requests, the parameter can contain wildcards. If the installation gives names that form patterns to the systems in the sysplex and to jobs for associated work, you can use wildcards, *, and ?, to specify the names. For example, use the name TRANS? for the jobnames TRANS1, TRANS2, and TRANS3 and the name TRANS* for TRANS1, TRANS12, and TRANS123.

**Note:** If a Transaction dump uses the REMOTE parameter to dump one or more address spaces on a pre-release 4 system, the result will be a single SVC dump containing the requested data, instead of one or more Transaction dumps written to data set names specified with the DSN parameter. Issue the DISPLAY DUMP,STATUS command to determine the name of this SVC dump.

## Printing, viewing, copying, and clearing a dump data set

Transaction Dumps are unformatted when created. Use IPCS to format a dump and then view it at a terminal or print it. For example, for a pre-allocated data set or a dump data set, the JCL shown in Figure 23 on page 54 does the following:

- Uses the Transaction dump in the APPL.TDUMP00 data set. The IPCSTDMP DD statement identifies this data set.
- Deletes the IPCS dump directory in the DELETE(DDIR) statement. This statement uses the USERID of the batch job in the directory identification.
- Allocates the dump directory through the BLSCDDIR statement. The default is volume VSAM01. The example shows VSAM11. Override the default volume with the desired volume.
- Formats the dump using the IPCS subcommands in LIST 0. To use this example, replace the LIST 0 command with the desired IPCS subcommands or a CLIST. See *z/OS MVS IPCS User’s Guide* for CLISTS.

```
//IPCSJOB JOB
//IPCS EXEC PGM=IKJEFT01,DYNAMNBR=75,REGION=1500K
//SYSPR0C DD DSN=SYS1.SBLSCLI0,DISP=SHR
//IPCSTDMP DD DSN=APPL.TDUMP00,DISP=SHR
//SYSUDUMP DD SYSOUT=* 
//IPCSTOC DD SYSOUT=* 
//IPCSPRNT DD SYSOUT=* 
//SYSTSIN DD *
DELETE(DDIR) PURGE CLUSTER
BLSCDDIR VOLUME(VSAM11)
IPCS NOPARM
SETOFF DD(IPCSTDMP) LIST NOCONFIRM
LIST 0 END
/*
```

*Figure 23. Example: JCL to Print, Copy, and Clear the Dump Data Set*
Contents of transaction dumps

Transaction Dumps share parmib member IEADMR00 to establish the dump options list at system initialization. The IBM-supplied IEADMR00 parmib member specifies dump options NUC, SQA, LSQA, SWA, TRT, RGN, and SUM.

See z/OS MVS IPCS Commands for examples of IPCS output formatted from Transaction Dumps.

Customizing transaction dump contents

You can customize the contents of a Transaction dump to meet the needs of your installation. For example, you might want to add areas to be dumped, reduce the dump size, or dump Hiperspaces. In most cases, you will customize the contents of a Transaction dump through the SDATA parameter of the IEATDUMP macro.

Hiperspaces: Transaction Dumps do not include Hiperspaces. To include Hiperspace data in a Transaction Dump, you have to write a program to copy data from the Hiperspace into address space storage that is being dumped.

Adding areas: If the dump, as requested, will not contain all the needed areas, see one of the following for ways to add the areas:

- “Customized contents using the SDATA parameter” on page 55
- “Contents of summary dumps in transaction dumps” on page 58

Customized contents using the SDATA parameter

The IBM-supplied default contents and the contents available through customization are detailed in Table 13 on page 55. The tables show dump contents alphabetically by the parameters that specify the areas in the dumps. Before requesting a dump, decide what areas will be used to diagnose potential errors. Find the areas in the tables. The symbols in columns under the dump indicate how the area can be obtained in that dump; the order of the symbols is not important.

D
  IBM-supplied default contents

M
  Available on the macro that requests the dump

P
  Available in the parmib member that controls the dump options

X
  Available on the CHNGDUMP operator command that changes the options for the dump type

blank
  No symbol indicates that the area cannot be obtained.

Note: System operator commands and assembler macros use the parameters in the table to specify dump contents.

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>Transaction dump for IEATDUMP Macro</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLNUC</td>
<td>The DAT-on and DAT-off nucleuses</td>
<td>M P X</td>
</tr>
</tbody>
</table>
### Table 13. Customizing transaction dump contents through the SDATA Parameter (continued)

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>Transaction dump for IEATDUMP Macro</th>
</tr>
</thead>
</table>
| CSA                    | Common service area (CSA) (that is, subpools 227, 228, 231, 241) and virtual storage for 64-bit addressable memory objects created using one of the following services:  
  - IARV64 REQUEST=GETCOMMON, DUMP=LIKECSA  
  - IARCP64 COMMON=YES, DUMP=LIKECSA  
  - IARST64 COMMON=YES, TYPE=PAGEABLE | M P X                               |
| DEFS                   | Default areas LSQA, NUC, PSA, RGN, SQA, SUM, SWA, TRT                                                                                                | M                                   |
| ALL                    | CSA, GRSQ, LPA, NUC, RGN, SQA, SUM, SWA, TRT                                                                                                | X                                   |
| GRSQ                   | Global resource serialization control blocks for the task being dumped:  
  - Global queue control blocks  
  - Local queue control blocks | M P X                               |
| IO                     | Input/output supervisor (IOS) control blocks for the task being dumped:  
  - EXCPD  
  - UCB                                                                 | D                                   |
| LPA                    | Active link pack area (LPA): module names and contents                                                                                          | M P X                               |
| LSQA                   | Local system queue area (LSQA) allocated for the address space (that is, subpools 203 - 205, 213 - 215, 223 - 225, 229, 230, 233 - 235, 249, 253 - 255), and virtual storage for 64-bit addressable memory objects created using one of the following services:  
  - IARV64 REQUEST=GETSTOR, DUMP=LIKELSQA  
  - IARCP64 COMMON=NO, DUMP=LIKELSQA  
  - IARST64 COMMON=NO | D M P X                             |
| NUC                    | Read/write portion of the control program nucleus (that is, only the non-page-protected areas of the DAT-on nucleus), including:  
  - CVT  
  - LSQA  
  - PSA  
  - SQA                                                                 | M P X                               |
<p>| PSA                    | Prefixed save areas (PSA) for the processor at the time of the error or the processor at the time of the dump                                           | D M P                               |</p>
<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>Transaction dump for IEATDUMP Macro</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGN</td>
<td>Allocated pages in the private area of each address space being dumped, including subpools 0 - 127, 129 - 132, 203 - 205, 213 - 215, 223 - 225, 229, 230, 236, 237, 244, 249, 251 - 255, and virtual storage for 64-bit addressable memory objects created using the following services:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETSTOR,DUMP=LIKERGN</td>
<td>M P X</td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETSTOR,SVCDUMP,PRGN=YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARCP64 COMMON=NO,DUMP=LIKERGN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARST64 COMMON=NO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETSTOR,DUMP=LIKELSQA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 COMMON=NO,DUMP=LIKELSQA</td>
<td></td>
</tr>
<tr>
<td>SQA</td>
<td>System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248) and virtual storage for 64-bit addressable memory objects created using one of the following services:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARV64 REQUEST=GETCOMMON,DUMP=LIKESQA</td>
<td>D M P X</td>
</tr>
<tr>
<td></td>
<td>• IARCP64 COMMON=NO,DUMP=LIKESQA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARST64 COMMON=NO,TYPE=FIXED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IARST64 COMMON=NO,TYPE=DREF</td>
<td></td>
</tr>
<tr>
<td>SUM</td>
<td>Summary dump (See “Contents of summary dumps in transaction dumps” on page 58.)</td>
<td>D M P X</td>
</tr>
<tr>
<td>SWA</td>
<td>Scheduler work area (SWA) (that is, subpools 236 and 237)</td>
<td>M P X</td>
</tr>
<tr>
<td>TRT</td>
<td>System trace, generalized trace facility (GTF) trace, and master trace, as available</td>
<td>D M P X</td>
</tr>
<tr>
<td>Default system data</td>
<td>Instruction address trace, if available</td>
<td>D</td>
</tr>
<tr>
<td>Default system data</td>
<td>Nucleus map and system control blocks, including:</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>• ASCB for each address space being dumped</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ASVT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Authorization table for each address space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CVT, CVT prefix, and secondary CVT (SCVT)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Entry tables for each address space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GDA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JSAB of each address space being dumped</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Linkage stack</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Linkage table for each address space</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PCCA and the PCCA vector table</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TOT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TRVT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• UCB</td>
<td></td>
</tr>
<tr>
<td>Default system data</td>
<td>DFP problem data, if DFP Release 3.1.0 or a later release is installed</td>
<td>D</td>
</tr>
<tr>
<td>Default system data</td>
<td>Storage for the task being dumped and program data for all of its subtasks</td>
<td>D</td>
</tr>
</tbody>
</table>
Table 13. Customizing transaction dump contents through the SDATA Parameter (continued)

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>Transaction dump for IEATDUMP Macro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default system data</td>
<td>Storage: 4 kilobytes before and 4 kilobytes after the address in the PSW at the time of the error</td>
<td>D</td>
</tr>
</tbody>
</table>

Contents of summary dumps in transaction dumps

When you request a summary dump, the **SUM** parameter requests many useful, predefined areas with one parameter.

Summary dump does not contain volatile system information. The system writes the summary dump before it returns control to the dump requester; the summary information is saved for each address space that is being dumped.

The Summary Dump contains:

1. ASID record for the address space of the dump task
2. Control blocks for the recovery termination manager (RTM):
   - RTM2WA associated with all TCBs in the dumped address space
3. Dump header, which is mapped by AMDDATA.
   - For the AMDDATA mapping, see *z/OS MVS Data Areas* in the *z/OS Internet library* (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).
4. 4 kb before and 4 kb after:
   - All valid unique addresses in the PSWs in the RTM2WAs shown in the dump
   - All valid unique addresses in the registers in the RTM2WAs shown in the dump
5. Supervisor control blocks:
   - Current linkage stack
   - Primary address space number (PASN) access list
   - Work unit access list

For information about control blocks that are listed in Table 13 on page 55, see *z/OS MVS Data Areas* in the *z/OS Internet library* (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

Customizing contents through operator commands

The dump options list for Transaction Dumps can be customized through a CHNGDUMP operator command by all the ways shown in Table 14 on page 59.

**Nucleus areas in dumps:** Dump options control the parts of the nucleus that appear in a dump. A diagnostician seldom needs to analyze all the nucleus. An installation can eliminate nucleus areas from dumps. If the IBM-supplied defaults are used, Transaction dump for an IEATDUMP macro contains the nucleus map and certain control blocks.

Most problems can be debugged without dumping the nucleus. If a problem arises that requires the nucleus be dumped, use the CHNGDUMP operator command to add the NUC SDATA option to all IEATDUMPs. This also applies to other options.

DAT, dynamic address translation, is the hardware feature that enables virtual storage. In the DAT-on part of the nucleus, the addresses are in virtual storage; in the DAT-off part of the nucleus, the addresses are in central storage.
<table>
<thead>
<tr>
<th>Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Updating IEADMR00 parmlib member</strong></td>
<td><strong>Change occurs</strong>: At system initialization</td>
<td>To add the link pack area (LPA) to all Transaction dumps for IEATDUMP macros and SDATA, while keeping the local system queue area (LSQA) and trace data, change the line in IEADMR00:</td>
</tr>
<tr>
<td></td>
<td><strong>What changes</strong>: This parmlib member establishes the dump options for Transaction dumps for IEATDUMP macros and SDATA. See “Contents of transaction dumps” on page 55 for the list.</td>
<td>SDATA=(LSQA, TRT, LPA)</td>
</tr>
<tr>
<td><strong>Adding the CHNGDUMP operator command in IEACMD00 parmlib member</strong></td>
<td><strong>Change occurs</strong>: At system initialization</td>
<td>To add the link pack area (LPA) to all Transaction dumps for IEATDUMP macros and SYSMDUMP, while keeping the local system queue area (LSQA) and trace data, add the following command to IEACMD00:</td>
</tr>
<tr>
<td></td>
<td><strong>What changes</strong>: This command establishes the dump options for Transaction dumps for IEATDUMP macros and SYSMDUMPS. See “Contents of transaction dumps” on page 55 for the list.</td>
<td>CHNGDUMP SET, SYSMDUMP=(LPA)</td>
</tr>
<tr>
<td><strong>Entering CHNGDUMP operator command with SYSMDUMP parameter on a console with master authority</strong></td>
<td><strong>Change occurs</strong>: Immediately when command is processed</td>
<td>To add the LPA to all Transaction dumps for the IEATDUMP macro and SYSMDUMP, until changed by another CHNGDUMP SYSMDUMP, enter:</td>
</tr>
<tr>
<td></td>
<td><strong>What changes</strong>:</td>
<td>CHNGDUMP SET, SYSMDUMP=(LPA)</td>
</tr>
<tr>
<td></td>
<td>• <strong>For the ADD mode</strong>: CHNGDUMP options are added to the current Transaction dump options list and to any options specified in the macro or operator command that requested the dump. The options are added to all Transaction dumps for IEATDUMP macros and SYSMDUMP, until another CHNGDUMP SYSMDUMP operator command is entered.</td>
<td>• To add the CHNGDUMP IEATDUMP options list to all Transaction dumps: CHNGDUMP SET, SYSMDUMP, ADD</td>
</tr>
<tr>
<td></td>
<td>• <strong>For the OVER mode</strong>: CHNGDUMP options are added to the current Transaction dump options list. The system ignores any options specified in the macro or operator command that requested the dump. The options override all Transaction dumps for the IEATDUMP macro and SYSMDUMP, until a CHNGDUMP SYSMDUMP,ADD operator command is entered.</td>
<td>• To override all Transaction dumps with the CHNGDUMP IEATDUMP options list: CHNGDUMP SET, SYSMDUMP, OVER</td>
</tr>
<tr>
<td></td>
<td>• <strong>For the DEL option</strong>: CHNGDUMP options are deleted from the Transaction dump options list. When more than one CHNGDUMP operator command with IEATDUMP is entered, the effect is cumulative.</td>
<td>• To remove LPA from the IEATDUMP options list: CHNGDUMP DEL, SYSMDUMP=(LPA)</td>
</tr>
</tbody>
</table>
Transaction dump
Chapter 4. Stand-alone dump

The stand-alone dump program (SADMP) produces a stand-alone dump of storage that is occupied by one of the following:

- A system that failed.
- A stand-alone dump program that failed.

Either the stand-alone dump program dumped itself — a self-dump —, or the operator loaded another stand-alone dump program to dump the failed stand-alone dump program.

The stand-alone dump program and the stand-alone dump together form what is known as the stand-alone dump service aid. The term stand-alone means that the dump is performed separately from normal system operations and does not require the system to be in a condition for normal operation.

The stand-alone dump program produces a high-speed, unformatted dump of all of central storage, plus it can include user tailorable parts of paged-out virtual storage. The user generated stand-alone dump program must reside on a storage device that can be used to IPL from.

Produce a stand-alone dump when the failure symptom is a wait state with a wait state code, a wait state with no processing, an instruction loop, or slow processing.

You create the stand-alone dump program that dumps the storage. Use the AMDSADMP macro to produce the following:

- A stand-alone dump program that resides on DASD, with output directed to a tape volume or to a DASD dump data set
- A stand-alone dump program that resides on tape, with output directed to a tape volume or to a DASD dump data set.

A stand-alone dump supplies information that is needed to determine why the system or the stand-alone dump program failed.

You can create different versions of the stand-alone dump program to dump different types and amounts of storage. To create the different versions, code several AMDSADMP macros by varying the values of keywords on the macros.

Before you begin, also consider reading the following topics:

- For a set of best practices for optimizing stand-alone dump (SADMP) data capture, optimizing problem analysis time, and ensuring that the stand-alone dump is successful at capturing the necessary information for use by IBM Support, see the topic about Best practices for large stand-alone dump in z/OS Problem Management.
- To enable your operators and the system to respond appropriately to disabled wait states, consider activating the AutoIPL function, see the topic about Using the automatic IPL function in z/OS MVS Planning: Operations.

This information covers the following topics, which describe how to use stand-alone dump:

- “Planning for stand-alone dump” on page 62
- “Creating the stand-alone dump program” on page 65
- “Generating the stand-alone dump program” on page 88
- “Running the stand-alone dump program” on page 98
- “Capturing a stand-alone dump quickly” on page 104
- “Copying, viewing, and printing stand-alone dump output” on page 105
- “Message output” on page 109
- “Analyzing stand-alone dump output” on page 110
Planning for stand-alone dump

There are several decisions you need to make when planning for a stand-alone dump. You implement most of these decisions when you create the stand-alone dump program, either when you code the AMDSADMP macro, when you assemble the macro, or when you use the SADMP option on the IPCS Dialog. Some typical questions follow.

Should I take a stand-alone dump to DASD or to tape?

When choosing an output device for stand-alone dump, consider the need for operator intervention, the amount of operator intervention involved, and the amount of time the system will be unavailable.

You can reduce the level of operator intervention during stand-alone dump processing by dumping to DASD. With an automation package set up to IPL the stand-alone dump program from DASD, stand-alone dump can be run from a remote site. When you dump to tape, an operator is required to handle other aspects of dumping, such as mounting or changing tapes, unless the tape is in an IBM Virtual Tape Server (VTS).

The system is unavailable when a stand-alone dump is taken. The amount of time the system is unavailable depends upon the size of the dump. See “Dumping to a DASD data set” on page 80 for more information.

If I do dump to DASD, how much space do I need?

The maximum size of a single-volume DASD dump data set depends on the type of data set.

- Conventional sequential (DSNTYPE=BASIC) data sets can span 65,535 tracks per volume, and can hold approximately 3 GB per volume.
- Extended format (DSNTYPE=EXTREQ) data sets are supported by z/OS V1R6 and later releases. Extended format sequential data can hold 4,294,967,295 blocks per volume. The maximum size for extended format sequential is approximately 98,304 GB per volume. You cannot use striping or compression options for extended format sequential data sets. You must use the guaranteed free space option to require DFSMS to reserve space at the time that the data set is created.
- Large format data sets are supported by z/OS V1R7 and later releases. Large format (DSNTYPE=LARGE) data sets can span 16,777,215 tracks per volume. The maximum size for large format data sets is 768 GB per volume.

If you require more space than you want to allocate on a single volume, you can define a multi-volume DASD dump data set that can span up to 32 volumes of the same device type.

Note: Beginning in z/OS V1R12, SADMP supports placement of dump data sets in cylinder-managed space. In releases prior to z/OS V1R12, stand-alone data sets must remain in track-managed space.

Use the AMDSADDD REXX utility or the SADMP dump data set utility on the IPCS dialog to allocate and initialize a single volume DASD dump data set or a multi-volume DASD dump data set. This prepares the data set for use by the system where initialization is performed and for other systems that have access to the same data set using the same device numbers. For more information, see:

- “Using the AMDSADDD utility” on page 81
- SADMP option on the IPCS Dialog in z/OS MVS IPCS User’s Guide

When using a multi-volume DASD dump data set, the device number of the first volume is specified. The other volumes are located by stand-alone dump using the information that is placed in the data set when it is initialized. All volumes are written concurrently by stand-alone dump. The data set is rejected if stand-alone dump is unable to access all volumes of the data set or if invalid control information is read from the data set during initialization.

If you do not allocate enough space in your dump data set, the stand-alone dump program prompts the operator to continue dumping to another DASD dump data set or tape volume. You can continue dumping to any stand-alone dump supported device, however, after a tape device is selected, it must be used to complete the dump even though multiple volumes might be required.
IBM recommends that you allocate multiple dump data sets to perform a complete stand-alone dump.

**Can I dump to multiple dump data sets?**

Stand-alone dump does allow you to dump to multiple dump data sets. By coding the DDSPROMPT=YES keyword on the AMDSADMP macro, you can generate a stand-alone dump program that allows run-time dump data set prompting.

When the Stand-alone dump program is initiated, message AMD001A is issued to prompt the operator for an output device. If a DASD device is specified and run-time dump data set prompting is active, message AMD002A is issued to prompt the operator for a dump data set name. Providing the dump data set is validly allocated and initialized on the output device, the stand-alone dump program uses the dump data set name specified. If message AMD099I is issued indicating that the dump data set is full, the operator can continue dumping to any stand-alone dump supported DASD dump data set or tape device by replying to message AMD001A (and possibly AMD002A) again. After the dump completes, message AMD104I is issued to indicate the entire set of devices and/or dump data sets that were used during the taking of the dump.

By coding DDSPROMPT=NO on the AMDSADMP macro, the stand-alone dump program is generated without run-time dump data set prompting. In this case, replying to message AMD001A with a DASD device causes the stand-alone dump program to assume that the output dump data set is named SYS1.SADMP.

**Note:**

1. Use the AMDSADDD REXX or the IPCS SADMP dump data set utilities to allocate and initialize the stand-alone dump data sets.
2. The stand-alone dump program must locate the dump data set on the device that is specified. Therefore, it is imperative that the necessary data set management steps be taken so that the stand-alone dump data sets are not placed into a migrated state or moved to a different volume. The dump data sets must also be exempt from any space management processing that releases unused space.
3. You can continue a dump to any stand-alone dump supported device, however, after a tape device is selected, it must be used to complete the dump even though multiple tape volumes might be required.

See the following topics for more information:

- For more information on dump data set processing, see the description of the DDSPROMPT keyword in the "Syntax of the AMDSADMP macro" on page 70.
- For more information on how to use multiple dump data sets with IPCS, see “Copying from multiple dump data sets” on page 107.
- For more information on performing tasks associated with creating, clearing, and reallocating SADMP data sets on DASD, see the SADMP option on the IPCS Dialog in [z/OS MVS IPCS User’s Guide](https://www.ibm.com/support/docview/docid/16001).

**What can I name my DASD dump data sets?**

A stand-alone dump data set can be any valid MVS data set name, however, stand-alone dump has two requirements that are checked at both generation time and run-time:

- The data set name must be 44 characters or less
- The data set name must contain the text ‘SADMP’ as either part of, or as an entire data set qualifier

In addition, because the generation process does not perform any allocation on the output device or dump data set name, it is imperative that you ensure that the data set name specified on the OUTPUT= keyword matches exactly the dump data set name allocated by the AMDSADDD REXX or IPCS SADMP data set utilities. The following are some additional rules to follow when specifying a dump data set name:

- The data set name specified should be fully qualified (without quotation marks)
- The alphabetic characters in the dump data set name should be specified as capital letters
How much of the system should I dump?

The situation dictates the amount of information you need to diagnose the failure. You can use the DUMP keyword to control the amount of storage you want dumped. See “Using the DUMP or ADDSUMM keyword to request additional storage or address spaces” on page 76 for more information.

When should I specify the dump tailoring options?

The most flexible way to specify the dump options for a stand-alone dump is to specify, on the DUMP keyword of the AMDSADMP macro, those areas of storage you normally always want dumped and additionally allow the operator who requests the dump to specify additional options by coding the PROMPT keyword on the AMDSADMP macro. In most cases, to simplify the dumping process, it is best to define any installation specific dump options on the AMDSADMP macro and not use the PROMPT keyword. See “Using the DUMP or ADDSUMM keyword to request additional storage or address spaces” on page 76 for more information.

What type of security does the stand-alone dump program require?

After the stand-alone dump program is properly created on a DASD residence volume, it resides in the SYS1.PAGEDUMP.Vvolser data set. To ensure that the stand-alone dump program is available and processes successfully, do not delete the data set or move it to another volume or pack. To protect the stand-alone dump program in SYS1.PAGEDUMP.Vvolser, use a password or a security product, such as RACF. If the data set is not protected, unauthorized users can read the dump data in SYS1.PAGEDUMP.Vvolser. Also consider protecting the stand-alone dump output dump data sets from unauthorized reading.


Should I use IEBGENER or the COPYDUMP subcommand to copy a dump to a data set?

The recommended method is IPCS COPYDUMP. IPCS COPYDUMP can run without a dump directory being employed. Use the DEFER option when initiating the IPCS session to tell IPCS to defer accessing a dump directory until one is required. IPCS COPYDUMP has the ability to merge the records from a multi-volume SADMP and recapture the prioritized order used by SADMP to get the most important data into the dump data sets first.

If SADMP is allowed to complete normally, IEBGENER and similar transcription programs can produce a logically complete dump data set that IPCS can process. However, IPCS performance, particularly IPCS dump initialization, degrades as more volumes are added to the SADMP data set.

What is dumped when I run the stand-alone dump program?

The default dump contains all areas of central storage and some areas of virtual storage that are not backed by central storage. The output of the stand-alone dump program includes:

- The prefixed save areas (PSA)
- The nucleus and extended nucleus
- The system queue area (SQA) and the extended SQA
- The common service area (CSA) and the extended CSA
- Subpools 203-205, 213-215, 229, 230, 236, 237, 247, 248, and 249 for all address spaces
- The local system queue area (LSQA) and the extended LSQA for eligible address spaces
- The dump title provided by the operator; otherwise, the dump is untitled
- The processor STORE STATUS information for each processor
- Central storage from address 0 to the top of main storage (some blocks might be missing because of offline storage elements)
- Virtual storage areas selected by the DUMP keyword, or selected by the operator at runtime.
A message log, normally consisting of all console messages issued by the dump program, including suppressed messages. (To format and print the stand-alone dump message log, use the VERBEXIT SADMPMSG subcommand or the SADMPMSG option of the IPCS dialog.)

- High virtual for the TRACE address space.
- High virtual for the DUMPSRV address space.
- High virtual for the GRS address space.
- Dump records summarizing the zeroed pages in the dump
- The full generalized trace facility (GTF) address space
- Subpool 127 in the GRS address space
- Data spaces whose names begin with ISG for the GRS address space
- All of DUMPSRV's data spaces
- The full cross-system coupling facility (XCF) address space
- All of XCF's dataspaces
- XES-related dataspaces for address spaces with an XES connection

Note that this list does not imply an order of the stand-alone dump process. During stand-alone dump processing, several different messages are issued to indicate the progress of the dumping:

- For real dump processing, AMD005I is issued.
- For both real and virtual dump processing, AMD095I is issued every 30 seconds, followed by message AMD056I indicating that dumping of virtual storage has completed and AMD104I to indicate what output devices and/or dump data sets were used by the stand-alone dump program.

Can I use my current version of the stand-alone dump program to dump a new version of z/OS?

Always use the stand-alone dump version that is generated from the same release of z/OS that you want to dump. IBM does not guarantee that a different level of stand-alone dump will successfully dump anything other than the level of z/OS it was designed for. The new version of z/OS might have changed making the stand-alone dump program unable to locate vital information it needs to operate.

When migrating to a new version of z/OS, IBM strongly recommends that you generate a new version of the stand-alone dump program built from the new z/OS system data sets. See “One-stage generation” on page 89 for more information.

Creating the stand-alone dump program

The first step in creating a stand-alone dump program is selecting a tape or DASD as the stand-alone dump IPL volume (residence volume). After you select the residence volume, you can create the stand-alone dump program. To create the stand-alone dump program, you:

1. Code the AMDSADMP macro. See “Coding the AMDSADMP macro” on page 69.
2. Assemble the macro, placing the stand-alone dump program onto the residence volume in ready-to-load form. IBM recommends that you use one-stage generation when building or creating a stand-alone dump program for the currently executing version of MVS. Use the two-stage generation to create multiple stand-alone dump programs and to create a new version of the stand-alone dump program when migrating to a new version of MVS. See “Generating the stand-alone dump program” on page 88.

MNOTES from the AMDSADMP macro

The output listing from the assembly can contain error messages, called MNOTES, that describe errors made while coding the AMDSADMP macro. To respond to one of these messages, check the specification of the macro and run the assembly step again. The meaning of the severity code is as follows:
Assembly processing ends

Warning

Informational

AMDSADMP Messages, Explanations and Severity Codes

AMDSADMP: COMPACT=compact IS NOT ALLOWED. IT MUST BE YES OR NO. COMPACT=YES HAS BEEN USED.
Explanation: The system could not recognize the value specified on the COMPACT keyword. The stand-alone dump program will use the IDRC feature for the output tape if IDRC is installed.
Severity Code: 0.

AMDSADMP: CONSOLE ADDRESS conad IS INVALID. IT MUST BE A DEVICE NUMBER. 001F IS SUBSTITUTED.
Explanation: The console address operand is not a valid device number of 3 or 4 hexadecimal digits.
Severity Code: 0.

AMDSADMP: CONSOLE PARM NOT DETECTED. DEFAULT (001F, 3278) WILL BE USED.
Explanation: Either the console parameter was not specified or it was not specified correctly on the continuation statement. The parameter was probably not continued correctly on the next defined statement. Continue the interrupted parameter or field beginning in any column from 4 through 16.
See Continuing JCL Statements in z/OS MVS JCL Reference.
Severity Code: 0.

AMDSADMP: CONSOLE TYPE contp IS INVALID. IT MUST BE A 4 DIGIT NUMBER. 3278 HAS BEEN USED.
Explanation: An incorrect console type was specified. Only 3277, 3278, 3279, or 3290 are acceptable.
Severity Code: 0.

AMDSADMP: DEFAULT OUTPUT DEVICE T0282 WILL BE USED.
Explanation: A device number was incorrectly specified, or was not specified, on the OUTPUT= parameter.
Severity Code: 0.

AMDSADMP: IPL=ipl IS INVALID. FIRST CHARACTER MUST BE D OR T, AND HAS BEEN REPLACED WITH A D.
Explanation: The IPL operand is incorrect. It is not prefixed with a 'D' or a 'T'.
Severity Code: 4.

AMDSADMP: IPL=ipl IS TOO LONG. THE UNIT NAME WILL BE TRUNCATED.
Explanation: The unit name can be at most 8 characters long.
Severity Code: 4.
AMDSADMP Messages, Explanations and Severity Codes

AMDSADMP: IPLUNIT WAS NOT SPECIFIED OR IPL= TYPE (D OR T) WAS SPECIFIED INCORRECTLY. UNIT WILL BE DEFAULTED TO SYSDA.

Explanation: The IPL parameter should be specified as IPL=duuu, where ‘d’ is D for direct access or T for tape, and ‘uuu’ is a valid unit type or device number for the SADMP IPL volume as described by the UNIT=uuu JCL parameter.

System Programmer Response: A device number consists of 3 or 4 hexadecimal digits.

Severity Code: 0.

AMDSADMP: MSG=msg IS INVALID. IT MUST BE ALL, ACTION, OR ALLASIDS. MSG=ALL HAS BEEN USED.

Explanation: The MSG operand is not ALL, ACTION, or ALLASIDS.

Severity Code: 0.

AMDSADMP: DDSPROMPT=ddsprompt IS NOT ALLOWED. IT MUST BE YES OR NO. DDSPROMPT=YES HAS BEEN USED.

Explanation: The DDSPROMPT operand is incorrect. It must be either ‘YES’ or ‘NO’. DDSPROMPT=YES is assumed.

System Programmer Response: The output device must be specified as a 3-digit or 4-digit device number. You can change the OUTPUT parameter at run time, if the default is not what you want.

Severity Code: 4.

AMDSADMP: OUTPUT=output IS INCORRECT. IT MUST BE EITHER (T|D)UNIT OR (DUNIT,DATA SET NAME).

Explanation: The OUTPUT operand is incorrect. It must be specified in one of the following formats:

- A ‘T’ or a ‘D’ followed by a device number
- A ‘D’ followed by a device number and a data set name pair specified within parentheses.

System Programmer Response: If a default dump data set name is desired, correct the OUTPUT= specification and regenerate the SADMP program.

Severity Code: 4.

AMDSADMP: OUTPUT DUMP DATA SET NAME IS INCORRECT. THE DATA SET NAME IS GREATER THAN 44 CHARACTERS.

Explanation: The data set name had a length greater than 44 characters.

System Programmer Response: If a default dump data set name is desired, correct the OUTPUT= specification and regenerate the SADMP program.

Severity Code: 4.
### AMDSADMP Messages, Explanations and Severity Codes

**AMDSADMP: REUSED$=reused$ IS NOT ALLOWED. VALID SPECIFICATIONS ARE NEVER, CHOICE, OR ALWAYS. REUSED$=CHOICE HAS BEEN USED.**

**Explanation:** The REUSED$ operand is not NEVER, CHOICE, or ALWAYS.

**System Action:** Generation continues, using the default for the REUSED$ operand, CHOICE.

**Severity Code:** 0.

**AMDSADMP: ULABEL=NOPURGE IS NOT POSSIBLE FOR A TAPE RESIDENCE VOLUME.**

**Explanation:** The ULABEL cannot be NOPURGE when the IPL device is tape. SADMP ignores your ULABEL specification.

**Severity Code:** 8.

**AMDSADMP: keyword IS AN OBSOLETE KEYWORD. IT IS IGNORED. SADMP GENERATION CONTINUES.**

**Explanation:** An obsolete keyword is specified on the AMDSADMP macro. SADMP no longer requires the LOADPT or TYPE keywords to create a stand-alone dump program.

**System Action:** The system ignores the keyword and continues processing.

**System Programmer Response:** To eliminate this MNOTE, remove the indicated keyword and its associated parameter from the generation JCL.

**Severity Code:** 0.

**AMDSADMP: ALIB=alib IS NOT VALID. THE REQUIRED SYNTAX IS ALIB=(VOLSER,UNIT).**

**Explanation:** The system could not recognize the parameters specified on the ALIB keyword. The correct syntax is ALIB=(volser,unit), where volser is the volume serial number and unit is the UNIT=value of the device.

**System Action:** The system ignores this keyword and continues. The second step JCL might be incorrect.

**System Programmer Response:** Correct the syntax specified on the AMDSADMP macro and resubmit the JCL.

**Severity Code:** 8.

**AMDSADMP: NUCLIB=nuclib IS NOT VALID. THE REQUIRED SYNTAX IS NUCLIB=(VOLSER,UNIT).**

**Explanation:** The system could not recognize the parameters specified on the NUCLIB keyword. The correct syntax is NUCLIB=(volser,unit), where volser is the volume serial number and unit is the UNIT=value of the device.

**System Action:** The system ignores this keyword and continues. The second step JCL might be incorrect.

**System Programmer Response:** Correct the syntax specified on the AMDSADMP macro and resubmit the JCL.

**Severity Code:** 8.

**AMDSADMP: MODLIB=modlib IS NOT VALID. THE REQUIRED SYNTAX IS MODLIB=(VOLSER,UNIT).**

**Explanation:** The system could not recognize the parameters specified on the MODLIB keyword. The correct syntax is MODLIB=(volser,unit), where volser is the volume serial number and unit is the UNIT=value of the device.

**System Action:** The system ignores this keyword and continues. The second step JCL might be incorrect.

**System Programmer Response:** Correct the syntax specified on the AMDSADMP macro and resubmit the JCL.

**Severity Code:** 8.
AMDSADMP Messages, Explanations and Severity Codes

AMDSADMP: LNKLIB=lnklib IS NOT VALID. THE REQUIRED SYNTAX IS MODLIB=(VOLSER,UNIT).

Explanation: The system could not recognize the parameters specified on the LNKLIB keyword. The correct syntax is LNKLIB=(volser,unit), where volser is the volume serial number and unit is the UNIT=value of the device.

System Action: The system ignores this keyword and continues. The second step JCL might be incorrect.

System Programmer Response: Correct the syntax specified on the AMDSADMP macro and resubmit the JCL.

Severity Code: 8.

AMDSADMP: CONSOLE TYPE contp IS INVALID. NO VALUE MAY BE SPECIFIED FOR SYSC. IT WILL BE IGNORED.

Explanation: A console type was specified following the console name of SYSC. No console type is allowed for this console.

System Action: The system ignores the specification.

System Programmer Response: None.

Severity Code: 0.

AMDSADMP: CONSOLE ADDRESS SYSC MAY ONLY BE SPECIFIED FOR THE FIRST CONSOLE. IT WILL BE IGNORED.

Explanation: The console name SYSC was not specified as the first console in the console list. SYSC can only be specified as the first console.

System Action: The system ignores the specification.

System Programmer Response: None.

Severity Code: 0.

AMDSADMP: ONLY SYSTEM CONSOLE DEFINED. DEFAULT (001F,3278) WILL ALSO BE USED.

Explanation: The console named SYSC was the only console that was defined. At least one 3270 console must also be defined.

System Action: The system defined a default console of (001F,3278).

System Programmer Response: None.

Severity Code: 0.

AMDSADMP: REAL=ALL OR REAL=USED NOT SPECIFIED, THE DEFAULT REAL=ALL WILL BE USED.

Explanation: Either the REAL keyword was not specified or it was not specified correctly. REAL=ALL is the default.

Severity Code: 0.

AMDSADMP: POSITIONAL value IGNORED.

Explanation: A positional value other than PROMPT appeared as the first positional argument to the AMDSADMP macro. It was ignored.

System Programmer Response: None.

Severity Code: 0.

Coding the AMDSADMP macro

This section describes the coding of the AMDSADMP macro, including the following topics:

• “Using the DUMP or ADDSUMM keyword to request additional storage or address spaces” on page 76
• “Dumping to a DASD data set” on page 80
Syntax of the AMDSADMP macro

Figure 24 on page 70 shows the syntax of the AMDSADMP macro and its parameters.

```plaintext
symbol AMDSADMP
[,IPL={Tunit|Dunit|DSYSDA}]
[,VOLSER={volser|SADUMP}]
[,ULABEL={PURGE|NOPURGE}]
[,CONSOLE={cnum|(cnum,ctype) [,(cnum,ctype)]...|01F,3278}]
[,SYSUT={unit|SYSDA}]
[,OUTPUT={Tunit|Dunit|(Dunit,ddsname)|T0282}]
[,DUMP=('options')][,PROMPT]
[,MSG={ACTION|ALLASIDS|ALL}]
[,MINASID={ALL|PHYSIN}]
[,COMPACT={YES|NO}]
[,REUSED={CHOICE|ALWAYS|NEVER}]
[,ALIB=(volser,unit)]
[,NUCLIB=(volser,unit)]
[,MODLIB=(volser,unit)]
[,LNKLIB=(volser,unit)]
[,DDSPROMPT={YES|NO}]
[,AMD029={YES|NO}]
[,IPLEXIST={YES|NO}]
[,ADDSUMM=('options')]
[,REAL={ALL|USED}]
```

**Figure 24. Format of AMDSADMP Macro Instruction**

**symbol**
An arbitrary name you can assign to the AMDSADMP macro. Stand-alone dump uses this symbol to create a job name for use in the initialization step.

**AMDSADMP**
The name of the macro.

**IPL={Tunit|Dunit|DSYSDA}**
Indicates the device number, device type, or esoteric name of the stand-alone dump residence volume. The first character indicates the volume type; T for tape, D for DASD. Stand-alone dump uses the unit character string as the UNIT=value to allocate the residence volume for initialization.

A device number consists of 1 to 4 hexadecimal digits. To distinguish a device number from a unit type, the device number must be preceded by a slash (/); for example, you could specify IPL=D/410F. Otherwise, the dynamic allocation of the IPL device (IPLDEV DD-statement) may fail with reason code X'021C' (unavailable system resource).

The default is IPL=DSYSDA. When you specify IPL=T, stand-alone dump assumes T3400. When you specify IPL=D, stand-alone dump assumes DSYSDA.

**Note:**
1. This device also contains a work file used during stand-alone dump processing.
2. It is not recommended to place the IPL text of stand-alone dump on a volume that contains page data sets. A restart of stand-alone dump (see “Running the stand-alone dump program” on page 98) hangs during the real dump phase in this case.

**VOLSER={volser|SADUMP}**

Indicates the volume serial number the system is to use to allocate the residence volume for initialization. When you specify a tape volume, it must be NL (no labels). VOLSER=SADUMP is the default.

**ULABEL={PURGE|NOPURGE}**

Indicates whether stand-alone dump deletes (PURGE) or retains (NOPURGE) existing user labels on a DASD residence volume. When you specify NOPURGE, the stand-alone dump program is written on cylinder 0 track 0 of the residence volume, immediately following all user labels. If the user labels occupy so much space that the stand-alone dump program does not fit on track 0, the initialization program issues an error message and ends.

ULABEL=NOPURGE is the default.

**CONSOLE=({cnum|(cnum,ctype)\[(cnum,ctype)\]...|01F,3278})**

Indicates the device numbers and device types of the stand-alone dump consoles that stand-alone dump is to use while taking the dump. When you specify CONSOLE=cnum, stand-alone dump assumes (cnum,3278). You can specify from two to 21 consoles by coding:

```
CONSOLE=((SYSC)|(cnum,ctype),(cnum,ctype),\[(cnum,ctype)\]...)
```

A device number consists of 3 or 4 hexadecimal digits, optionally preceded by a slash (/). Use a slash preceding a 4-digit device number to distinguish it from a device type.

The 3277, 3278, 3279, and 3290 device types are valid, and are interchangeable.

CONSOLE=(01F,3278) is the default.

You can specify CONSOLE=SYSC for the first console only. SYSC is a constant representing the hardware system console.

**SYSUT={unit|SYSDA}**

Specifies the UNIT=value of the device that stand-alone dump uses for work files during stand-alone dump initialization. You can specify the device as a group name (for example, SYSDA), a device type (for example, 3330), or a unit address (for example, 131). SYSUT=SYSDA is the default.

**OUTPUT={Tunit|Dunit|(Dunit,ddsname)|T0282}**

Indicates the device type, number, and data set name that stand-alone dump uses as a default value if the operator uses the EXTERNAL INTERRUPT key to bypass console communication, or if the operator provides a null response to message AMD001A during stand-alone dump initialization. OUTPUT=T0282 is the default.

The device type can be specified as either a ‘T’ for tape or ‘D’ for DASD.

The device number consists of 3 or 4 hexadecimal digits, optionally preceded by a slash (/). Use a slash preceding a 4-digit device number to distinguish it from a device type.

If the default device is a DASD, you can also set up a default dump data set name to use by specifying both the device and the dump data set name on the OUTPUT= parameter. You can specify the first volume of a multi-volume DASD data set. If you specify a default dump data set name it must:

- Have a length that is 44 characters or less.
- Contain the text ‘SADMP’ as either part of, or as an entire data set qualifier.

Note that AMDSADMP processing does not allocate the data set or check to see that a valid MVS data set name has been provided. Therefore, you should insure that:
The AMDSADDD REXX is used to allocate and initialize the same data set name specified on the OUTPUT= keyword.

The data set name specified should be fully qualified (without quotation marks).

The necessary data set management steps are taken so that the stand-alone dump data sets are not placed into a migrated state or moved to a different volume.

Alphabetic characters appearing in the dump data set name should be specified as capital letters.

If the default DASD device is to be used and no dump data set name is provided, the stand-alone dump program assumes that the default dump data set name is SYS1.SADMP if the DDSPROMPT=NO parameter was also specified. Otherwise, if DDSPROMPT=YES was specified, the stand-alone dump program prompts the operator at runtime for a dump data set name to use.

**Note:**

1. At run-time, only a null response to message AMD001A causes the stand-alone dump program to use the default device and/or dump data set name.
2. Do not place a data set that is intended to contain a stand-alone dump on a volume that also contains a page data set that the stand-alone dump program might need to dump. When stand-alone dump initializes a page volume for virtual dump processing, it checks to see if the output dump data set also exists on this volume. If it does, the stand-alone dump program issues message AMD100I and does not retrieve any data from page data sets on this volume. Thus, the dump might not contain all of the data that you requested. This lack of data can impair subsequent diagnosis.
3. You cannot direct output to the stand-alone dump residence volume.

**DUMP=** *options*

Indicates additional virtual storage that you want dumped. This storage is described as address ranges, dataspaces, and subpools in address spaces. When you do not specify DUMP, stand-alone dump does not dump any additional storage unless you specify PROMPT. See “Using the DUMP or ADDSUMM keyword to request additional storage or address spaces” on page 76 for more information.

**PROMPT**

Causes stand-alone dump, at run time, to prompt the operator for additional virtual storage to be dumped. The operator can respond with the same information that can be specified for the DUMP keyword. When you do not specify PROMPT, stand-alone dump does not prompt the operator to specify additional storage. See “Using the DUMP or ADDSUMM keyword to request additional storage or address spaces” on page 76 for more information.

**MSG=** *ACTION*|*ALLASIDS*|*ALL*

Indicates the type of stand-alone dump messages that appear on the console. When you specify ACTION, stand-alone dump writes only messages that require operator action. When you specify ALL, stand-alone dump writes most messages to the console. However, messages AMD010I, AMD057I, AMD076I, AMD081I, and AMD102I appear only in the stand-alone dump message log. When you specify ALLASIDS, the stand-alone dump program behaves as if MSG=ALL was specified, except that message AMD010I also appears on the console. ALL is the default.

This keyword has no effect on the stand-alone dump message log; even if you specify MSG=ACTION, the stand-alone dump virtual dump program writes all messages to the message log in the dump.

**MINASID=** *ALL*|*PHYSIN*}

Indicates the status of the address spaces that are to be included in the minimal dump. Specify PHYSIN to dump the minimum virtual storage (LSQA and selected system subpools) for the physically swapped-in address spaces only. Specify ALL to dump the minimum virtual storage (LSQA and selected system subpools) for all of the address spaces. ALL is the default. At run time, if PHYSIN was specified, stand-alone dump writes message AMD082I to the operator's console to warn the operator that some virtual storage might be excluded from the dump.
COMPACT={YES|NO}

COMPACT(YES) compacts the data stored on a tape cartridge if the IDRC hardware feature is available on your tape drive. If the IDRC feature is available and you do not specify the COMPACT keyword, the default is YES, so that IDRC compacts the dump data. Otherwise, the data is handled as usual.

REUSEDS={CHOICE|ALWAYS|NEVER}

Indicates whether stand-alone dump should reuse the dump data set on the specified output device when it determines that the data set is valid, however, it can contain data from a previous dump. Stand-alone dump determines this by checking to see if the first record in the data set matches the record that is written by the AMDSADD rexx utility. When you specify ALWAYS, stand-alone dump issues message AMD094I and reuses the specified dump data set. When you specify NEVER, stand-alone dump issues message AMD093I and prompts the operator, through message AMD001A, for an output device. When you specify CHOICE, stand-alone dump informs the operator, with message AMD096A, that the data set is not reinitialized and requests permission to reuse the data set. See for more information about defining, clearing, and reallocating the dump data set.

CHOICE is the default.

ALIB=(volser,unit)

Specifies the volume serial number and UNIT=value of the volume that contains all of the following system data sets:

- SYS1.MODGEN
- SYS1.LINKLIB
- SYS1.NUCLEUS

This parameter is valid only when you are generating the stand-alone dump program using two-stage generation.

Note: The specification of the NUCLIB, LNKLIB, or MODLIB parameters overrides the corresponding value specified on the ALIB parameter.

See "Using two-stage generation of stand-alone dump when migrating" on page 96 for information on the use of this parameter.

NUCLIB=(volser,unit)

Specifies the volume serial number and UNIT=value of the volume that contains the system data set SYS1.NUCLEUS. If you specify NUCLIB, there is no need to specify IPLTEXT, IPITEXT, DVITEXT, DPLTEXT and PGTEXT DD statements. Beginning with z/OS V1R12, this parameter is valid for one-stage generation JCL. Prior to z/OS V1R12, this parameter is valid only when you generate the stand-alone dump program using two-stage generation. See "One-stage generation" on page 89 for information on the use of this parameter.

MODLIB=(volser,unit)

Specifies the volume serial number and UNIT=value of the volume that contains the system data set SYS1.MODGEN. This parameter is valid only when you generate the stand-alone dump program using two-stage generation. See “Using two-stage generation of stand-alone dump when migrating” on page 96 for information on the use of this parameter.

LNKLIB=(volser,unit)

Specifies the volume serial number and UNIT=value of the volume that contains the system data set SYS1.LINKLIB. This parameter is valid only when you generate the stand-alone dump program using two-stage generation. See “Using two-stage generation of stand-alone dump when migrating” on page 96 for information on the use of this parameter.

DDSPROMPT={YES|NO}

DDSPROMPT=YES allows the stand-alone dump program to prompt the operator for an output dump data set when dumping to a DASD device. When DDSPROMPT=YES is specified, after replying to message AMD001A with a DASD device number, message AMD002A is also issued to prompt the operator for a dump data set name.

DDSPROMPT=NO indicates that the stand-alone dump program should not prompt for a dump data set name when dumping to a DASD device. When DDSPROMPT=NO is specified, after replying to
message AMD001A with a DASD device number, the stand-alone dump program uses data set SYS1.SADMP. DDSPROMPT=NO is the default.

Note that regardless of the DDSPROMPT= keyword value, you can always use a default device and dump data set name by specifying the OUTPUT=(Dunit,ddsnamed) keyword. The stand-alone dump program uses the default values specified on the OUTPUT= keyword when the operator uses the EXTERNAL INTERRUPT key to bypass console communication, or if the operator provides a null response to message AMD001A.

**AMD029={YES|NO}**

If AMD029=NO is specified, SADMP does not issue AMD029D when a 3270 console screen becomes full. SADMP behaves as if the operator had replied NO to AMD029D. This parameter is meaningless when the system console is used, because AMD029D is never issued for the system console. AMD029=YES is the default.

**IPLEXIST={YES|NO}**

If IPLEXIST=YES is specified, SADMP includes IPLEXIST with the ICKDSF parameters, so that ICKDSF does not prompt the operator with message ICK21836D if there is already IPL text on the volume. IPLEXIST=NO is the default.

**ADDSUMM=('options')**

Indicates additional address spaces that you want dumped during a summary phase. Default summary address spaces are always dumped during a summary phase. If you do not specify ADDSUMM, stand-alone dump dumps only the default summary address spaces unless you specify PROMPT, in which case you have the opportunity to dump additional address spaces at run time. See “Using the DUMP or ADDSUMM keyword to request additional storage or address spaces” on page 76 for more information.

**REAL={ALL|USED}**

Indicates which real storage to dump. Specify USED to dump real storage that is being used at the time of the dump. Specify ALL to dump all real storage (used and unused). ALL is the default.

**Examples of Coding the AMDSADMP Macro**

The following examples show how to code the AMDSADMP macro to create various kinds of stand-alone dump programs.

Figure 25 on page 74 shows the AMDSADMP macro coded without explicitly specified parameters to generate a direct access resident dump program. The defaults are:

```plaintext
IPL=DSYSDA
VOLSER=SADUMP
ULABEL=NOPURGE
CONSOLE=(01F,3278)
SYSUT=SYSDA
OUTPUT=T282
MSG=ALL
MINASID=ALL
COMPACT=YES
REUSED=CHOICE
DDSPROMPT=NO
REAL=ALL
```

**Figure 25. Example: Accepting All Defaults**
In Figure 26 on page 75, the IPL parameter specifies tape as the residence volume, and the VOLSER parameter identifies that tape. All other parameters are allowed to default. The defaults are:

```
ULABEL=NOPURGE
CONSOLE=(01F,3278)
SYSUT=SYSDA
OUTPUT=T282
MSG=ALL
MINASID=ALL
COMPACT=YES
REUSED=CHOICE
DDSPROMPT=NO
REAL=ALL
```

**Figure 26. Example: Generating an unformatted, tape resident dump program**

In Figure 27 on page 75, the OUTPUT parameter directs the stand-alone dump output to dump data set SYS1.SADMP on device 450, and the REUSED parameter specifies that the operator be prompted about whether to reuse the dump data set. The defaults are:

```
IPL=DSYSDA
VOLSER=SADUMP
ULABEL=NOPURGE
CONSOLE=(01F,3278)
SYSUT=SYSDA
MSG=ALL
MINASID=ALL
COMPACT=YES
DDSPROMPT=NO
REAL=ALL
```

**Figure 27. Example: Generating a dump program with output to DASD**

In Figure 28 on page 75, the OUTPUT parameter directs the stand-alone dump output to dump data set SADMP.DDS1 on device 450. Furthermore, the DDSPROMPT=YES keyword allows for run-time dump data set prompting. The defaults are:

```
IPL=DSYSDA
VOLSER=SADUMP
ULABEL=NOPURGE
CONSOLE=(01F,3278)
SYSUT=SYSDA
MSG=ALL
MINASID=ALL
COMPACT=YES
REUSED=CHOICE
REAL=ALL
```

**Figure 28. Example: Generating a dump program with output to DASD**
Recommended specification during the build process is as follows:

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP(ALL) IN ASID(1,'JESXCF')</td>
</tr>
<tr>
<td>ALSO DATASPACES OF ASID(1,'JESXCF', 'APPC', 'SMSVSAM', 'CONSOLE', 'SYSBMAS')</td>
</tr>
<tr>
<td>ALSO PAGETABLES OF DATASPACES</td>
</tr>
</tbody>
</table>

If you run JES2, add:

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALSO SP(ALL) IN ASID('JES2')</td>
</tr>
</tbody>
</table>

Additional subpools and dataspaces might be needed, depending on your installed IBM, vendor, and locally-written products and applications.

### Using the DUMP or ADDSUMM keyword to request additional storage or address spaces

You can request that stand-alone dump dump additional storage or additional address spaces in two ways:

- **Specifying DUMP options or ADDSUMM options on the AMDSADMP macro**

  As the following example show, specify the dump tailoring options described in “Dump tailoring options” on page 77 within parentheses and single quotation marks as the value of the DUMP keyword on the AMDSADMP macro.

  ```
  DUMP=('SP(5,37,18) IN ASID('JES3')')
  DUMP=('RANGE(0:1000000) IN ASID(1)')
  DUMP=('DATASPACES OF ASID('DUMPSRV')')
  DUMP=('SADMPNO IN ASID('IOSAS')')
  ```

  **Note:** Do not double the quotation marks within the DUMP options. The DUMP options cannot exceed 255 characters in length.

  You can also specify additional summary address space as the value of the ADDSUMM keyword on the AMDSADMP macro.

  ```
  ADDSUMM=('ASID('BPX*')')
  ADDSUMM=('ASID(28),ASID('JOHNDOE')')
  ADDSUMM=('ASID('MYDB',40,46:48)')
  ```

  **Note:** Do not double the quotation marks within the ADDSUMM options. The ADDSUMM options cannot exceed 255 characters in length.

- **Specifying additional dump options at run time**

  By coding the PROMPT keyword on the AMDSADMP macro, you can have Stand-alone dump prompt the operator to dump additional storage or specify additional address spaces to be dumped as part of summary phase. When you code PROMPT, and the virtual storage dump program gets control, stand-alone dump issues the AMD059D message:

  ```
  AMD059D ENTER 'DUMP' OR 'SET' OR 'ADDSUMM' WITH OPTIONS, 'LIST' OR 'END'.
  ```

  The operator can respond with one of the following:

  - DUMP followed by dump options. In this case, the ‘=’ after DUMP is optional. See “Dump tailoring options” on page 77 for the possible dump options.
  - SET followed by the MINASID or REAL options.
  - ADDSUMM followed by address space list to additionally be dumped as part of summary phase. In this case, the ‘=’ after ADDSUMM is optional. See “Dump tailoring options” on page 77 for the possible options.
  - LIST. On the console, stand-alone dump displays the current virtual storage areas to be dumped and address space list to be dumped during the summary phase.
  - END. Stand-alone dump stops prompting the operator for options and begins processing.
Figure 29 on page 77 shows a sample exchange between stand-alone dump and the operator. The operator's replies are in lowercase. Note the operator's reply to message AMD059D using the DUMP keyword and ADDSUMM keyword.

```
AMD082I WARNING: THE MINASID SPECIFICATION HAS BEEN SET TO 'PHYSIN'.
AMD059D ENTER 'DUMP' OR 'SET' OR 'ADDSUMM' WITH OPTIONS, 'LIST' OR 'END'.
dump sp(0::9) inasid('jes2')
AMD060I ERROR IN INPUT TEXT INDICATED BY '*':
DUMP SP(0:9) INASID('JES2')
AMD065A ENTER TEXT TO BE SUBSTITUTED FOR THE TEXT IN ERROR.
> AMD0660I ERROR IN INPUT TEXT INDICATED BY '*':
DUMP SP(0:9) INASID('JES2')
******
AMD065A ENTER TEXT TO BE SUBSTITUTED FOR THE TEXT IN ERROR.
> in asid
AMD082I WARNING: THE MINASID SPECIFICATION HAS BEEN SET TO 'PHYSIN'.
AMD059D ENTER 'DUMP' OR 'SET' OR 'ADDSUMM' WITH OPTIONS, 'LIST' OR 'END'.
> list
AMD067I CURRENT DUMP OPTIONS:
ALSO SP(0:9) IN ASID('JES2')
ADDSUMM ASID('ALLOCAS','ANTAS000','ANTMAIN','CATALOG','CONSOLE','DEVMAN',
'DUMPsrv','GRS','IEFSCHAS','IOSAS','IXGLOGR','JESXCF','JES2','JES3','OMVS',
'SMSPDSE','SMSPDSE1','SMSVSAM','WLM','SMF','SMFXC','XCFAS')
AMD082I WARNING: THE MINASID SPECIFICATION HAS BEEN SET TO 'PHYSIN'.
AMD059D ENTER 'DUMP' OR 'SET' OR 'ADDSUMM' WITH OPTIONS, 'LIST' OR 'END'.
> end
```

When stand-alone dump detects an error in the reply to message AMD059D, it repeats the incorrect line at the console, underscores the incorrect part with asterisks, and prompts the operator for replacement text. If the dump options exceed 255 characters, stand-alone dump marks the whole line in error.

If a system restart occurs during the virtual storage dump program, stand-alone dump re-prompts the operator for dump options. stand-alone dump does not use any of the dump options that the operator specified before the system restart.

**Dump tailoring options**

You can specify the dump tailoring options in one or all of the following ways:

- On the DUMP keyword of the AMDSADMP macro.
- On the ADDSUMM keyword of the AMDSADMP macro.
- By the operator in reply to message AMD059D at run time.

Following is a list of the dump tailoring options you can specify. For a complete explanation of the options, see “Explanation of dump tailoring options” on page 78.

```
{dump-spec-list|SET MINASID{ALL|PHYSIN}|SET REAL{ALL|USED}|ADDSUMM addsumm-spec-list|LIST|END}
```

`dump-spec-list` is one or more of the following:

- `range-spec-list` IN ASID(`address-space-list`) [ALSO...]
- DATASPACES OF `domain-spec-list`[ ...]
- DSP OF `domain-spec-list`[ ...]
- PAGETABLES OF DATASPACES

`range-spec-list` is one or more of the following:

- SP(`subpool-list`)
- RANGE(`address-range-list`)
Stand-Alone dump

- LSQA
- HIGH VIRTUAL
- SADMPNO

subpool-list is one of the following:
- subpool-number TO subpool-number [...]
- ALL

address-range-list is one of the following:
- address TO address [...]
- ALL

address-space-list is one of the following:
- asid TO (asid|jobname|SYSKEY|PHYSIN)[,...]
- ALL

addsumm-spec-list is the following:
- ASID (address-space-list) [...]
address-space-list is the following:
- asid[ dlm asid] | jobname[,...]
  dlm is ‘TO’ or ‘:’.

Use the following guidelines when specifying values in your dump tailoring options:
- HIGH VIRTUAL cannot be used by itself; specify additional keywords.
- SADMPNO cannot be used by itself; specify additional keywords.
- address is a hexadecimal number from 0 to X’7FFFFFFF’.
- subpool-number is a decimal number from 0 to 255.
- asid is a hexadecimal number from 0 to X’FFFF’.
- jobname is a valid jobname enclosed in single quotation marks. Including wildcard characters is valid for jobnames. For a description of wildcard characters, see the ASID(‘jjjj’) option in the topic “Explanation of dump tailoring options” on page 78.
- range-spec-list is a list of subpools, a list of storage ranges, or both.
- domain-spec-list is a list of address spaces.
- ‘TO’ and ‘:’ are synonyms.
- ‘DATASPACES’ and ‘DSP’ are synonyms.

Keywords, such as DATASPACES, can be truncated on the right, provided the truncated form is not ambiguous. You can enter letters in either lower-case or uppercase. Blanks can be inserted between numbers, keywords, and separators; blanks cannot be inserted within numbers or keywords.

Explanation of dump tailoring options

This section provides an explanation for each of the dump tailoring options.

RANGE(xxxxxxxx:yyyyyyy,xxxxxxxx:yyyyyyy...)
Specifies one or more ranges of storage that you want dumped. xxx and yyy are hexadecimal addresses from 0 to X’7FFFFFFF’

RANGE(ALL)
Specifies dumping of all storage from 0 to X’7FFFFFFF’

SP(ddd)
Causes stand-alone dump to dump subpool ddd. ddd is a decimal integer from 0 to 255.
**SP(ddd:eee)**
Causes stand-alone dump to dump all subpools from ddd to eee, inclusive.

**SP(ddd:eee,ddd:eee,...)**
Causes stand-alone dump to dump the combination of subpools that you specify.

**SP(ALL)**
Causes stand-alone dump to dump all subpools, from 0 to 255 inclusive.

**LSQA**
Causes stand-alone dump to dump the LSQA.

**HIGH VIRTUAL**
Causes stand-alone dump to dump all allocated paged out storage above 2G. This applies to storage that was not being excluded because of a SADMP=NO specification. See “SADMPNO” on page 79 for more information.

**SADMPNO**
Causes stand-alone dump to dump memory objects created with SADMP=NO in the specified address space(s). See IARV64 in z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG for more information.

**ASID(xxxx:yyyy)**
Causes stand-alone dump to dump storage for the range of address spaces whose ASIDs begin at xxx and end at yyy, inclusive. xxx and yyy are hexadecimal numbers from X'1' to X'FFFF'.

**ASID('jjj')**
Causes stand-alone dump to dump storage for the address space that jobname jjj identifies. Note that you must enclose the jobname in single quotation marks.

You can use wildcard characters to identify multiple jobnames. The valid wildcard characters are:

- ****
  Zero or more characters, up to the maximum length of the string. An asterisk can start the string, end it, appear in the middle of the string, or appear in several places in the string. A single asterisk for the jobname indicates that all jobnames match.

- **?**
  One character. One or more question marks can start the string, end it, appear in the middle of the string, or appear in several places in the string. A single question mark indicates all jobnames consisting of one character.

**ASID(SYSKEY)**
Causes stand-alone dump to dump storage for all address spaces whose active TCB has an associated storage key of 0 to 7.

**ASID(combination)**
You can combine any of the above specifications. An example of a valid combination is ASID(2, 'IMSJOB',SYSKEY).

**ASID(PHYSIN)**
Causes stand-alone dump to dump storage for physically swapped-in address spaces.

**ASID(ALL)**
Causes stand-alone dump to dump storage for all address spaces. Note that you cannot specify ASID(ALL) in combination with any of the other ASID specifications.

**DATASPACES OF ASID(qualifier)**
When you specify the DATASPACES OF ASID(qualifier) keyword, stand-alone dump dumps all data spaces owned by the specified address space. For each requested data space, stand-alone dump:

- Dumps pages backed by central storage during the central storage dump
- Copies into central storage and dumps every page that is not a first reference page and not backed by central storage
**PAGETABLES OF DATASPACES**

When you specify the PAGETABLES OF DATASPACES keyword, stand-alone dump dumps paged-out virtual storage that contains the page tables for all data spaces.

When stand-alone dump dumps the storage that you specify, stand-alone dump dumps all listed subpools and address ranges in all specified address spaces for each specification of dump options. However, stand-alone dump does not merge your specifications across the dump options that you specify. For example, to cause stand-alone dump to dump subpools 0 and 1 in address space A, and subpools 0 and 1 in address space B, enter:

```
DUMP SP(0,1) IN ASID(A,B)
```

To cause stand-alone dump to dump subpool 0 in address space A and subpool 1 in address space B, enter:

```
DUMP SP(0) IN ASID(A) ALSO SP(1) IN ASID(B)
```

Figure 30 on page 80 shows other examples of valid specifications.

```
DUMP SP(0:7,15),RANGE(0:10000000) IN ASID(SYSKEY),ASID(8)
DUMP SP(0 TO 7 OR 15),SP(255) IN AS('TCAM')
DUMP RANGE(ALL) IN ASID(1) ALSO SP(0) IN ASID(SYSKEY,8)
DUMP DAT SP(0:127) IN ASID('GENER') ALSO SP(0) IN ASID('IMS')
DUMP LSQA IN ASID(C,PHYSIN)
DUMP DATAS PACES OF ASID('MYDB*')
DUMP HIGH VIRTUAL IN ASID(C)
ADDSUMM ASID(3F),ASID('DEBBIE')
ADDSUMM ASID('MYDB*'),46,46:48
AD ASID('MYJOB'),AS(26,'REPORT')
DUMP SADMPNO IN ASID('DUMPSRV')
DUMP SADMPNO IN ASID(5,6,'XCFAS')
```

**Figure 30. Example of valid specifications**

---

**Dumping to a DASD data set**

When you specify DASD on the OUTPUT parameter, you direct the output of the stand-alone dump program to a predefined dump data set on one of the following types of DASD:

- 3380
- 3390
- 9345

**Note:** The selection of the output device (DASD or tape) can be made at both generation time and at run time. An output device specified at run time overrides an output device specified at generation time.

When preparing to take a stand-alone dump to DASD, you must allocate and initialize the dump data set using the AMDSADD REXX or IPCS SADMP dump data set utilities.

The following requirements exist for the allocation of the DASD dump data set:

- The dump data set must have the text ‘SADMP’ as either part of, or as an entire data set qualifier.
- Do not place a data set that is intended to contain a stand-alone dump on a volume that also contains a page data set that the stand-alone dump program you might need to dump. When stand-alone dump initializes a page volume for virtual dump processing, it checks to see if the output dump data set also exists on this volume. If it does, the stand-alone dump program issues message AMD100I and does not retrieve any data from page data sets on this volume. Thus, the dump might not contain all of the data that you requested. This lack of data can impair subsequent diagnosis.
- The dump data set cannot be defined on the same volume that contains the IPL text of stand-alone dump.
Note: Because the data set does not have to be cataloged, there can be more than one dump data set with the same name per system. Furthermore, because the data set can be uniquely named, there can be more than one dump data set per volume.

- IBM recommends that you define the dump data set on a volume that does not contain any other data sets, especially volumes that contain sysplex couple data sets. This ensures maximum capacity when needed and avoid the possibility of other data sets being accessed by another system.
- The dump data set must be both allocated and initialized using the AMDSADDD REXX or IPCS SADMP dump data set utilities.
- Because the stand-alone dump program must be able to locate the dump data set on the output device being used, it is imperative that the necessary data set management steps be taken so that the stand-alone dump data sets are not placed into a migrated state or moved to a different volume. The dump data sets must also be exempt from any space management processing that releases unused space.

When the dump data set is filled, the stand-alone dump program prompts the operator, with message AMD001A, to specify another output device. The stand-alone dump program can continue dumping to any stand-alone dump supported device, however, after a tape device is selected, it must be used to complete the dump even though multiple tape volumes can be required.

Note: Dumping to multiple DASD dump data sets requires that each dump data set used has been preformatted by the AMDSADDD REXX or IPCS SADMP dump data set utilities.

Using the AMDSADDD utility

The REXX utility AMDSADDD resides in SYS1.SBLSCL10. This section describes how to use the AMDSADDD REXX utility to:

- Allocate and initialize the data set. See Figure 31 on page 85 for an example of allocating and initializing the dump data set.
- Clear (reinitialize) the data set. See Figure 34 on page 87 for an example of clearing the dump data set.
- Reallocate and initialize the data set. See Figure 35 on page 88 for an example of reallocating and initializing the dump data set.

The IPCS SADMP dump data set utility performs the same functions as the AMDSADDD REXX utility. See SADMP option on the IPCS Dialog in z/OS MVS IPCS User's Guide for more information. See z/OS MVS IPCS Customization for more information on the migration tasks involving AMDSADDD.

The data set allocated by the AMDSADDD REXX utility must have these characteristics:

- The data set name (DSNAME) must:
  - be 44 characters or less in length
  - contain the text 'SADMP' as either part of, or as an entire data set qualifier.

  For example, valid dump data set names are:
  - SYS1.SADMP
  - SADMP
  - SYSTEMA.SADMPDDS
  - Invalid dump data set names are:
    - SYS1.DUMP.DATASET
    - SADUMP
- The block size (BLKSIZE) must be:

  | DASD | BLKSIZE |
  | 3380 | 9345   |
  | 2080 | 0      |
Stand-Alone dump

3390
24960

Note: Stand-alone dump processing can use a 3390 DASD defined with a block size of 20800; however, the allocated space is not fully utilized unless a block size of 24960 is used. The AMDSADDD REXX utility allocates 3390 DASD devices using a block size of 24960.

- The logical record length (LRECL) must be 4160.
- The record format (RECFM) must be FBS.
- The data set must consist of a single extent.
- The data set organization can be PS (DSORG=PS) or non-VSAM extended format (DSORG=PS-E).
- Occupies space on 1-32 volumes.

All stand-alone dump data sets that are SMS managed must have a STORCLAS with the GUARANTEED_SPACE attribute.

All DSORG=PS-E data sets must:

- Be SMS managed
- Have a DATACLAS that specifies no compression
- Have a STORCLAS that specifies a sustained data rate of zero (suppress striping).

For SMS to honor the allocation request, your installation's automatic class selection (ACS) routines must be configured to do so. For instructions on setting up an SMS environment, see the following publications:

- z/OS DFSMS Using Data Sets
- z/OS DFSMSdfp Storage Administration

You provide the volume, dump data set name, unit, space, and catalog disposition on the invocation of the AMDSADDD REXX utility. If multiple volumes are specified, then a multi-volume data set is allocated and formatted. Up to 16 volumes can be specified, all having the same device type. The amount of space specified for the data set is allocated on each volume.

Special control information is written to multi-volume data sets to allow all of the volumes to be located when the data set is written to. This includes the device number of the volume. The data set is not usable by stand-alone dump if the control information is missing or invalid. If a volume of a multi-volume data set is moved to a new device number, the data set must be re-initialized to update the control information.

The data set cannot be used by a system that has the volumes attached at a device number different than the system which writes the control information.

When using multi-volume data sets, it is highly recommended that they be cataloged. This simplifies processing, as IPCS can easily be used to format and copy the dump data in the cataloged data sets.

**Syntax**

Note: REXX requires that the specified parameters appear in the order listed. If you do not specify a parameter, the AMDSADDD REXX utility prompts for a specification of that parameter.

```
AMDSADDD  {DEFINE|CLEAR|REALLOC}
  volser{(data set name)}
  (type[,[STORCLAS][,[DATACLAS][,[MGMTCLAS]]]])
  [space]  [YES|NO]  [EXTREQ|LARGE|BASIC]  [OPT|NO]
```
or

```
AMDSADDD  {DEFINE|CLEAR|REALLOC}
  (volumelist){(data set name)}
  (type[,[STORCLAS][,[DATACLAS][,[MGMTCLAS]]]])
  [space]  [YES|NO]  [EXTREQ|LARGE|BASIC]  [OPT|NO]
```
Parameters

**AMDSADDD**

The name of the REXX utility.

**DEFINE|CLEAR|REALLOC**

Indicates the function to be performed by the AMDSADDD REXX utility:

**DEFINE**

Allocates and initializes a new dump data set.

**CLEAR**

Initializes an existing dump data set again. After you use CLEAR, the data set is ready for use.

**REALLOC**

Deletes an existing stand-alone dump data set, then reallocates and reinitializes a new stand-alone dump data set on the same volume(s), with the sole purpose of increasing its size. If the specified dump data set does not exist, AMDSADDD converts the function to a DEFINE request and continues using DEFINE processing. If the request to reallocate and reinitialize a new dump data set cannot be satisfied (for example, if you attempt to reallocate a new data set using more cylinders than are available), AMDSADDD might delete the existing dump data set. REALLOC can change the EATTR attributes of the dump data set and can also modify the DSNTYPE but cannot change data sets from SMS to non-SMS managed and vice versa. For example, DSNTYPE=BASIC/LARGE to EXTREQ isn’t allowed.

**Note:** When specifying the REALLOC option for an existing multi-volume data set, the same list of volumes must be specified as when the dataset was originally allocated.

**volser**(data set name)**

Indicates the VOL=SER= name of the volume on which the dump data set is to be allocated. Do not use the stand-alone dump residence volume or the volumes containing the system paging data sets. Optionally, also defines the dump data set name to be allocated on the volume. If data set name is specified, it must:

- be fully qualified (without quotation marks)
- have a length of 44 characters or less
- contain the text ‘SADMP’ as either part of, or as an entire data set qualifier.

**Note:** If no data set name is specified, the AMDSADDD utility will allocate the data set SYS1.SADMP on the specified volume.

**(vollist)**(data set name)**

*vollist* is a comma delineated list of volsers to use for the data set. A multi-volume data set will be allocated using the list of volumes. The device number of the first volume is used to specify the data set to stand-alone dump.

**Tip:** When you take a stand-alone dump to a multi-volume data set it will be striped and take significantly less time to capture.

**(type[,STORCLAS][,DATACLAS][,MGMTCLAS]])**

Type indicates the device type on which the dump data set should be allocated. Valid DASD types are 3380, 3390, and 9345.

**STORCLAS**

The SMS storage class.

**DATACLAS**

The SMS data class.

**MGMTCLAS**

The SMS management class.

For additional information on these classes, see *z/OS MVS JCL Reference*. 
**space**  
Indicates the number of cylinders for the dump data set to be allocated. For a multi-volume data set, this amount is allocated on each volume.

The size of your dump output depends on your storage configuration and how much of that storage you choose to dump using the options of stand-alone dump. To estimate how much space, in cylinders, to allocate for your dump data set, use the number of cylinders of DASD that a typical dump to tape consumes when it has been copied to DASD for IPCS processing. If you do not allocate enough space, the stand-alone dump program prompts the operator, through message AMD001A and message AMD002A (if DDSPROMPT=YES was specified on the AMDSADMP macro), to specify a different device and/or a different dump data set so that dumping can continue.

The space option is not required with the CLEAR parameter. The space option is, however, required with the DEFINE and REALLOC parameters.

**YES|NO**  
Specifies whether the system is to catalog the dump data set. If you want the data set to be cataloged, specify YES or Y. If you do not want the data set to be cataloged, specify NO or N.

Specifying N allows you to allocate multiple dump data sets with the same name.

The catalog option is not required with the CLEAR parameter. The catalog option is, however, required with the DEFINE and REALLOC parameters.

**EXTREQ|LARGE|BASIC**  
Indicates the DSNTYPE of the dump data set to be defined.

EXTREQ requests an extended format dump data set. This data set must have the attribute DSNTYPE=EXTREQ. This attribute allows the system to place the data set in cylinder-managed space on extended access volumes.

LARGE requests a large format dump data set, one with attribute DSNTYPE=LARGE that the system allows to span more than 64K tracks per volume.

BASIC indicates that a large format dump data set is not desired. BASIC can be associated with a conventional dump data set or an extended format sequential dump data set, depending on other options. BASIC is the default.

The dsntype option is not required with CLEAR parameter. The dsntype is optional with DEFINE and REALLOC parameters. The dsntype option with REALLOC must match with the existing dsntype option.

**OPT|NO**  
Indicates the extended attributes of a dump data set. The EATTR option is not required with the CLEAR parameter.

**OPT**  
Requests that extended attributes are optional. The system might store the dump data set in the cylinder-managed space on extended access volumes.

**NO**  
Requests that extended attributes are not required. The default value is NO.

**Examples of running AMDSADDD interactively**

Figure 31 on page 85 shows an example of using the AMDSADDD REXX utility to allocate and initialize the dump data set with a size of 350 cylinders and a VOL=SER= of SAMPLE. Because no data set name is specified, AMDSADDD allocates the dump data set SYS1.SADMP on the volume SAMPLE.

**Note:** Stand-alone dump does not issue error messages during the processing of AMDSADDD. Stand-alone dump does, however, pass messages to the operator from other sources, such as the TSO/E ALLOC command.
Figure 31. Using AMDSADDD to allocate and initialize a basic dump data set

Figure 32 on page 86 shows an example of using the AMDSADDD REXX utility to allocate and initialize a multi-volume, large format dump data set with extended attributes and a size of 1500 cylinders on volumes DMC880 and DMC881 in storage class SADEXTND. Because no data set name is specified, AMDSADDD allocates the dump data set SYS1.SADMP on the specified volumes.
ENTER TSO COMMAND, CLIST, OR REXX EXEC BELOW:

```bash
===> exec 'sys1.sblsc110(amsaddd)' 
```

What function do you want?
Please enter DEFINE if you want to allocate a new dump dataset
Please enter CLEAR if you want to clear an existing dump dataset
Please enter REALLOC if you want to reallocate and clear an existing
dump dataset
Please enter QUIT if you want to leave this procedure

**DEFINE**

Please enter VOLSER or VOLSER(dump_dataset_name) or
(VOLLIST) or (VOLLIST)(dump_dataset_name)

(dmc880,dmc881)

Please enter the device type for the dump dataset
Device type choices are 3380 or 3390 or 9345
(A SMS storage class, data class, and management
class may also be specified with the device type)

(3390,SADEXTND)

Please enter the number of cylinders (per volume)
1500

Do you want the dump dataset to be cataloged? Please respond Y or N

Y

Specify the DSNTYPE. Reply BASIC or LARGE or EXTREQ

LARGE

Specify the extended attributes for the dump dataset.
Reply OPT or NO

OPT

IKJ56650I TIME-02:09:36 PM. CPU-00:00:01 SERVICE-7077780
SESSION-02:16:31 JANUARY 20,2017

Note: Allocated space does not match requested amount

Amount allocated: 1512

Amount requested: 1500

Initializing output dump dataset with a null record:
Dump dataset has been successfully initialized

Results of the DEFINE request:

- Dump Dataset Name : SYS1.SADMP
- Volume : DMC880
- Device Type : 3390
- Allocated Amount : 1512 (per volume)

Figure 32. Using AMDSADDD to allocate and initialize a multi-volume, large format dump data set

Figure 33 on page 87 shows an example of using the AMDSADDD utility to allocate and initialize an extended format dump data set 'SADMP.SAMPLE' with a size of 400 cylinders in the cylinder-managed space. This SMS managed dump data set spans multiple volumes SADPK1 and SADPK2. In an extended address volume environment, some systems might round up the cylinders causing the requested amount and allocated amount to be different. In this case, a message is displayed that indicates the requested amount of cylinders and the allocated amount of cylinders.
Figure 33. Using AMDSADDD to Allocate and Initialize an Extended Dump Data Set

Figure 34 on page 87 shows an example of using the AMDSADDD REXX utility to clear (reinitialize) an existing dump data set called SADMP.DDS1 on VOL=SER=SAMPLE. In this example, the parameters are part of the invocation of the utility; therefore, AMDSADDD does not prompt for values.

Figure 34. Using AMDSADDD to Clear an Existing Dump Data Set

Figure 35 on page 88 shows an example of using the AMDSADDD REXX utility to allocate a new dump data set called SYSTEM1.SADMPDDS on VOL=SER=SMS001. In this example, the parameters are part of the invocation of the utility; therefore, AMDSADDD does not prompt for values.

Note: In an SMS environment, it is possible to have the dump data set cataloged on a different volume than the one specified. If the dump data set is allocated on a different volume, AMDSADDD issues an error message and exits. In Figure 35 on page 88, the dump data set was not allocated on the specified volume causing AMDSADDD to delete the dump data set, issue an error message and quit.
Figure 35. Using AMDSADDD to Reallocate the Dump Data Set

Examples of running AMDSADDD in batch mode

The following examples show how to use JCL to allocate and initialize dump data sets.

**Note:** Because users cannot be prompted to enter values when invoking the AMDSADDD REXX utility in batch mode, you must specify all parameters in the order listed.

Figure 36 on page 88 shows how to use JCL to allocate and initialize the dump data set SYS1.SADMP.A1 on VOL=SER=ZOSSVA with a size of 2653 cylinders. The BASIC type of data set is allocated because the dsntype parameter is not specified.

```
//STEP1 EXEC PGM=IKJEFT01,REGION=64M
//SYSTSPRT DD SYSOUT=* 
//SYSTSIN DD * 
EXEC 'SYS1.SBLSCLI0(AMDSADDD)' +
'DEFINE ZOSSVA(SYS1.SADMP.A1) 3390 2653 N'
/*

Figure 36. Example: Using JCL to allocate and initialize a dump data set
```

Figure 37 on page 88 shows how to use JCL to allocate and initialize an extended format dump data set named SADMP.DS on VOL=SER=USRDS1 with a size of 2953 cylinders in the cylinder-managed space.

```
//SAMPLE JOB 'S3031,B707000,S=C', 'BATCH EXAMPLE', RD=R, 
MSGLEVEL=(1,1),CLASS=E,NOTIFY=$SYSUID,MSGCLASS=H 
//STEP1 EXEC PGM=IKJEFT01,REGION=64M 
//SYSTSPRT DD SYSOUT=* 
//SYSTSIN DD * 
EXEC 'SYS1.SBLSCLI0(AMDSADDD)' +
'DEFINE USRDS1(SADMP.DS)(3390,storclas) 2953 Y EXTREQ OPT'
/*

Figure 37. Example: Using JCL to allocate and initialize an extended format dump data set
```

Generating the stand-alone dump program

After coding the AMDSADMP macro, you can generate the stand-alone dump program. There are two ways to generate the stand-alone dump program:

- **“One-stage generation”** on page 89
- **“Two-stage generation”** on page 94

IBM recommends that you use one-stage generation to create the stand-alone dump program because multiple tasks are performed in one-stage.

**Note:** You can use either two-stage or one-stage JCL when migrating to a new version of MVS.
One-stage generation

In one-stage generation, run the AMDSAOSG program as a single job, using the AMDSADMP macro you have coded as input data on the GENPARMS control statement. The stand-alone dump utility program, AMDSAOSG, initializes a stand-alone dump residence volume in one job by dynamically allocating data sets and invoking the appropriate programs. To run the one-stage generation program, indicate one AMDSADMP macro as a control statement for DDNAME GENPARMS.

```
//SADMPGEN JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
// DD DSN=SYS1.MODGEN,DISP=SHR
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(,PASS),
// SPACE=(4096,(2,1)),UNIT=SYSDA
//DSFSYSIN DD DSN=&DSFSYSIN,DISP=(,PASS),
// SPACE=(88,(4,1)),UNIT=SYSDA
//GENPRINT DD DSN=SADMP.LIST,DISP=OLD
//GENPARMS DD *
AMDSADMP IPL=DSYSDA,VOLSER=SPOOL2,
CONSOLE=(1A0,3277)
END
/*
//PUTIPL EXEC PGM=ICKDSF,REGION=5M
//IPLDEV DD DISP=OLD,UNIT=SYSDA,
// VOL=(PRIVATE,RETAI,SER=SPOOL2)
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(OLD,DELETE)
//SYSIN DD DSN=&DSFSYSIN,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=* 
```

Figure 38. Example: One-stage generation

Table 15 on page 89 contains the DDNAMES AMDSAOSG uses, and the defaults for the DDNAMES. Additional related notes follow this table.

<table>
<thead>
<tr>
<th>ddname</th>
<th>Default value</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPLTEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSADPL),DISP=SHR</td>
<td>Input for AMDSABL.</td>
</tr>
<tr>
<td>DVITEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSADVI),DISP=SHR</td>
<td>Input for AMDSABL.</td>
</tr>
<tr>
<td>GENPARMS</td>
<td>Must be preallocated.</td>
<td>Input for AMDSAOSG, passed to assembler.</td>
</tr>
<tr>
<td>GENPRINT</td>
<td>SYSOUT=A</td>
<td>Output listing from AMDSAOSG.</td>
</tr>
<tr>
<td>IPITEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSAIPI),DISP=SHR</td>
<td>Input for AMDSABL.</td>
</tr>
<tr>
<td>IPLDEV</td>
<td>DSN=SYS1.PAGEDUMP:Wolser,UNIT=iplunit, VOL=(PRIVATE,SER=iplser),</td>
<td>Stand-alone dump program, output from AMDSABL. ICKDSF uses VOL keywords to describe the residence volume.</td>
</tr>
<tr>
<td></td>
<td>DISP=OLD,DCB=(BLKSIZE=12288,RECFM=U, DSORG=PS), LABEL=(,NL)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISP=(NEW,KEEP),DCB=(LRECL=4096, BLKSIZE=4096,RECFM=F,DSORG=PS),SPACE=(4096, (1095),CONTIG),LABEL=EXPDT=99366</td>
<td>DASD IPL volume.</td>
</tr>
<tr>
<td>IPLTEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSAIPD),DISP=SHR for DASD</td>
<td>Input for AMDSABL.</td>
</tr>
<tr>
<td></td>
<td>DSN=SYS1.NUCLEUS(AMDSAIPT),DISP=SHR for tape</td>
<td></td>
</tr>
<tr>
<td>PGEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSAPGE),DISP=SHR</td>
<td>Input for AMDSABL.</td>
</tr>
<tr>
<td>SYSPRINT</td>
<td>Must not be pre-allocated.</td>
<td>Temporary listings from called programs.</td>
</tr>
</tbody>
</table>
### Table 15. DDNAMEs and defaults used by AMDSAOSG. (continued)

<table>
<thead>
<tr>
<th>ddname</th>
<th>Default value</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSPUNCH</td>
<td>DSN=&amp;OBJ,UNIT=SYSDA,SPACE=(80,(250,50))</td>
<td>Object module passed from assembler to AMDSABLD.</td>
</tr>
<tr>
<td>SYSTERM</td>
<td>None</td>
<td>Assembly messages.</td>
</tr>
<tr>
<td>SYSUT1</td>
<td>UNIT=SYSDA,SPACE=(1700,(400,50))</td>
<td>Work file for assembler.</td>
</tr>
<tr>
<td>TRK0TEXT</td>
<td>Must be preallocated.</td>
<td>Cylinder 0, Track 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPL text from AMDSABLD to ICKDSF (DASD only).</td>
</tr>
<tr>
<td>DSFSYSIN</td>
<td>DSN=&amp;DSFSYSIN, DISP=(,PASS), SPACE=(80,(4,1)), UNIT=SYSDA</td>
<td>SYSIN input for ICKDSF</td>
</tr>
</tbody>
</table>

**Note:**

1. You **must** specify the GENPARMS DDNAME on the job step.
2. You **cannot** specify the SYSPRINT and SYSIN DD statements in the job step.
3. In GENPARMS, you specify values for UNIT= and VOLSER= on the AMDSADMP macro statement.
4. You must specify SYSLIB TRK0TEXT and DFSSYSIN statements.
5. The JCL shown in Figure 39 on page 90 generates a stand-alone dump from DASD 222 using a volume serial of SADMPM. The output is directed to the data set SYS1.SADMP on a DASD 450. Stand-alone dump determines at run-time if that device is usable. If the dump data set on device 450 is not usable, the operator will be prompted for another data set. The operator can press enter on any of the consoles at address 041, 042, 0A0, 3E0, or 3E1. The dump will include the default storage ranges in those address spaces that are physically-swapped in at the time of the dump. In addition, all storage in ASID 1 and the JES2 address spaces will be dumped. Stand-alone dump will also dump the data spaces created by the DUMPSRV address space.

```plaintext
//OSG      EXEC PGM=AMDSAOSG,REGION=5M
//SYSLIB   DD DSN=SYS1.MACLIB,DISP=SHR
//          DD DSN=SYS1.MODGEN,DISP=SHR
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(,PASS),
//            SPACE=(4096,(2,1)),UNIT=SYSDA
//DSFSYSIN DD DSN=&DSFSYSIN,DISP=(,PASS),
//          SPACE=(80,(4,1)),UNIT=SYSDA
//GENPARMS DD *
AMDSADMP  CONSOLE=((041,3277),(042,3277),(0A0,3277),
                   (3E0,3277),(3E1,3277)),
          DUMP='SP(ALL) IN ASID(1,'JES2') ALSO DATASPACES
          OF ASID('DUMPSRV')',
          IPL=0222, X
          MINASID=PHYSIN,
          OUTPUT=0450,
          REUSEDS=NEVER,
          PROMPT, X
          VOLSER=SADMPM
END
/*
//PUTIPL   EXEC PGM=ICKDSF,REGION=4M
//IPLDEV   DD DISP=OLD,UNIT=SYSDA,
//          VOL=(PRIVATE,RETAIN,SER=SADMPM)
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(OLD,DELETE)
//SYSIN    DD DSN=&DSFSYSIN,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=* 
```

**Figure 39. Example: One-stage generation of stand-alone dump to a DASD**

The JCL shown in Figure 40 on page 91 generates a stand-alone dump from tape 333 using a volume serial of TSADMP. The output is directed to the unlabeled volume on tape 550. Stand-alone dump determines at runtime if that device is usable. If the dump data set on device 550 is not usable, the
operator is prompted for another data set. The operator can press enter on any of the consoles at address 051,052, 0A0, 3E0, or 3E1. The dump includes the default storage ranges in all address spaces at the
time of the dump. In addition, the data spaces of master, XCF and OMVS address spaces are also included
in the stand-alone dump.

```plaintext
//SADMPGEN JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//SYSLIB DD DSN=SYS1.MODGEN,DISP=SHR
//GENPARMS DD *
AMDSADMP IPL=T333,VOLSER=TSADMP,
CONSOLE=((051,3277),(052,3277),
(0A0,3277),(3E0,3277),(3E1,3277)),
DUMP='SP(ALL) IN ASID(ALL)
ALSO DSP OF ASID(1,'XCFAS','OMVS')',
MINASID=ALL,
OUTPUT=(500),
REUSED=NEVER,
PROMPT
END
/*

Figure 40. Example: One-stage generation of stand-alone dump to tape

The output from AMDSAOSG contains a listing for the stand-alone dump common communication table
(CCT) and device and dump options (DDO) control blocks that contain information specified at generation
time. The remainder of the output consists of messages, including message AMD064I, from both stand-
alone dump and, when the residence volume is direct access, the device utility ICKDSF. Table 16 on page
91 lists the codes AMDSAOSG returns in message AMD064I.

<table>
<thead>
<tr>
<th>Return Code</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Residence volume initialized</td>
</tr>
<tr>
<td>4</td>
<td>Residence volume not initialized due to an error, or a warning was issued during AMDSADMP assembly</td>
</tr>
<tr>
<td>8</td>
<td>Residence volume not initialized; GENPRINT could not be opened</td>
</tr>
</tbody>
</table>

See z/OS MVS System Messages, Vol 1 (ABA-AOM) for more information about AMD064I.

Considerations when using one-stage generation

When generating the stand-alone dump program using one-stage generation, do the following:

- Ensure that the SYSLIB DDNAME concatenates SYS1.MODGEN to SYS1.MACLIB. Your installation should catalog the SYS1.MODGEN data set before generating the stand-alone dump program. Otherwise, the JCL that stand-alone dump produces will fail to create the stand-alone dump program.
- If you are generating stand-alone dump for residence on a direct access volume, AMDSAOSG creates and loads a SYS1.PAGEDUMP.Vvolser data set containing the stand-alone dump program and places an IPL text on the volume. If the volume already contains a SYS1.PAGEDUMP.Vvolser data set, AMDSAOSG will fail. While AMDSAOSG is running, the mount attribute of the volume must be PRIVATE.
- When generating the stand-alone dump program from a Magnetic Tape Subsystem, be aware of which tape format you use or you might not be able to IPL the program. Specifically, IPL processing will end abnormally if you:
  - Generate stand-alone dump on a 3490E Magnetic Tape Subsystem and use a tape subsystem other than a 3490E for IPL.
  - Generate stand-alone dump on a tape subsystem other than a 3490E and use a 3490E Magnetic Tape Subsystem for the IPL.
**Using one-stage generation of stand-alone dump when migrating**

When migrating to a new version of MVS, generate a new version of the stand-alone dump program. Use the new MVS system data sets to build the new version of the stand-alone dump program. Always use a stand-alone dump version that is generated from the same release of MVS that you want to dump. IBM does not guarantee that a different level of stand-alone dump can successfully dump anything other than the level of MVS it was designed for. The new version of MVS might have changed making the stand-alone dump program unable to locate vital information it needs to operate.

To generate a new version of the stand-alone dump program, follow the same steps you followed for a normal one-stage generation, then add the following steps:

- Specifying the correct SYSLIB data set to ensure the new version of the AMDSADMP macro is in use.
- Beginning with z/OS V1R12, use the NUCLIB parameters on the AMDSADMP macro invocation to create the correct one-stage JCL.

Use the following JCL examples for DASD when migrating to a new level of MVS:

- One-stage generation JCL (beginning with z/OS V1R12) for a DASD, see Figure 41 on page 92.
- One-stage generation JCL (any release prior to z/OS V1R12) for a DASD, see Figure 42 on page 93.

The JCL shown in Figure 41 on page 92 assembles the version of the AMDSADMP macro contained in the SYSLIB data set SYS1.MACLIB, found on a 3390 DASD with volser=NEWSYS. Because the NUCLIB is specified, one-stage JCL uses the SYS1.NUCLEUS system data sets found on the 3390 DASD with volser=NEWSYS. The stand-alone dump is saved on DASD device 560 in the SYS1.SADMP data set.

```bash
//ASSEMSAD JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//STEPLIB DD DSN=SYS1.LINKLIB,DISP=SHR,UNIT=3390,
//      VOL=SER=NEWSYS
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR,
//      UNIT=3390,VOL=SER=NEWSYS
//         DD DSN=SYS1.MODGEN,DISP=SHR,UNIT=3390,
//      VOL=SER=NEWSYS
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(,PASS),
//      SPACE=(4896,(2,1)),UNIT=3390
//DSFSYSIN DD DSN=&DSFSYSIN,DISP=(,PASS),
//      SPACE=(80,(4,1)),UNIT=3390
//GENPRINT DD SYSOUT=*  
//GENPARMS DD *
AMDSADMP IPL=DSYSDA,VOLSER=SADASD, 
DUMP=('DATASPACES OF ASID('XCFAS',

'CTTX','APPC')'), 
MINASID=ALL,PROMPT,MSG=ALL, 
CONSOLE=((020,3277), (030,3277),

(040,3277), (050,3277)), 
OUTPUT=D560,
NUCLIB=(NEWSYS,3390)
END
*/
//PUTIPL EXEC PGM=ICKDSF,REGION=4M
//IPLDEV DD DISP=OLD,UNIT=SYSDA,
//      VOL=(PRIVATE,RETAIN,SER=SADASD)
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(OLD,DELETE)
//SYSPRINT DD DSN=&DSFSYSIN,DISP=(OLD,DELETE)
//SYSOUT DD SYSOUT=*  
```

Figure 41. One-stage generation JCL for a DASD (beginning with z/OS V1R12)

Figure 42 on page 93 shows JCL that assembles the version of the AMDSADMP macro contained in the SYSLIB data set SYS1.MACLIB, found on a 3390 DASD with volser=NEWSYS. It uses SYS1.NUCLEUS
system data set found on 3390 DASD with volser=NEWSYS as suggested by IPLTEXT, IPITEXT, DVITEXT, DPLTEXT and PGETEXT. The stand-alone dump is saved on DASD device 560 in the SYS1.SADMP data set.

```
//ASSEMSAD JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//STPLEIB DD DSN=SYS1.LINKLIB,DISP=SHR,UNIT=3390,
//       VOL=SER=NEWSYS
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR,UNIT=3390,
//       VOL=SER=NEWSYS
//       DD DSN=SYS1.MODGEN,DISP=SHR,UNIT=3390,
//       VOL=SER=NEWSYS
//IPLTEXT DD DSN=SYS1.NUCLEUS(AMDSAPD),DISP=SHR,
//       VOL=SER=NEWSYS,UNIT=3390
//IPITEXT DD DSN=SYS1.NUCLEUS(AMDSAPI),DISP=SHR,
//       VOL=SER=NEWSYS,UNIT=3390
//DVITEXT DD DSN=SYS1.NUCLEUS(AMDSADV),DISP=SHR,
//       VOL=SER=NEWSYS,UNIT=3390
//DPLTEXT DD DSN=SYS1.NUCLEUS(AMDSADPL),DISP=SHR,
//       VOL=SER=NEWSYS,UNIT=3390
//PGETEXT DD DSN=SYS1.NUCLEUS(AMDSAPGE),DISP=SHR,
//       VOL=SER=NEWSYS,UNIT=3390
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(,PASS),
//           SPACE=(4096,(2,1)),UNIT=3390
//DSFSYSIN DD DSN=&DSFSYSIN,DISP=(,PASS),
//           SPACE=(80,(4,1)),UNIT=3390
//GENPRINT DD SYSOUT=*
//GENPARMS DD *
AMDSADMP IPL=DSYSDA,VOLSER=SADASD,
    DUMP=('DATASPACES OF ASID('XCFAS','
          'CTTX','APPC')'),
    MINASID=ALL,PROMPT,MSG=ALL
    CONSOLE=((020,3277),(030,3277),
              (040,3277),(050,3277)),
    OUTPUT=D560
    DDSPROMPT=YES,
    NUCLIB=(NEWSYS,3390),
    CONSOLE=((020,3277),(030,3277),
              (040,3277),(050,3277)),
    OUTPUT=D560
END
/*
//PUTIPL EXEC PGM=ICKDSF,REGION=4M
//IPLEDEV DD DISP=OLD,UNIT=SYSDA,
//        VOL=(PRIVATE,RETAIN,SER=SADASD)
//TRK0TEXT DD DSN=&TRK0TEXT,DISP=(OLD,DELETE)
//SYSIN DD DSN=DSFSYSIN,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=*
```

Figure 42. Example: One-stage generation JCL (any release) for a DASD (any release)

Use the following JCL examples for tape when migrating to a new level of MVS:

- One-stage JCL (beginning with z/OS V1R12) for tape (Figure 43 on page 93)
- One-stage JCL (any release prior to z/OS V1R12) for tape (Figure 44 on page 94)

The JCL shown in Figure 43 on page 93 assembles the version of the AMDSADMP macro contained in the SYSLIB data set SYS1.MACLIB, found on a 3390 DASD with volser=NEWSYS. Because NUCLIB is specified, it uses the SYS1.NUCLEUS system data set found on 3390 DASD with volser=NEWSYS. Only one job step is necessary because the stand-alone dump program is saved on a tape 5B0 with a volume serial of SADMPT. The output gets directed to the data set SYS1.SADMP.SAMPLE on DASD 450.

```
//SADMPGEN JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSSG,REGION=5M
//STPLEIB DD DSN=SYS1.LINKLIB,DISP=SHR,UNIT=3390,
//       VOL=SER=NEWSYS
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR,UNIT=3390,
//       VOL=SER=NEWSYS
//       DD DSN=SYS1.MODGEN,DISP=SHR,UNIT=3390,
//       VOL=SER=NEWSYS
//GENPARMS DD *
AMDSADMP IPL=T5B0,VOLSER=SADMPT,
    OUTPUT=('D450,SYSTYPE=SADMP.SAMPLE'),
    DDSPROMPT=YES,
    NUCLIB=(NEWSYS,3390),
    CONSOLE=('(E1,3278),(3E1,3278)')
END
/*
```

Figure 43. Example: One-stage JCL (beginning with z/OS V1R12) for tape
Figure 44 on page 94 shows JCL that assembles the version of the AMDSADMP macro contained in the SYSLIB data set SYS1.MACLIB, found on a 3390 DASD with volser=NEWSYS. It uses the SYS1.NUCLEUS system data set found on 3390 DASD with volser=NEWSYS. Because the stand alone dump program is being saved on a tape, only one job step is necessary. The stand alone dump program is saved on TAPE 5B0 with volume serial of SADMPT. The output goes to the data set SYS1.SADMP.SAMPLE on DASD 450.

//SADMPGEN JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//STEPLIB DD DSN=SYS1.LINKLIB,DISP=SHR,UNIT=3390,
//        VOL=SER=NEWSYS
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR,VOL=SER=NEWSYS
//        DD DSN=SYS1.MODGEN,DISP=SHR,VOL=SER=NEWSYS
//IPLTEXT DD DSN=SYS1.NUCLEUS(AMDSAIPT),DISP=SHR,
//         UNIT=3390,VOL=SER=NEWSYS
//IPITEXT DD DSN=SYS1.NUCLEUS(AMDSAIPI),DISP=SHR,
//         UNIT=3390,VOL=SER=NEWSYS
//DVITEXT DD DSN=SYS1.NUCLEUS(AMDSADVI),DISP=SHR,
//         UNIT=3390,VOL=SER=NEWSYS
//DPLTEXT DD DSN=SYS1.NUCLEUS(AMDSADPL),DISP=SHR,
//         UNIT=3390,VOL=SER=NEWSYS
//PGETEXT DD DSN=SYS1.NUCLEUS(AMDSPGPE),DISP=SHR,
//         UNIT=3390,VOL=SER=NEWSYS
//GENPARMS DD *
AMDSADMP IPL=T5B0,VOLSER=SADMPT,
OUTPUT=(D450,SYS1.SADMP.SAMPLE),
DDSPROMPT=YES,
CONSOLE=((3E0,3278),(3E1,3278))
END
/

Figure 44. Example: One-stage JCL (any release) for tape

Two-stage generation

In two-stage generation of the stand-alone dump program, you must perform two tasks:

1. Assemble the AMDSADMP macro
2. Initialize the residence volume

After you code the AMDSADMP macro, you can assemble the macro. Use the JCL shown in Figure 45 on page 94 to assemble the AMDSADMP macro. The SYSLIB data set must contain the AMDSADMP macro.

//ASSEMSAD JOB MSGLEVEL=(1,1)
//ASM EXEC PGM=ASMA90,REGION=4096K,PARM='DECK'
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
//   DD DSN=SYS1.MODGEN,DISP=SHR
//SYSUT1 DD UNIT=SYSDA,SPACE=(1700,(400,50))
//SYSPRINT DD SYSPRINT=*,,STD,HOLD=YES
//SYSPUNCH DD DSN=D10.SYS420.STAGE3.JCL(SADMPST2),DISP=SHR
//SYSLIN DD SYSLIN=H
//SYSIN DD *
AMDSADMP MINASID=ALL,IPL=DSYSDA,
DUMP=('DATASPACES OF ASID('XCFAS','CTTX','APPC')'),
VOLSER=XXXXX,
CONSOLE=((020,3277),(030,3277),(040,3277),(050,3277)),
PROMPT,MSG=ALL,
OUTPUT=T560
END
/

Figure 45. Example: Stage-two JCL to assemble the AMDSADMP macro

The output of the assembly is a job stream that can be used to initialize the residence volume. The output of the assembly can be directed to a DASD or tape device by coding the SYSPUNCH DD card, as shown in Table 17 on page 95.
<table>
<thead>
<tr>
<th>Direct assembly output</th>
<th>SYSPUNCH DD statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tape</td>
<td>//SYSPUNCH DD UNIT=tape, LABEL=( ,NL ), DISP=( NEW, KEEP ), VOL=SER=volser</td>
</tr>
<tr>
<td>New direct access data set</td>
<td>//SYSPUNCH DD UNIT=dasd, SPACE=(80,(30,10)), DSN=dsname, DISP=( NEW, KEEP ), VOL=SER=volser</td>
</tr>
</tbody>
</table>

**Assembling multiple versions of AMDSADMP**

You can assemble multiple versions of AMDSADMP at the same time, provided that each version specifies a different residence volume. Differentiate between versions by coding a unique symbol at the beginning of each macro. AMDSADMP uses the symbol you indicate to create unique stage-two job names. The output from a multiple assembly is a single listing and a single object deck, which can be broken into separate jobs if desired. Use the JCL shown in Figure 46 on page 95 for coding multiple versions of AMDSADMP.

```jcl
//MULTISAD JOB MSGLEVEL=(1,1)
//ASM EXEC PGM=ASMA90,PARM='DECK,NOOBJ'
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
//         DD DSN=SYS1.MODGEN,DISP=SHR
//SYSUT1 DD UNIT=SYSDA,SPACE=(1700,(400,50))
//SYSPRINT DD SYSOUT=A
//SYSPUNCH DD SYSOUT=B
//SYSIN DD *
TAPE AMDSADMP IPL=T3400,VOLSER=SADMP1
DASD1 AMDSADMP VOLSER=SADMP2,MINASID=PHYSIN
DASD2 AMDSADMP VOLSER=SADMP3
END
/*
```

**Figure 46. Example: Assembling multiple versions of AMDSADMP Macro**

**Initializing the residence volume**

When you are generating stand-alone dump for residence on a direct access volume using the stage-two JCL, a SYS1.PAGEDUMP.Vvolser data set containing the stand-alone dump program is created, loaded, and IPL text is placed on the volume. If the volume already contains a SYS1.PAGEDUMP.Vvolser data set, the stage-two job fails. While the stage-two job is running, the mount attribute of the volume must be PRIVATE.

Physical output from the assembly part of the initialization step is a listing for the stand-alone dump common communication table (CCT) and devices and dump options (DDO) control blocks that contain information specified at generation time. The remainder of the output consists of informational, error, and action messages from both stand-alone dump and, when the residence volume is direct access, the device utility ICKDSF.

When generating the stand-alone dump program from a Magnetic Tape Subsystem, be aware of which tape format you use or you might not be able to IPL the program. Specifically, IPL processing will end abnormally if you:

- Generate stand-alone dump on a 3490E Magnetic Tape Subsystem and use a tape subsystem other than a 3490E for the IPL.
- Generate stand-alone dump on a tape subsystem other than a 3490E and use a 3490E Magnetic Tape Subsystem for the IPL.
Using two-stage generation of stand-alone dump when migrating

When migrating to a new version of MVS, generate a new version of the stand-alone dump program. Use the new MVS system data sets to build the new version of the stand-alone dump program.

Always use a stand-alone dump version that is generated from the same release of MVS that you want to dump. IBM does not guarantee that a different level of stand-alone dump will successfully dump anything other than the level of MVS it was designed for. The new version of MVS might have changed making the stand-alone dump program unable to locate vital information it needs to operate.

To generate a new version of the stand-alone dump program, follow the same steps you followed for a normal two-stage generation, then add the following steps:

- Ensure that the new version of the AMDSADMP macro is being used by specifying the correct SYSLIB data set.
- Use the NUCLIB, MODLIB, LNKLIB and/or ALIB parameters on the AMDSADMP macro invocation to create the correct stage-two JCL.

The output shown in Figure 47 on page 96 assembles the version of the AMDSADMP macro contained in the SYSLIB data set SYS1.MACLIB, found on a 3390 DASD with volser=NEWSYS. Because the ALIB parameter is specified, the stage-two JCL will use the SYS1.NUCLEUS, SYS1.MODGEN, and SYS1.LINKLIB system data sets, also found on the 3390 DASD with volser=NEWSYS.

```
//ASSEMSAD JOB    MSGLEVEL=(1,1)
//ASM     EXEC PGM=ASMA90,REGION=4096K,PARM='DECK'
//SYSLIB   DD   DSN=SYS1.MACLIB,DISP=SHR,
//                  UNIT=3390,VOL=SER=NEWSYS,
//                  SYSUT1 DD   UNIT=SYSDA,SPACE=(1700,(400,50))
//SYSPRINT DD   SYSOUT=(*,,STD),HOLD=YES
//SYSPUNCH DD   DSN=D10.SYS430.STAGE3.JCL(SADMPST2),DISP=SHR
//SYSLIN   DD   SYSOUT=H
//SYSIN    DD   *
    AMDSADMP   MINASID=ALL,IPL=DSYSDA,
                DUMP=('DATASPACES OF ASID('XCFAS','CTTX','APPC')'),
                VOLSER=SADUMP,
                CONSOLE=((020,3277),(030,3277),(040,3277),(050,3277)),
                PROMPT,MSG=ALL,
                OUTPUT=T560,
                ALIB=(NEWSYS,3390)
END
/*
```

Figure 47. Example: Stage-two JCL to assemble the AMDSADMP macro

Note: Using the ALIB parameter is convenient if all of the system data sets used by the stand-alone dump program reside on the same volume. Also, note that the same results could have been achieved by coding the NUCLIB, MODLIB, and LNKLIB keywords separately with each specifying NEWSYS and 3390 for volser and unit.

Figure 48 on page 97 shows the output that assembles the version of the AMDSADMP macro contained in the SYSLIB data set, SYS1.MACLIB, found on a 3390 DASD with volser=NEWSYS. Because the MODLIB parameter is specified, the stage-two JCL will use the SYS1.MODGEN system data set found on a 3380 DASD with volser=SYS51A. Because the ALIB parameter is specified, the stage-two JCL will use the SYS1.NUCLEUS and SYS1.LINKLIB system data sets found on a 3390 DASD with volser=SYS51B.
Note that the ALIB parameter has no effect on the SYS1.MODGEN system data set because the MODLIB parameter was specified separately. The stand-alone dump program will be generated using the cataloged system data sets if the NUCLIB, MODLIB, LNKLIB, or ALIB parameters are not specified.

**Using two-stage generation for overriding**

When overriding to use a different systems database, IBM recommends that you generate a new version of the stand-alone dump program. Use the new MVS system data sets to build the new version of the stand-alone dump program.

Although the current version of the stand-alone dump program might be able to dump a new version of MVS successfully, it is not guaranteed. MVS might have changed such that the stand-alone dump program would not be able to locate vital information it needs to operate.

To generate a new version of the stand-alone dump program, follow the same steps you followed for a normal two-stage generation, then add the following steps:

- Ensure that the new version of the AMDSADMP macro is being used by specifying the correct SYSLIB data set.
- Use the NUCLIB, MODLIB, LNKLIB and/or ALIB parameters on the AMDSADMP macro invocation to create the correct stage-two JCL.

The output shown in Figure 49 on page 98 assembles the version of the AMDSADMP macro contained in the SYSLIB data set SYS1.MACLIB, found on a 3390 DASD with volser=OVERRIDE. Because the ALIB parameter is specified, the stage-two JCL will use the SYS1.NUCLEUS, SYS1.MODGEN, and SYS1.LINKLIB system data sets, also found on the 3390 DASD with volser=OVERRIDE.
Figure 49. Example: Stage-Two JCL to assemble the AMDSADMP macro with overrides

Note: Using the ALIB parameter is convenient if all of the system data sets used by the stand-alone dump program reside on the same volume. Also, note that the same results could have been achieved by coding the NUCLIB, MODLIB, and LNKLIB keywords separately with each specifying NEWSYS and 3390 for volser and unit.

Running the stand-alone dump program

The operator usually takes a stand-alone dump for one of the following types of problems:

- Disabled wait
- Enabled wait
- Loop
- Partial system hang

When one of these problems occurs, the stand-alone dump program, residing in the SYS1.PAGEDUMP.Vvolser data set, can be run to produce a stand-alone dump. There are several procedures that can be used to run the stand-alone dump program:

- “Procedure A: Initialize and run stand-alone dump” on page 98
- “Procedure B: Restart stand-alone dump” on page 102
- “Procedure C: ReIPL stand-alone dump” on page 102
- “Procedure D: Dump the stand-alone dump program” on page 102

When to use which procedure:

- Use Procedure A to initialize the stand-alone dump program and dump storage.
- If you want to run stand-alone dump again, for instance when stand-alone dump fails, use Procedure B, Procedure C, or procedure D.
- When you want to restart stand-alone dump, try procedure B before you try Procedure C or D.
- Procedures C and D can result in the loss of some central storage from the output, whereas Procedure B usually does not.

Although the stand-alone dump program was created under the operating system, it runs as a stand-alone operation.

Procedure A: Initialize and run stand-alone dump

Use the following procedure to initialize and run a stand-alone dump.
1. Ready the residence device. If it is a tape, mount the volume on a device attached to the selected processor and ensure that the tape cartridge is write-enabled. If it is a DASD volume, ensure that it is write-enabled.

If you mirror the SADMP IPL volume to a device in an alternate subchannel set and have swapped so that the devices in the alternate subchannel set are now in use, prefix the SADMP IPL device number with the subchannel set id when you specify the SADMP IPL device. In this case, DASD SADMP output devices should be defined in the alternate subchannel set as well.

2. If dumping a failed stand-alone dump program, in order to diagnose the stand-alone dump failure, select the Store Status option during the IPL, or perform a manual Store Status. Otherwise, for all other cases, do not perform a Store Status because the machine automatically performs a Store Status when it is necessary.


Stand-alone dump does not communicate with the operator console. Instead, stand-alone dump loads an enabled wait PSW with wait reason code X'3E0000'. The IPLing of the stand-alone dump program causes absolute storage (X'0'-X'18' and storage beginning at X'FC0') to be overlaid with CCWs. You should be aware of this and not consider it as a low storage overlay.

Note: Stand-alone dump uses the PSW to communicate with the operator or system programmer. Stand-alone dump waits for a console I/O interrupt or an external interrupt.

4. When stand-alone dump is IPLed, you can specify a load parm that alters the operation of stand-alone dump. The format of the load parm is Saddddo.

S
The constant S must be specified as the first character or the load parm will be ignored.

a
The a specification allows stand-alone dump to start using a console without the operator performing any action on it. It also allows stand-alone dump to bypass the prompts for which output device and default dump title to use. You can specify the following values for a:

N
No console communication requested. Use default dump device and title. Execution begins with no console messages. No prompting to the operator is allowed. If a prompt occurs, a wait state will be loaded.

O
Use the default console with the default dump device and title. No prompting to the operator is allowed. If a prompt occurs, a wait state will be loaded.

M
Use the default console with the default dump device and title. Additional prompts can be made to the operator if they are needed.

C
Use the default console. The operator must respond to all prompts.

P
Wait for an interrupt from the console device that is to be used. If you do not supply the load parm, this is the default.

dddd
The dddd specification is the default console device. It must be one of the devices specified as a console device on the AMDSADMP macro when the stand-alone dump was generated, or the constant SYSC for the hardware system console. If you do not specify a default console device, then the stand-alone dump will use the first console defined on the AMDSADMP macro when the stand-alone dump was generated.

The AMDSADMP macro allows you to specify SYSC as the first console in the console list. If you do this without specifying a console device in the load parm, the hardware system console will be the default console device.
The o field contains flags, and the second bit (bit 1) indicates that SADMP must start an IPL of MVS at the conclusion of its processing. If bit 1 is on, and SADMP locates an AutoIPL policy within MVS storage that specifies a re-IPL of MVS, SADMP uses the information to initiate an IPL of MVS. For details about AutoIPL, see topic about Using the automatic IPL function in z/OS MVS Planning: Operations.

The valid values for the o field are '0', '4' or blank. '0' or blank leaves all bits off. '4' sets bit 1 on. Bit 1 is intended to automate the re-IPL of MVS when SADMP is initiated manually. IBM recommends that it be left off otherwise.

If you do not use the load parm, select the system console or an operator console with a device address that is in the console list that you specified at stand-alone dump generation time (in the CONSOLE keyword of AMDSADMP). At stand-alone dump run time, the operator can choose either a console specified with the CONSOLE= keyword or the system console to control stand-alone dump operation. If an operator console is chosen, press ATTENTION or ENTER on that console. (On some consoles, you might have to press RESET first.) This causes an interruption that informs stand-alone dump of the console's address. Message AMD001A appears on the console.

a. Ready an output device. When you dump to devices that have both real and virtual addresses (for example, dumping a VM system), specify the virtual address to the stand-alone dump program. If you are dumping to tape, ensure that the tape cartridge is write-enabled and unlabeled. If you are dumping to DASD, ensure that the DASD data set has been initialized using the IPCS SADMP or AMDSADD REXX dump data set utilities.

b. Reply with the device number for the output device. Note: A DASD output device must be in the same subchannel set as the device from which the stand-alone dump is IPLed, and only the specification of a 4-digit device number is allowed. So, for example, if in reply to the device number prompt, you enter 4180 and the stand-alone dump has been IPLed from device 15660, device 4180 is assumed to be in subchannel set 1, or in this example, 14180. If you are dumping to a DASD device and DDSPROMPT=YES was specified on the AMDSADMP macro, message AMD002A is issued to prompt the operator for a dump data set. IF DDSPROMPT=NO was specified, message AMD002A is not issued and the stand-alone dump program assumes that the dump data set name is SYS1.SADMP.

Note:

1) Pressing ENTER in response to message AMD001A will cause the stand-alone dump program to use the default device specified on the OUTPUT= keyword of the AMDSADMP macro. If the default device is a DASD device, then pressing the ENTER key in response to message AMD001A will cause the stand-alone dump program to use both the default device and the dump data set name specified on the OUTPUT= keyword of the AMDSADMP macro. If no dump data set name was provided on the OUTPUT= keyword and the DDSPROMPT=YES keyword was specified, message AMD002A is issued to prompt the operator for a dump data set. If DDSPROMPT=NO was specified, then the stand-alone dump program assumes that the dump data set name is SYS1.SADMP.

2) If you reply with the device number of an attached device that is not of the required device type, or if the device causes certain types of I/O errors, stand-alone dump might load a disabled wait PSW. When this occurs, use procedure B to restart stand-alone dump.

c. Stand-alone dump prompts you, with message AMD011A, for a dump title.

In Figure 50 on page 101, the dump is initialized using a load parm with no console prompts.
5. When no console is available, run stand-alone dump without a console.
   a. Ready the default output device that was specified on the OUTPUT parameter on the AMDSADMP macro. For tapes, ensure that the tape cartridge is write-enabled. For DASD, ensure that the dump data set has been initialized using the AMDSADDD REXX or IPCS SADMP dump data set utilities.
   b. Enter an external interruption on the processor that stand-alone dump was IPLed from. Stand-alone dump proceeds using the default output device and/or the default dump data set. No messages appear on any consoles; stand-alone dump uses PSW wait reason codes to communicate to the operator.

6. Stand-Alone dump first processes the real storage in ASID order. The message AMD005I is issued after each phase to display the status of the dump.
   a. Phase 1 dumps the Page Frame Table and its related structures in virtual order.
   b. The next three phases dump real storage associated with the minimal, summary and swapped-in ASIDs in virtual order.
   c. Phase 5 dumps the In-Use real storage in real order.

7. Stand-Alone dump processes the paged-out storage in virtual order based on customer specifications. Message AMD108I is issued to display the status of the virtual phase of the dump
   a. Phases 6 to 8 dumps the paged-out storage of minimal, summary and swapped-in ASIDs. At end of phase VIII, all storage associated with the swapped-in ASIDs has been dumped.
   b. Phase 9 dumps the storage of swapped-out ASIDs.

8. Stand-Alone dump proceeds to dump the available real storage in Phase 10. The storage dumped during this phase includes the real frames that were not dumped earlier. At the completion of this phase, message AMD104I is issued to signal the end of the dump.

9. When stand-alone dump begins dumping real storage (Phase 1 to Phase 5 and Phase 10) it issues message AMD005I. Message AMD095I is issued every 30 seconds to illustrate the process of the dump. Message AMD005I will be issued as specific portions of real storage have been dumped, as well as upon completion of the real dump. Stand-alone dump can end at this step.

10. When stand-alone dump is dumping virtual storage, it issues message AMD108I as specific portions of virtual storage is dumped. Message AMD056I is issued to signal the end of virtual phase dump.

11. If you specified PROMPT on the AMDSADMP macro, stand-alone dump prompts you for additional storage that you want dumped by issuing message AMD059D.

12. Stand-alone dump dumps paged-out virtual storage, the stand-alone dump message log, and issues message AMD095I every 30 seconds to illustrate the progress of the dump.
13. When stand-alone dump completes processing, stand-alone dump unloads the tape, if there is one, and enters a wait reason code X'410000'.

See z/OS MVS System Codes for more information about the wait state reason codes loaded into the PSW.

**Note:** Some processor models do not allow selection of a specific processor to IPL from. Normally, the processor previously IPL’ed is selected again for this IPL.

### Procedure B: Restart stand-alone dump

A system restart does not always work, either because it occurs at a point when stand-alone dump internal resources are not serialized, or because stand-alone dump has been too heavily damaged to function. If the restart does not work, try procedure C (reIPL).

If a dump to a DASD data set is truncated because there is not enough space on the data set to hold the dump, use a system restart to dump the original data to tape. By causing a system restart, you can reinitialize and restart a failing stand-alone dump program without losing the original data you wanted to dump.

If a permanent error occurs on the output device, the stand-alone dump program will prompt the operator to determine if a restart of the stand-alone dump program should be performed. If the operator indicates that a restart of the stand-alone dump program should be performed, then the stand-alone dump program restarts the dump using the same console and prompts the operator to specify a different output device. Continue procedure A at step 6A; see “Procedure A: Initialize and run stand-alone dump” on page 98.

For other types of stand-alone dump errors and wait states, it might be necessary for the operator to perform a manual restart of the stand-alone dump program. In this case, the operator should perform the following steps:

1. Perform a system restart on the processor that you IPLed stand-alone dump from.
2. If the restart is successful, stand-alone dump dumps central storage. If stand-alone dump abnormally ends while dumping central storage, try to restart stand-alone dump. If the restart succeeds, stand-alone dump reruns the entire dump. It will first enter wait state X'3E0000' to allow you to specify a new console and output device. You can do this to recover from an I/O error on the output device. Stand-alone dump recognizes any console in the console list and starts with the same output device defaults that are used at the IPL of stand-alone dump.
3. Continue procedure A at step 3, see “Procedure A: Initialize and run stand-alone dump” on page 98.

### Procedure C: ReIPL stand-alone dump

When you reIPL stand-alone dump, the previous running of stand-alone dump has already overlaid some parts of central storage and modified the page frame table. If the virtual storage dump program was in control, a reIPL might not dump paged-out virtual storage. The number of times that you can IPL stand-alone dump to dump paged-out virtual storage is equal to the number of processors present.

To run procedure C, repeat procedure A. If the previous IPL of stand-alone dump did not load a wait state and reason code of X'250000' or higher and the reIPL succeeds, stand-alone dump usually completes processing as in procedure A. Some storage locations might not reflect the original contents of central storage because, during a previous IPL, stand-alone dump overlaid the contents. These locations include the absolute PSA and possibly other PSAs.

### Procedure D: Dump the stand-alone dump program

Use a new IPL of stand-alone dump to debug stand-alone dump if stand-alone dump fails. When you use stand-alone dump to dump itself, the dump program dumps central storage only, because a dump of central storage provides enough information to diagnose a stand-alone dump error. Follow procedure A at step “2” on page 99 by performing a STORE STATUS instruction. Stand-alone dump follows procedure A steps 2 through 6, then issues message AMD088D. This message allows the operator to stop the dump after central storage has been dumped or to continue dumping virtual storage.
**Stand-alone self-dump**

When running a virtual storage dump and stand-alone dump error recovery detects errors in stand-alone dump, stand-alone dump can take a self-dump before proceeding. At most, stand-alone dump takes twelve self-dumps; after the twelfth request for a self-dump, stand-alone dump stops taking self-dumps, but continues to count the number of self-dump requests and continues to issue the AMD066I message. After a large number of self-dump requests, stand-alone dump terminates. Stand-alone dump places both the self-dump and the operating system dump onto the output tape or DASD.

You can use the LIST subcommand of IPCS to print stand-alone dump self-dumps. The format of the subcommand is as follows, where x = 001 - 012. See z/OS MVS IPCS Commands for more information.

```plaintext
LIST address COMPDATA(AMDSAxxx)
```

**Running the stand-alone dump program in a sysplex**

The operator usually takes a stand-alone dump in a sysplex when an MVS system is not responding. Situations that indicate that stand-alone dump should be run include:

- Consoles do not respond
- MVS is in a WAIT state
- An MVS system is in a “status update missing” condition and has been or is waiting to be removed from the sysplex
- A stand-alone dump has been requested by Level 2.

There are two high-level methods for taking a stand-alone dump of an MVS system that resides in a sysplex. Both methods emphasize the expeditious removal of the failing MVS system from the sysplex. If the failed MVS system is not partitioned out of the sysplex promptly, some processing on the surviving MVS systems might be delayed.

**Method A**

Use this method to take a stand-alone dump of an MVS system that resides in a sysplex. Assume that the MVS system to be dumped is “SYSA”.

1. IPL the stand-alone dump program on SYSA (see “Running the stand-alone dump Program”).
2. Issue VARY XCF,SYSA,OFFLINE from another active MVS system in the sysplex if message IXC402D or IXC102A is not already present.
   
   You do not have to wait for the stand-alone dump to complete before issuing the VARY XCF,SYSA,OFFLINE command.
3. Reply DOWN to message IXC402D or IXC102A.

Performing steps 2 and 3 immediately after IPLing stand-alone dump will expedite sysplex recovery actions for SYSA and allow resources held by SYSA to be cleaned up quickly, thus enabling other systems in the sysplex to continue processing.

After you IPL the stand-alone dump, MVS cannot automatically ISOLATE system SYSA through SFM. Message IXC402D or IXC102A issues after the VARY XCF,SYSA,OFFLINE command or after the XCF failure detection interval expires. You must reply DOWN to IXC402D or IXC102A before sysplex partitioning can complete.

**Note:** DO NOT perform a SYSTEM RESET in response to IXC402D, IXC102A after the IPL of stand-alone dump. The SYSTEM RESET is not needed in this case because the IPL of stand-alone dump causes a SYSTEM RESET. After the IPL of stand-alone dump is complete, it is safe to reply DOWN to IXC402D or IXC102A.
Method B

Use this method if there is a time delay between stopping processors, as part of the SYSTEM RESET-NORMAL function in step one, and IPLing the stand-alone dump program.

1. Perform the SYSTEM RESET-NORMAL function on SYSA.
2. Issue VARY XCF,SYSA,OFFLINE from another active MVS system in the sysplex if message IXC402D or IXC102A is not present.
3. Reply DOWN to message IXC402D or IXC102A. Performing steps two and three immediately after doing the SYSTEM RESET will expedite sysplex recovery actions for SYSA. It allows resources that are held by SYSA to be cleaned up quickly, and enables other systems in the sysplex to continue processing.
4. IPL the stand-alone dump program (see “Running the stand-alone dump program” on page 98). While this step can be done earlier, the aim of performing steps one through three is to minimize disruption to other systems in the sysplex.

After a SYSTEM RESET is performed, MVS cannot automatically ISOLATE system SYSA through SFM. Message IXC402D or IXC102A is issued after the VARY XCF,SYSA,OFFLINE command or after the XCF failure detection interval expires. You must reply DOWN to IXC402D or IXC102A before sysplex partitioning can complete.

Capturing a stand-alone dump quickly

There are times when you need to process stand-alone dump information quickly to diagnose a problem. It is important to perform the stand-alone dump process quickly, to minimize the time the system is unavailable. Sometimes a stand-alone dump is not captured because of the time that the dumping process takes. Skipping the stand-alone dump, however, can prevent the diagnosis of the system failure. Instead of skipping the stand-alone dump, it is better to spend a short time to get as much of the stand-alone dump as is possible, as quickly as possible. The following are two methods to save time when performing a stand-alone dump.

- Minimize the operator actions
- Get a partial stand-alone dump

Minimize the operator actions

Time spent waiting for the operator to reply to a message or mount a tape is idle time. Minimizing the operator actions turns the idle time into data capture time. It also simplifies the process, so that the stand-alone dump process becomes easier to do. The following are ways to minimize the operator’s actions when performing a dump.

- Use the stand-alone dump LOAD parameter SO or SM to skip the prompt for the console to use to avoid other responses to messages.
- Use the default device specified on the OUTPUT= keyword of the AMDSADMP macro. If the default device is a DASD device, then pressing the ENTER key in response to message AMD001A will cause the stand-alone dump program to use both the default device and the dump data set specified on the OUTPUT= keyword of the AMDSADMP macro.
- Use REUSEDS=ALWAYS on the AMDSADMP macro to indicate that stand-alone dump should reuse the dump data set on the specified output device when it determines that the data set is valid, however, it can contain data from a previous dump. Or, you can always clear the dataset.

Note: Be sure you do not overwrite another dump.

- Specify DDSPROMPT=NO, then the stand-alone dump program assumes that the dump data set name is SYS1.SADMP.
- Do not specify PROMPT on the AMDSADMP macro, unless requested by IBM.
- Use “fast” device for output
**Get a partial stand-alone dump**

While it is always best to get a complete stand-along dump, sometimes time constraints will not allow this. There is no guarantee that it will be possible to diagnose a failure from a partial stand-alone dump; however, if the choice is between no dump at all or a partial dump, then the partial dump is the best choice.

When taking a partial stand-alone dump:

- Let the stand-alone dump run for as long as you can. If you run out of time, you can stop the dump cleanly.
- Stand-alone dump tries to write out the most important information first.
  - Status information (PSW, registers, and so forth) for all CPUs
  - Critical real storage, including common storage and trace information
  - Real storage for address spaces executing at the time of the dump
  - Any remaining real storage
  - Paged out storage for swapped in address spaces
  - Paged out storage for swapped out address spaces
- Use the EXTERNAL INTERRUPT key to terminate the dumping process. This causes a clean stop, closing the output dataset properly.

In Figure 51 on page 105, the dump was ended early using the EXTERNAL INTERRUPT key.

---

**Copying, viewing, and printing stand-alone dump output**

When stand-alone dump processing completes the dump, the output resides on a tape volume, a DASD, or a combination of devices. The easiest way to view the dump is to copy the dump to a DASD data set. When a stand-alone dump resides on multiple devices and/or dump data sets, you can concatenate the dump into one data set. After the dump is available on DASD, it can be viewed online using IPCS.

**Note:** If the dump resides in a DASD dump data set, IBM recommends that you copy the dump to another data set for IPCS processing and clear (reinitialize) the dump data set using the AMDSADDD or IPCS SADMP dump data set utilities. For more information, see “Using the AMDSADDD utility” on page 81 and SADMP option on the IPCS Dialog in *z/OS MVS IPCS User's Guide*.

**Copying the dump to a data set**

If you want to view the dump online, copy the dump to a data set. There are two tools you can use to copy the dump:

- Use the IPCS COPYDUMP subcommand when the IPCS environment has been set up on your system. This is the only option recommended if the dump was written to a multi-volume DASD data set.
Stand-Alone dump

- Use the IEBGENER utility when the IPCS environment has not been set up on your system. Many operators take a stand-alone dump so that the system programmer can view the dump. The operator does not require IPCS on the system because the operator will not be viewing the dump. Therefore, the operator should use the IEBGENER utility to copy the dump to a data set accessible by the system programmer's system.

For more information, see the following references:

- See z/OS MVS IPCS Commands for information about COPYDUMP.
- See z/OS DFSMSdfp Utilities for information about IEBGENER.

Copying from tape

The example below shows how to use IEBGENER to copy tape output to DASD. Two advantages of copying stand-alone dump tape output to DASD are:

- When stand-alone dump ends prematurely and does not give the stand-alone dump output (SYSUT1) an end-of-file, the SYSUT2 data set does contain an end-of file. (SYSUT2 is the data set to which stand-alone dump output is copied.) This occurs even when SYSUT2 is another tape. IEBGENER might end with an I/O error on SYSUT1; this is normal if SYSUT1 does not contain an end-of-file.
- Making SYSUT2 a direct access data set to use as input to IPCS saves IPCS processing time.

Use the JCL shown in Figure 52 on page 106 to invoke the IEBGENER utility, which will copy the stand-alone dump output from tape to a DASD data set.

```
//SADCOPY JOB MSGLEVEL=(1,1)
//COPY EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT1 DD DSN=SADUMP.TAPE,UNIT=tape,
//       VOL=SER=SADOUT,LABEL=(,NL),DISP=SHR,
//       DCB=(RECFM=FBS,LRECL=4160,BLKSIZE=29120)
//SYSUT2 DD DSN=SADUMP.COPY,UNIT=dasd,
//       VOL=SER=SADCOPY,DISP=(NEW,CATLG),
//       DCB=(RECFM=FBS,LRECL=4160,DSORG=PS),AVGREC=K,
//       SPACE=(4160,(8,4),RLSE)
```

Figure 52. Example: Copying stand-alone dump output from tape to DASD

**Note:** Specifying AVGREC= requires SMS be running, but the data set does not have to be SMS managed.

Copying from DASD

The example below shows how to use IEBGENER to copy DASD output to a DASD data set. After the dump is successfully copied, use the AMDSADDD REXX utility to clear (reinitialize) the dump data set and ready it for another stand-alone dump. For more information, see:

- SADMP option on the IPCS Dialog in z/OS MVS IPCS User's Guide.
- “Using the AMDSADDD utility” on page 81
Use the JCL shown in Figure 53 on page 107 to invoke IEBGENER, which will copy the stand-alone dump output from a DASD data set to another DASD data set.

```
//SADCOPY  JOB  MSGLEVEL=(1,1)
//COPY     EXEC PGM=IEBGENER
//SYSPRINT DD   SYSOUT=A
//SYSIN    DD   DUMMY
//SYSUT1   DD   DSN=SYS1.SADMP,UNIT=DASD,
//         VOL=SER=SADMP1,DISP=SHR,
//         DCB=(LRECL=4160,RECFM=FBS,DSORG=PS),
//         SPACE=(CYL,(90,0),RLSE)
//SYSUT2   DD   DSN=SYS2.SADMP,UNIT=DASD,
//         VOL=SER=SADMP2,
//         DCB=(LRECL=4160,RECFM=FBS,DSORG=PS),
//         SPACE=(CYL,(90,0),RLSE)
```

Figure 53. Example: Copying stand-alone dump output from DASD to DASD

### Copying from multiple dump data sets

The stand-alone dump program allows a dump to be contained in multiple dump data sets. Therefore, when you want to view a stand-alone dump using IPCS, it is necessary to concatenate all of the dump data sets onto one DASD data set.

Use the JCL in Figure 54 on page 107 to invoke the IPCS COPYDUMP subcommand to copy stand-alone dump output from three DASD dump data sets to another data set. Note that two of the dump data sets reside on the volume SADMP1, while the third resides on the volume SADMP2.

```
//SADCOPY  JOB  MSGLEVEL=(1,1)
//COPY     EXEC PGM=IKJEFT01
//SYSTSIN DD  *
IPCS NOPARM DEFER
COPYDUMP OUTFILE(COPYTO) NOCONFIRM INFILE(C1, C2, C3)
END
/*
```

Figure 54. Example: Copying a stand-alone dump from multiple DASD data sets

Use the JCL shown in Figure 55 on page 107 to invoke the IPCS COPYDUMP subcommand to copy stand-alone dump output from two DASD dump data sets and two tape volumes to a DASD data set.

```
//SADCOPY  JOB  MSGLEVEL=(1,1)
//COPY     EXEC PGM=IKJEFT01
//SYSTSIN DD  *
IPCS NOPARM COPYDUMP OUTFILE(COPYTO) NOCONFIRM INFIL((C1,C2,C3,C4)
END
/*
```

Figure 55. Example: Copying stand-alone dump output from DASD and tape
Viewing stand-alone dump output
You can view the stand-alone dump output at a terminal using IPCS. Do the following:
1. Start an IPCS session.
2. On the IPCS Primary Option Menu panel, select the SUBMIT option to copy the dump and do initial dump analysis.
3. Return to the IPCS Primary Option Menu panel. Select the DEFAULTS option.
4. IPCS displays the IPCS Default Values panel. Enter the name of the data set containing the dump on the Source line.
5. Return to the IPCS Primary Option Menu panel. Select the BROWSE, ANALYZE, or COMMAND option to view the dump.
See z/OS MVS IPCS Commands for information about the IPCS subcommands.

Printing stand-alone dump output
You can print an analysis of the stand-alone dump or the entire dump using IPCS.
To print an analysis of the dump in batch mode:
1. Start an IPCS session.
2. On the IPCS Primary Option Menu panel, select the SUBMIT option to copy the dump and do initial dump analysis.
3. On the IPCS Dump Batch Job Option Menu panel, enter the requested information.
4. On the next panel, enter the sysout output class. IPCS writes the dump analysis to the specified output class.
5. The system prints the dump in the printout of the output class.
To print the full dump in batch mode:
1. Use IPCS CLIST BLSCBSAP.
See z/OS MVS IPCS User's Guide for IPCS panels and the CLIST BLSCBSAP.
The example in Figure 56 on page 108 runs an IPCS CLIST that:
• Copies the stand-alone dump from the tape data set defined in an IEFROER DD statement to a cataloged, direct access data set named SA1DASD.
• Analyzes and formats the dump.
• Writes the formatted dump output to a data set named IPCSPRNT. A TSO/E CLIST used for IPCS should allocate this print output data set to a sysout print class, as follows:

ALLOCATE DDNAME(IPCSPRNT) SYSOUT(A)

After the CLIST runs, the dump remains available in the SA1DASD data set for supplementary formatting jobs.

Figure 56. Example: Printing an unformatted stand-alone dump
Message output

There are three types of message output from a stand-alone dump program, as follows:

- MNOTES from the AMDSADMP macro
- Messages on the 3480, 3490, or 3590 display
- Messages on the system console or the operator console

For more information about messages on the system console or the operator console, see *MVS System Messages*.

Stand-alone dump messages on the 3480, 3490, or 3590 display

When stand-alone dump output is sent to a 3480, 3490, or 3590 magnetic tape subsystem, stand-alone dump uses the subsystem's eight-character message display to inform and prompt the operator. The leftmost position on the message display indicates a requested operator action. The eighth position (rightmost) gives additional information.

In the messages listed below, alternating indicates that there are two messages which are flashing on the display, one after the other. A blinking message is one message that is repeated on the display.

The stand-alone dump messages that can appear on the display are:

**Dvolser (alternating)**

- **MSADMP#U**
  - Informs the operator that a labeled tape has been rejected and a new tape must be mounted.
- **MSADMP#U (blinking)**
  - Requests that the operator mount a new tape.
- **RSADMP#U (blinking)**
  - Indicates that the stand-alone dump program has finished writing to the tape.

**RSADMP# (alternating)**

- **MSADMP#U**
  - Informs the operator that an end-of-reel condition has occurred and a new tape must be mounted.
- **SADMP# (blinking)**
  - Indicates that the tape is in use by stand-alone dump.
- **SADMP# (alternating)**

**NTRDY**

- Informs the operator that some type of intervention is required.

The symbols used in the messages are:

- **#**
  - A variable indicating the actual number of cartridges mounted for stand-alone dump. It is a decimal digit starting at 1 and increasing by 1 after each end-of-cartridge condition. When the # value exceeds 9, it is reset to 0.

- **D**
  - Demount the tape and retain it for further system use, for example as a scratch tape. Stand-alone dump does not write on the tape.

- **M**
  - Mount a new tape.

- **R**
  - Demount the tape and retain it for future stand-alone dump use.
The new tape should not be file-protected.

volser
A variable indicating the volume serial number on the existing tape label.

Analyzing stand-alone dump output

The following sections describe how to analyze the output from a stand-alone dump. A stand-alone dump can indicate the following types of problems:

- Enabled wait state
- Disabled wait state
- Enabled loop
- Disabled loop

Use the information in this section to determine the type of problem the system has encountered. After the problem type is determined, see *z/OS Problem Management* for further information about diagnosing the problem type.

Collecting initial data

When an operator takes a stand-alone dump, it is important to determine the conditions of the system at the time the dump was taken. Because a stand-alone dump can be requested for a various number of problem types, the collection of problem data is imperative to determining the cause of the error.

The objectives for analyzing the output of a stand-alone dump are as follows:

- Gather symptom data
- Determine the state of the system
- Analyze the preceding system activity
- Find the failing module and component

Gathering external symptoms

When a stand-alone dump is taken, you must first question the operator or the person who requested the dump. It is important to understand the external symptoms leading up to the system problem. What was noticed before stopping the system? The answer might give you an idea of where the problem lies.

Here are a few questions you should find an answer to before continuing:

- Was the system put into a wait state?
- Were the consoles hung or locked up?
- Were commands being accepted on the operator console without a reply?
- Was a critical job or address space hung?

Gathering IPCS symptoms

After getting a list of symptoms, use IPCS to collect further symptom data. A primary symptom string is usually not available in a stand-alone dump; however, IPCS can add a secondary symptom string. In Figure 57 on page 111, the explanation of the secondary symptom string indicates an enabled wait state condition.
ASR10001I The dump does not contain a primary symptom string.

Secondary Symptom String:
WS/E000 FLDS/ASMIORQR VALU/CPAGBACKUP FLDS/IOSCOD VALU/CLCLC0D45
FLDS/IOSTSA VALU/CLCLDEV02

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Symptom data</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS/E000</td>
<td>000</td>
<td>Enabled wait state code</td>
</tr>
<tr>
<td>FLDS/ASMIORQR</td>
<td>ASMIORQR</td>
<td>Data field name</td>
</tr>
<tr>
<td>VALU/CPAGBACKUP</td>
<td>PAGBACKUP</td>
<td>Error related character value</td>
</tr>
</tbody>
</table>

Figure 57. Example: VERBEXIT SYMPTOMS output

Determining the system state

There are several control blocks that you can view that describe the state of the system when the stand-alone dump was requested.

**CSD**
Describes the number of active central processors and whether the alternate CPU recovery (ACR) is active.

**PSA**
Describes the current environment of a central processor, its work unit, FRR stack, an indication of any locks held.

**LCCA**
Contains save areas and flags of interrupt handlers.

**CVT**
Contains pointers to other system control blocks.

Use the IPCS subcommand STATUS WORKSHEET to obtain the data that will help you determine the state of the system. For example, in Figure 58 on page 112 look for the following:

- The CPU bit mask, which indicates how many processors are online.
- The PSW at the time of the dump
- The PSATOLD. If the fields are zero, this indicates that an SRB is running and the address in SMPSW indicates the save area of the dispatcher. If the fields are nonzero, the address in PSWSV indicates the save area of the dispatcher.
- The PSAAOLD, which indicates what address space jobs are running in.
Figure 58. Example: STATUS WORKSHEET output

You can also obtain the stored status of each central processor using the IPCS subcommand STATUS CPU REGISTERS. Watch for these bits in the first half of the PSW:

- Bits 6 and 7 indicate a disabled (04xxxxxx) or enabled (07xxxxxx) condition
- Bit 14 could indicate a wait (000A0000)
- Bits 16 and 17 indicate primary, secondary, access register (AR) or Home mode

Starting in V2R1, the worksheet displays 4-digit CPUIDs. There can be up to eight CPUs on one line, if allowed. For example:
In Figure 59 on page 113, the PSW indicates an enabled wait state condition. The program is running in primary mode with 24-bit addressing (bits 16 and 17 are 00 and the second word begins with 0).

```
CPU(X'0000') STATUS:
PSW=070E0000 00000000 NO WORK WAIT
ASCB1 at FD3280, JOB(*MASTER*), for the home ASID
ASXB1 at FD34F8 for the home ASID. No block is dispatched
CLTE: 01CB00EB
+0000 BLSd..... 00000000 XDS..... 00000000 XRES..... 00000000
+000C XQ........ 00FD4900 ESET..... 00FD4908 ULUT..... 00FD4910
CURRENT FRR STACK IS: SVC
PREVIOUS FRR STACK(S): NORMAL
GPR VALUES
 0-3  00000000  00000000  00000000  00000000
 4-7  00000000  00000000  00000000  00000000
 8-11 00000000  00000000  00000000  00000000
12-15 00000000  00000000  00000000  00000000
ACCESS REGISTER VALUES
 0-3  006FB01F  00000000  00000000  00000000
 4-7  00000000  00000000  00000000  00000000
 8-11 00000000  00000000  00000000  00000000
12-15 00000000  00000000  806FA03C  00000000
```

Figure 59. Example: STATUS CPU REGISTERS output

To obtain other fields from important control blocks, use the IPCS subcommand CBFORMAT. See z/OS MVS IPCS Commands for information about the CBFORMAT subcommand.

You can also use the WHERE subcommand to identify particular areas in the dump. For example, if a general purpose register contains an address, use the WHERE subcommand to determine in what module that address resides. In Figure 60 on page 113, the WHERE subcommand indicates that the address is part of the READONLY nucleus.

```
NOCPU ASID(X'0001') 0124EE9C. IEANUC01.IGVSLIS1+0ADC IN READ ONLY NUCLEUS
```

Figure 60. Example: WHERE subcommand output

Analyzing an enabled wait

An enabled wait is also known as a dummy wait or a no work wait. An indication of an enabled wait is a PSW of 070E0000 00000000 or 07060000 00000000 00000000 00000000 and GPRs containing all zeroes. An enabled wait occurred when the dispatcher did not find any work to be dispatched. An enabled wait can occur because of resource contention or system non-dispatchability, among other errors.

Reviewing outstanding I/O requests

When analyzing a stand-alone dump for an enabled wait condition, check the status of the input/output requests. A display of the IOS control block and any active UCBs can help determine what was happening when the system entered the wait state.

In Figure 61 on page 114, the HOTIO field indicates that a solicited interrupt has completed with other than DCC-3 because the last time HOT-I/O detection was called. Note also that the IOQF and IOQL fields are identical, indicating that the first and last request for this device is the same.
Analyzing for resource contention

You can obtain information related to resource contention by using the IPCS subcommand ANALYZE. This subcommand displays contention information for I/O, ENQs, suspend locks, allocatable devices and real storage. For example, in Figure 62 on page 114, 61 units of work are waiting to be processed. The top RB is in a wait state.

Obtaining real storage data

Use the IPCS RSMDATA subcommand to obtain information about storage usage and any unusual condition that have occurred prior to requesting the stand-alone dump. In the RSMDATA output, if the percent usage field is 100%, there are no frames left. Also, the percent of available total fixed frames should not be a high number. If it is, there can be a program using too many resources to complete. For example, in Figure 63 on page 114, the percent of available total fixed frames is at 25%.

You can also check the ASM control blocks to determine the statistics applicable to I/O requests. The I/O requests received and completed should be the same. In Figure 64 on page 115, note that the 509577 I/O requests received have all been completed.
**Determining dispatchability**

By performing an address space analysis on the major system address space, you can determine if there is any work waiting and if the address space is dispatchable. The major address space you should analyze are:

- Master scheduler, ASID 1
- CONSOLE
- JES2/JES3
- IMS/CICS/VTAM

When you are analyzing an address space for dispatchability, keep in mind these questions:

- Are there any suspended SRBs on the queue?
  
  You will need to run the WEBs on ASCBSAWQ and look for WEBs that have a WEBFLAG1 field of X'0000000' to check if there are any SRBs ready to be dispatched.

- Are there any ready TCBs indicated by ASCBTCBS and ASCBTCBL?
  
  ASCBTCBS and ASCBTCBL contain a count of the number of TCBs containing ready work to be dispatched. To find the TCBs for ASCBTCBL, look at the WEBs on the ASCBLTCS and ASCBLTCB queues that belong to the home space.

- If there is ready work, is the ASCB dispatchable (ASCBDSP1)?
  
  ASCBDSP1 is a non-dispatchability flag. For more information about what the values of ASCBDSP1 indicate, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

- If there is no ready work, are the TCBs in a normal wait (TCBFLGS4, TCBFLGS5, TCBDISP)?
  
  A non-zero value in any of these fields indicates that the TCB is non-dispatchable.

In Figure 65 on page 116, ASCBDSP1 is X'04', indicating that this address space is not eligible for CML lock requests. The ASCBSAWQ, ASCBLTCN, and ASCBTCBS fields all contain zeroes, indicating that there is no ready work available.
Figure 65. Example: SUMMARY FORMAT output (determining ready work)

For the mapping structure of WEBs under the IHAWEB, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

If your address space analysis indicated that ready work was available to be dispatched, look at ASCBDSP1 to determine if the address space is dispatchable. If your address space analysis indicated that there was no ready work available to be dispatched, look at the TCBs to determine if they are in a normal wait. In Figure 66 on page 117, for example, the TCB fields indicate that the top RB is in a wait.
Analyzing a disabled wait

A disabled wait condition can be analyzed by checking the PSW at the time of the error. If bits 6 and 7 are zero and bit 14 contains a 1, there is a disabled wait. The wait state code is in byte 7, with the reason code in byte 5.

The following examples show how to determine the wait state code:

- In the following PSW, the wait state code is X'014' and the reason code is zero.

PSW=000E0000 00000014

- In another example, the wait state code is X'064' and the reason code is X'09'.

PSW=000A0000 00090064

- In z/Architecture® mode, the PSW would look like:

PSW=00020000 00000000 00000000 00090064

After you determine the wait state code from the PSW, look at the documentation for the specific wait state code for any action you can take. See z/OS MVS System Codes for the specific wait state code you encountered.

If you cannot find the wait state code documented, do one of the following:

- Analyze the dump to determine if it is a stand-alone dump wait state.
- Check PSASMPSW and PSAPSWSV to determine if the dispatcher loaded the wait state PSW because of an overlay. See Chapter 7, “The dump grab bag,” on page 149 for more information about storage overlays.
- Use the stored status registers to determine who loaded the wait state into the PSW.

Analyzing an enabled loop

To determine if the stand-alone dump was requested because of an enabled loop, you need to view the system trace table. Repetitive patterns in the system trace table indicate an enabled loop condition. An enabled loop, however, does not normally cause a system outage. It will cause an outage in these circumstances:
• There is a non-preemptable loop in SRB mode
• There is a loop in a high priority address space that is in TCB mode

In Figure 67 on page 118, the CLKC entries indicate an enabled loop, and because column three is all zeroes, this loop is in SRB mode. The PSW addresses on the CLKCs identify the looping program. Use the WHERE subcommand to locate the responsible program.

```
01 003E 00000000   CLKC      070C0000 8100765C  00001004 00000000
01 003E 00000000   CLKC      070C2000 81005638  00001004 00000000
01 003E 00000000   CLKC      070C0000 810056E6  00001004 00000000
01 003E 00000000   CLKC      070C0000 80FF0768  00001004 00000000
01 003E 00000000   CLKC      070C0000 80FE4E34  00001004 00000000
01 003E 00000000   CLKC      070C1000 81004BB8  00001004 00000000
```

Figure 67. Example: SYSTRACE output (recognizing an enabled loop)

Because of interrupt processing that occurs during an enabled loop, the stored status data might not point to the module causing the loop. To determine if a first level interrupt handler (FLIH) was active, view the PSASUPER field of the PSA. If the PSASUPER field is non-zero, a FLIH was active at the time of the error. Using the FLIH’s save area, find the PSW and registers at the time of the error. The address in the second half of the PSW will point to the module involved in the loop. See “Problem data saved by first level interrupt handlers” on page 119 for more information.

**Analyzing a disabled loop**

A disabled loop is not visible in the system trace output because disabled routines do not take interrupts. Normally, a disabled loop results in a spin loop in a multiprocessor environment. When analyzing a stand-alone dump for a disabled loop, use the stored status data to determine the module involved in the loop. Also, examine the in-storage logrec buffer for entries that recovery routines have made but which were not written to the logrec data set because of a system problem. Very often it is these records that are the key to the problem solution. See “Obtaining information from the logrec recording control buffer” on page 528 for more information.

**SLIP problem data in the SLIP work area**

In a stand-alone dump taken after a SLIP ACTION=WAIT trap matches, problem data can be found in a work area pointed to by the PSAWTCOD field in the prefix save area (PSA). Table 18 on page 118 shows the format of this area.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>1</td>
<td>RTM/SLIP processing environment indicator:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• X’01’: RTM1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• X’02’: RTM2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• X’03’: MEMTERM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• X’04’: PER</td>
</tr>
<tr>
<td>1 (1)</td>
<td>2</td>
<td>Logical processor identifier (CPUID)</td>
</tr>
<tr>
<td>3 (3)</td>
<td>1</td>
<td>System mask, if offset 0 is 2 (RTM2)</td>
</tr>
<tr>
<td>4 (4)</td>
<td>4</td>
<td>Pointer to general purpose registers 0 through 15 at the time of the event</td>
</tr>
<tr>
<td>8 (8)</td>
<td>4</td>
<td>Pointer to the 16-byte program status word (PSW) at the time of the event</td>
</tr>
</tbody>
</table>
Table 18. Work area pointed to by the PSAWTCOD field (continued)

<table>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 (C)</td>
<td>4</td>
<td>One of the following, as indicated by the RTM/SLIP processing environment indicator at offset 0 of the work area:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pointer to the system diagnostic work area (SDWA), if offset 0 is 1 (RTM1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pointer to the recovery termination manager 2 (RTM2) work area (RTM2WA), if offset 0 is 2 (RTM2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pointer to the address space control block (ASCB) being ended, if offset 0 is 3 (MEMTERM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pointer to the PER code, if offset 0 is 4 (PER)</td>
</tr>
<tr>
<td>16 (10)</td>
<td>4</td>
<td>Pointer to cross memory information (control registers 3 and 4) at the time of the event</td>
</tr>
<tr>
<td>20 (14)</td>
<td>4</td>
<td>Pointer to access registers AR0 through AR15 at the time of the event. Pointer to the high 32 bits of the 64-bit GPRs, or 0 if not available. See Wait State 01B in the z/OS MVS System Codes for more information.</td>
</tr>
</tbody>
</table>

Problem data saved by first level interrupt handlers

If processing is stopped or an error occurs in one of the first level interrupt handlers (FLIH), you might need to determine the PSW and registers of the interrupted program. Field PSASUPER has bits to indicate if an FLIH was in control:

• PSAIO for the IO FLIH
• PSASVC for the SVC FLIH
• PSAEXT for the external FLIH
• PSAPI for the program interrupt FLIH

The following tables show where each FLIH saves the PSW and registers for interrupted tasks or SRB:

• Table 19 on page 119
• Table 20 on page 120
• Table 21 on page 121
• Table 22 on page 121

Table 19. Problem data saved by the SVC FLIH for task and SRB code.

<table>
<thead>
<tr>
<th>Code giving up control</th>
<th>Data saved</th>
<th>Field receiving data</th>
<th>Control block</th>
</tr>
</thead>
<tbody>
<tr>
<td>All SVCs, initially</td>
<td>General purpose registers 7-9</td>
<td>PSAGPREG</td>
<td>PSA</td>
</tr>
<tr>
<td></td>
<td>General purpose registers, if a problem occurred</td>
<td>LCCASGPR</td>
<td>LCCA</td>
</tr>
<tr>
<td>All SVCs</td>
<td>PSW</td>
<td>RBOPSW</td>
<td>Requestor’s RB</td>
</tr>
<tr>
<td></td>
<td>Cross memory status</td>
<td>XSBXMCRS</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>PCLINK stack header</td>
<td>XSBSTKE</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>EAX</td>
<td>XSBEAX</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>STCBARS</td>
<td>STCB</td>
</tr>
<tr>
<td></td>
<td>Current linkage stack entry pointer</td>
<td>STCBLSDP</td>
<td>STCB</td>
</tr>
<tr>
<td>Type 1 and 6 SVCs</td>
<td>General purpose registers 0-15</td>
<td>TCBGRS</td>
<td>TCB</td>
</tr>
<tr>
<td>Type 2, 3, and 4 SVCs</td>
<td>General purpose registers 0-15</td>
<td>RBGRSAVE</td>
<td>SVRB</td>
</tr>
</tbody>
</table>
Table 20. Problem data saved for a program check for task and SRB code.

<table>
<thead>
<tr>
<th>Code giving up control</th>
<th>Data saved</th>
<th>Field receiving data</th>
<th>Control block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initially for non-recursive program interruptions</td>
<td>General purpose registers 0-15</td>
<td>LCCAPGR2</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>LCCAPPSW</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>ILC/PINT</td>
<td>LCCAPINT</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>TEA</td>
<td>LCCAPVAD</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>TEA AR number</td>
<td>LCCAPTR2</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>LCCAPCR2</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>LCCAPAR2</td>
<td>LCCA</td>
</tr>
<tr>
<td>Initially for recursive program interruptions</td>
<td>General purpose registers 0-15</td>
<td>LCCAPGR1</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>LCCAPPS1</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>ILC/PINT</td>
<td>LCCAPIC1</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>TEA</td>
<td>LCCAPTE1</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>TEA AR number</td>
<td>LCCAPTR2</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>LCCAPCR1</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>LCCAPAR1</td>
<td>LCCA</td>
</tr>
<tr>
<td>Initially for monitor call interruptions that occur during page fault or segment fault processing</td>
<td>General purpose registers 0-15</td>
<td>LCCAPGR3</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>LCCAPPS3</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>ILC/PINT</td>
<td>LCCAPIC3</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>TEA</td>
<td>LCCAPTE3</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>TEA AR number</td>
<td>LCCAPTR3</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>LCCAPCR3</td>
<td>LCCA</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>LCCAPAR3</td>
<td>LCCA</td>
</tr>
<tr>
<td>Initially for all trace buffer full interruptions</td>
<td>General purpose registers 0-15</td>
<td>LCCAPGR4</td>
<td>LCCA</td>
</tr>
<tr>
<td>For unlocked tasks for page faults or segment faults that require I/O; problem data is moved from the LCCA</td>
<td>Registers</td>
<td>TCB and STCB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>RB</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>Other status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For locked tasks for page faults or segment faults that require I/O; problem data is moved from the LCCA</td>
<td>Registers</td>
<td>IHSA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>IHSA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other status</td>
<td>XSB for IHSA</td>
<td></td>
</tr>
<tr>
<td>For SRBs for page faults or segment faults that require I/O; SRB is suspended, no status is saved</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 21. Problem data saved by the I/O FLIH for task and SRB code.

<table>
<thead>
<tr>
<th>Code giving up control</th>
<th>Data saved</th>
<th>Field receiving data</th>
<th>Control block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initially</td>
<td>General purpose registers 0-15</td>
<td>SCFSIGR1</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>SCFSICR1</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>SCFSIAR1</td>
<td>SCFS</td>
</tr>
<tr>
<td>For unlocked tasks</td>
<td>General purpose registers 0-15</td>
<td>TCBGRS</td>
<td>TCB</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>RBOPSW</td>
<td>RB</td>
</tr>
<tr>
<td></td>
<td>Cross memory status</td>
<td>XSBXMCRS</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>EAX</td>
<td>XSBEAX</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>STCBARS</td>
<td>STCB</td>
</tr>
<tr>
<td></td>
<td>Current linkage stack entry pointer</td>
<td>STCBLSDP</td>
<td>STCB</td>
</tr>
<tr>
<td>For locally locked tasks</td>
<td>General purpose registers 0-15</td>
<td>IHSAGPRS</td>
<td>IHSA for locked address space</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>IHSACPSW</td>
<td>IHSA for locked address space</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>IHSAAARS</td>
<td>IHSA for locked address space</td>
</tr>
<tr>
<td></td>
<td>Current linkage stack entry pointer</td>
<td>IHSALSDP</td>
<td>IHSA for locked address space</td>
</tr>
<tr>
<td></td>
<td>Cross memory status</td>
<td>XSBXMCRS</td>
<td>XSB for locked address space</td>
</tr>
<tr>
<td></td>
<td>EAX</td>
<td>XSBEAX</td>
<td>XSB for locked address space</td>
</tr>
<tr>
<td>For SRBs and non-preemptive TCBs</td>
<td>General purpose registers 0-15</td>
<td>SCFSIGR1</td>
<td>SCF</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>FLCIOPSW</td>
<td>PSA</td>
</tr>
</tbody>
</table>

### Table 22. Problem data saved by the external FLIH for task and SRB code.

<table>
<thead>
<tr>
<th>Code giving up control</th>
<th>Data saved</th>
<th>Field receiving data</th>
<th>Control block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initially</td>
<td>General purpose registers 7-10</td>
<td>PSASLSA</td>
<td>PSA</td>
</tr>
<tr>
<td>For locally locked tasks</td>
<td>General purpose registers 0-15</td>
<td>IHSAGPRS</td>
<td>IHSA</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>IHSACPSW</td>
<td>IHSA</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>IHSAAARS</td>
<td>IHSA</td>
</tr>
<tr>
<td></td>
<td>Current linkage stack entry pointer</td>
<td>IHSALSDP</td>
<td>IHSA</td>
</tr>
<tr>
<td></td>
<td>Cross memory status</td>
<td>XSBXMCRS</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>EAX</td>
<td>XSBEAX</td>
<td>XSB</td>
</tr>
<tr>
<td>Code giving up control</td>
<td>Data saved</td>
<td>Field receiving data</td>
<td>Control block</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------</td>
<td>----------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Unlocked tasks</td>
<td>General purpose registers 0-15</td>
<td>TCBGRS</td>
<td>TCB</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>RBOPSW</td>
<td>RB</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>STCBARS</td>
<td>STCB</td>
</tr>
<tr>
<td></td>
<td>Current linkage stack entry pointer</td>
<td>STCBLSDP</td>
<td>STCB</td>
</tr>
<tr>
<td></td>
<td>Cross memory status</td>
<td>XSBXMCRS</td>
<td>XSB</td>
</tr>
<tr>
<td></td>
<td>EAX</td>
<td>XSBEAX</td>
<td>XSB</td>
</tr>
<tr>
<td>For SRBs and non-preemptive TCBs</td>
<td>General purpose registers 0-15</td>
<td>SCFSXGR1</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>SCFSXPS1</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>SCFSXCR1</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>SCFSXAR1</td>
<td>SCFS</td>
</tr>
<tr>
<td>If first recursion</td>
<td>General purpose registers 0-15</td>
<td>SCFSXGR1</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>SCFSXPS2</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>SCFSXCR2</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>SCFSXAR2</td>
<td>SCFS</td>
</tr>
<tr>
<td>If second recursion</td>
<td>General purpose registers 0-15</td>
<td>SCFSXGR3</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>PSW</td>
<td>FLCEOPSW</td>
<td>PSA</td>
</tr>
<tr>
<td></td>
<td>Control registers 0-15</td>
<td>SCFSXCR3</td>
<td>SCFS</td>
</tr>
<tr>
<td></td>
<td>Access registers 0-15</td>
<td>SCFSXAR3</td>
<td>SCFS</td>
</tr>
</tbody>
</table>
Chapter 5. ABEND dump

An ABEND dump shows the virtual storage predominately for an unauthorized program. Typically, a dump is requested when the program cannot continue processing and abnormally ends. An operator can also request an ABEND dump while ending a program or an address space.

The system can produce three types of ABEND dumps, one unformatted dump (SYSMDUMP) and two formatted dumps (SYSABEND and SYSUDUMP). These dumps are produced when a program cannot continue processing and a DD statement for an ABEND dump was included in the JCL for the job step that has ended. The data included is dependent on:

- Parameters supplied in the IEAABD00, IEADMR00, and IEADMP00 parmlib members for SYSABENDs, SYSMDUMPS, and SYSUDUMPS, respectively.
- A determination by the system
- ABEND, CALLRTM, or SETRP macro dump options
- IEAVTABX, IEAVADFM, or IEAVADUS installation exit processing

IBM recommends the use of SYSMDUMP, the unformatted dump. Unformatted dumping is more efficient because only the storage requested is written to the data set, which allows the application to capture diagnostic data and be brought back online faster. Also, pre-formatted dumps force the system to select a single set of reports, too many for the diagnosis of many problems, and too few for others. Unformatted dumps allow the analyst to determine, from a wide variety of reports, what information to use and how it is presented.

Use SYSUDUMP for diagnosis of program problems that need simple problem data. A SYSABEND dump, through the IBM supplied defaults, supplies more of the system information related to the application program's processing than a SYSUDUMP. The additional information may be better suited for complex problem diagnosis.

**Note:** The last of dump DDs SYSABEND,SYSUDUMP or SYSMDUMP will be used.

This section covers the following topics, which describe how to use ABEND dumps:

- “Synopsis of ABEND dumps” on page 123
- “Obtaining ABEND dumps” on page 125
- “Printing and viewing dumps” on page 128
- “Contents of ABEND dumps” on page 129
- “Customizing ABEND dump contents” on page 134
- “Analyzing an ABEND dump” on page 139

### Synopsis of ABEND dumps

Use Table 23 on page 124 as a quick reference for the three types of ABEND dumps. If you need further information about ABEND dumps, refer to the sections following this table.
### Table 23. Types of ABEND dumps

<table>
<thead>
<tr>
<th>Obtaining the dump</th>
<th>Receiving the dump</th>
<th>Dump contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYSABEND:</strong></td>
<td>Formatted dump in a data set with the ddname of SYSABEND:</td>
<td>Default contents: summary dump for the failing task and other task data. See “Contents of ABEND dumps” on page 129.</td>
</tr>
<tr>
<td>Assembler macro in any program:</td>
<td>- In SYSOUT; print in the output class or browse at a terminal</td>
<td>Customized by all of the following:</td>
</tr>
<tr>
<td>• ABEND with DUMP</td>
<td>- On tape or direct access: print in a separate job or browse at a terminal</td>
<td>• IEAADB00 parmlib member</td>
</tr>
<tr>
<td>• SETRP with DUMP=YES</td>
<td>- On a printer (Not recommended; the printer cannot be used for anything else for the duration of the job step.)</td>
<td>• Parameter list on the requesting ABEND, CALLRTM, or SETRP macro</td>
</tr>
<tr>
<td>Assembler macro in an authorized program:</td>
<td>For full information, see “Obtaining ABEND dumps” on page 125.</td>
<td>• Recovery routines invoked by the recovery termination manager (RTM)</td>
</tr>
<tr>
<td>• ABEND with DUMP</td>
<td></td>
<td>• Cumulative from all CHNGDUMP operator commands with SYSABEND</td>
</tr>
<tr>
<td>• CALLRTM with DUMP=YES</td>
<td></td>
<td>• Installation-written routines at the IEAVTABX, IEAVADFM, and IEAVADUS exits</td>
</tr>
<tr>
<td>• SETRP with DUMP=YES</td>
<td>For full information about customization, see “Customizing ABEND dump contents” on page 134.</td>
<td></td>
</tr>
<tr>
<td>Operator command on a console with master authority:</td>
<td></td>
<td>For full information about customization, see “Customizing ABEND dump contents” on page 134.</td>
</tr>
<tr>
<td>• CANCEL with DUMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For full information, see “Obtaining ABEND dumps” on page 125.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **SYSMDUMP:**     | Unformatted dump in a data set with the ddname of SYSMDUMP: | Default contents: summary dump and system data for the failing task. See “Contents of ABEND dumps” on page 129. |
| Assembler macro in any program: | - On tape or direct access; use IPCS to format and print/view the dump | Customized by all of the following: |
| • ABEND with DUMP | For full information, see “Obtaining ABEND dumps” on page 125. | • IEADM000 parmlib member |
| • SETRP with DUMP=YES | | • Parameter list on the requesting ABEND, CALLRTM, or SETRP macro |
| Assembler macro in an authorized program: | | • Recovery routines invoked by the recovery termination manager (RTM) |
| • ABEND with DUMP | | • Cumulative from all CHNGDUMP operator commands with SYSMDUMP |
| • CALLRTM with DUMP=YES | | • Installation-written routines at the IEAVTABX exit |
| • SETRP with DUMP=YES | For full information about customization, see “Customizing ABEND dump contents” on page 134. |
| Operator command on a console with master authority: | | For full information about customization, see “Customizing ABEND dump contents” on page 134. |
| • CANCEL with DUMP | | |
| For full information, see “Obtaining ABEND dumps” on page 125. | | |
### Table 23. Types of ABEND dumps (continued)

<table>
<thead>
<tr>
<th>Obtaining the dump</th>
<th>Receiving the dump</th>
<th>Dump contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SYSUDUMP:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembler macro in any program:</td>
<td>Formatted dump in a data set with the ddname of SYSUDUMP:</td>
<td>Default contents: summary dump for the failing task. See “Contents of ABEND dumps” on page 129.</td>
</tr>
<tr>
<td>• ABEND with DUMP</td>
<td>• In SYSOUT; print in the output class or browse at a terminal</td>
<td>Customized by all of the following:</td>
</tr>
<tr>
<td>• SETRP with DUMP=YES</td>
<td>• On tape or direct access; print in a separate job or browse at a terminal</td>
<td>• IEADMP00 parmlib member</td>
</tr>
<tr>
<td>Assembler macro in an authorized program:</td>
<td>• On a printer (Not recommended; the printer cannot be used for anything else for the duration of the job step.)</td>
<td>• Parameter list on the requesting ABEND, CALLRTM, or SETRP macro</td>
</tr>
<tr>
<td>• ABEND with DUMP</td>
<td>For full information, see “Obtaining ABEND dumps” on page 125.</td>
<td>• Recovery routines invoked by the recovery termination manager (RTM)</td>
</tr>
<tr>
<td>• CALLRTM with DUMP=YES</td>
<td></td>
<td>• Cumulative from all CHNGDUMP operator commands with SYSUDUMP</td>
</tr>
<tr>
<td>• SETRP with DUMP=YES</td>
<td></td>
<td>• Installation-written routines at the IEAVTABX, IEAVADFM, and IEAVADUS exits</td>
</tr>
<tr>
<td>Operator command on a console with master authority:</td>
<td></td>
<td>For full information about customization, see “Customizing ABEND dump contents” on page 134.</td>
</tr>
<tr>
<td>• CANCEL with DUMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For full information, see “Obtaining ABEND dumps” on page 125.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Obtaining ABEND dumps

You can obtain SYSABEND, SYSUDUMP, and SYSMDUMP dumps using one process. To obtain a specific type of ABEND dump, specify the correct DD statement in your JCL as shown in Table 24 on page 125; for more information about these statements, see z/OS MVS JCL Reference:

<table>
<thead>
<tr>
<th>Dump Type</th>
<th>DD statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSABEND</td>
<td>//SYSABEND DD . . .</td>
</tr>
<tr>
<td>SYSUDUMP</td>
<td>//SYSUDUMP DD . . .</td>
</tr>
<tr>
<td>SYSMDUMP</td>
<td>//SYSMDUMP DD . . .</td>
</tr>
</tbody>
</table>

Provide a data set to receive the dump, then arrange to view the dump. If a data set is not provided, the system ignores a request for an ABEND dump. When setting up the data set, determine if it will contain privileged data. If so, protect it with passwords or other security measures to limit access to it.

Because ABEND dumps provide information to debug application programs, the data they have access to is limited. Authorized programs require special processing to allow the information they can access into a dump. ABEND dump processing issues an IEA848I message when violations occur. The primary facility for dumping authorized data is through the SDUMPX macro, however, two security FACILITY classes are provided that allow installations to permit ABEND dumps to contain authorized data:

**IEAABD.DMPAUTH**
- For access to programs that are protected by the PROGRAM facility, or UNIX set-user-ID and/or set-group-ID programs that gain privilege.

**IEAABD.DMPAKEY**
- For programs that execute in authorized keys.

See z/OS Security Server RACF Security Administrator’s Guide for additional details. For details on the SDUMPX macro, see

- z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDU
- z/OS MVS Programming: Authorized Assembler Services Guide.
Data set for dump

Define the data set in either:

- The JCL for the job step, for batch processing
- The logon procedure for a TSO/E userid, for foreground processing

Define the data set in a DD statement with a ddname of SYSABEND, SYSMDUMP, or SYSUDUMP. The ddname for the data set determines how the dump can be printed or viewed, what the dump contains, and how the dump contents can be customized. The first two effects are discussed in the following topics.

The system writes the dump in a sequential data set using the basic sequential access method (BSAM). The dump data set can be on any device supported by BSAM. Note that the system provides a data control block (DCB) for the dump data set and opens and closes the DCB.

You can also use extended format sequential data sets as dump data sets for ABEND dumps. Extended format sequential data sets have the following features:

- Have a greater capacity than sequential data sets
- Support striping
- Support compression

Using DSNTYPE=LARGE: In z/OS V1R7 and later releases, sequential data sets that use DSNTYPE=LARGE are allowable for ABEND dumps when the systems that are involved in processing a DSNTYPE=LARGE data set are migrated to V1R7 prior to their use. If analysis using an earlier release is required, use z/OS V1R7 to transcribe the dump into a data set supported by the earlier release.

Placing dump data sets in cylinder-managed space: In z/OS V1R11 and later releases, extended format sequential data sets can be placed in either track-managed space or cylinder-managed space. Abend dump fully supports placement of dump data sets in cylinder-managed space.

VIO for ADDRSPC=REAL: A SYSMDUMP DD statement must specify a virtual input/output (VIO) data set if the job or step to be dumped is running in nonpageable virtual storage, that is, the JCL JOB or EXEC statement specifies ADDRSPC=REAL.

Preallocate data sets for SYSMDUMP dumps

You may use any dataset name you wish for the SYSMDUMP dataset. However, the dataset name SYS1.SYSMDPxx will be treated specially. If you use the data set naming convention of SYS1.SYSMDPxx for a DISP=SHR data set, the system writes only the first dump, with all subsequent dump requests receiving system message IEA849I. The data set can be either a magnetic tape unit or a direct access storage device (DASD) data set.

When using this naming convention, you must manage the dump data set to use the same data set repeatedly for SYSMDUMP dumps. For subsequent dumps, you must initialize the SYS1.SYSMDPxx data set with an end-of-file (EOF) mark as the first record.

Naming Convention: You must use SYS1.SYSMDPxx, where xx is 00 through FF and identifies the exact data set to be used.

Data Set Disposition: If you specify DISP=SHR with the SYS1.SYSMDPxx naming convention, the facility that enables the system to write only the first dump becomes active.

If you specify DISP=SHR without the SYS1.SYSMDPxx naming convention, the system writes a new dump over the old dump when the same data set is the target for multiple dumps. This also happens for multiple dumps within the same job if each step does not specify FREE=CLOSE on the SYSMDUMP DD statement.

For dispositions other than DISP=SHR, the system uses the data set as if it were any other MVS data set. If you specify DISP=MOD, the system writes the dump following the previous dump, so that the data set contains more than one dump. If you specify DISP=OLD, the system writes a new dump over the old dump when the same data set is the target for multiple dumps.

Data Set Management: To minimize the loss of subsequent dumps, your installation exit should follow these steps for the management of SYS1.SYSMDPxx data sets:
1. Intercept system message IEA993I. The system issues this message when it writes the dump to the SYS1.SYSMDPxx data set.
2. Copy the dump onto another data set.
3. Clear the SYS1.SYSMDPxx data set by writing an EOF mark as the first record, making it available for the next SYSMDUMP dump to be written on the data set.

The installation exit routine can be one of the following:
   • IEAVMXIT
   • The exit routine specified on the USEREXIT parameter in the MPFLSTxx parmlib member

See z/OS MVS System Messages, Vol 6 (GOS-IEA) for a description of system messages IEA849I and IEA993I. See z/OS MVS Installation Exits for information about the installation exit routine.

Process for obtaining ABEND dumps

Obtain an ABEND dump by taking the following steps for each job step where you want to code a dump:
1. Code a DD statement in the JCL for every job step where a dump would be needed. The statement can specify one of the following:
   • Direct access
   • SYSOUT
   • Tape
   • Printer (Not recommended; printer cannot be used for anything else for duration of job step.)

The presence of the DCB attributes enables the system-determined block size process to select an efficient block size for the DASD selected. For more information, see z/OS DFSMS Using Data Sets. Your installation can make specification of these attributes unnecessary through local SMS class selection routines.

For example, the following SYSOUT SYSABEND DD statement places the dump in sysout output class A. In the example, output class A is a print class. The system prints a dump written to this class when printing the class.

```
//SYSABEND DD SYSOUT=A
```

The following example places a SYSUDUMP dump on a scratch tape. In the example, TAPE is an installation group name. DEFER specifies that the operator is to mount the tape only when the data set is opened; thus, the operator will not mount the tape unless it is needed for a dump. The system deletes the data set if the job step ends normally; in this case, the data set is not needed because no dump was written. The system keeps the data set if the step ends abnormally; the data set contains a dump. A future job step or job can print the dump.

```
//SYSUDUMP DD DSN=DUMPDS,UNIT=(TAPE,,DEFER),DISP=(,DELETE,KEEP)
```

2. Place the DD statement in the JCL for the job step that runs the program to be dumped or in the logon procedure for a TSO/E user ID.

The following example shows a SYSABEND DD statement in the logon procedure for a TSO/E user ID. A dump statement must appear in the logon procedure in order to process a dump in the foreground. The system keeps the data set if the job step ends abnormally.

```
//SYSABEND DD DSN=MYID3.DUMPS,DISP=(OLD,,KEEP)
```

3. If you need to diagnose a program that does not contain code for an ABEND dump, code one of the following:
   • ABEND assembler macro with a DUMP parameter in a problem program or an authorized program...
The following example shows an ABEND macro that ends a program with a user completion code of 1024 and requests a dump:

```
ABEND 1024, DUMP
```

- **SETRP assembler macro with a DUMP=YES parameter in the recovery routine for a problem program or an authorized program**

The following example shows a SETRP macro in an ESTAE recovery routine for a problem program. The address of the system diagnostic work area (SDWA) is in register 1, which is the default location.

```
SETRP DUMP=YES
```

- **CALLRTM assembler macro with a DUMP=YES parameter in an authorized program**

The following example shows a macro in an authorized program. The CALLRTM macro ends a program and requests a dump. Register 5 contains the address of the task control block (TCB) for the program.

```
CALLRTM TYPE=ABTERM, TCB=(5), DUMP=YES
```

4. If you need to diagnose a program that already contains code for an ABEND dump, and that program is already abending, skip step 5.

5. If you need to diagnose a program that already contains code for an ABEND dump, but the program is not currently abending, ask the operator to enter a CANCEL command with a DUMP parameter on the console with master authority.

For example, to cancel a job and request a dump, ask the operator to use either of the following:

```
CANCEL BADJOB, DUMP
CANCEL STARTING, A=1234, DUMP
```

To cancel a user ID and request a dump, ask the operator to use either of the following commands:

```
CANCEL U=MYID3, DUMP
CANCEL U=*LOGON*, A=5678, DUMP
```

6. The system writes a formatted dump to the data set defined in step 1.

### Printing and viewing dumps

You can print or view the different types of ABEND dumps as follows:

**SYSABEND and SYSUDUMP dumps:** These two dumps are formatted as they are created. They can be:

- In a SYSOUT data set. The system can print the dump when printing the output class. To view at a terminal, use a facility that allows the viewing of JES SPOOL data sets.
- On a tape or direct access data set. Print the dump in a separate job or job step or view the dump at a terminal by browsing the data set containing the dump.

A convenient way to print the dump is in a later job step that runs only if an earlier job step abnormally ends and, thus, requests a dump. For this, use the JCL EXEC statement COND parameter.

- Sent directly to a printer. Note this is not recommended; the printer cannot be used for anything else while the job step is running, whether a dump is written or not.

Figure 68 on page 129 shows JCL that uses the IEBPTPCH facility to print a formatted dump data set. In this example, a SYSABEND dump is printed. The same JCL can be used for a SYSUDUMP. Because the system formats the dump when creating it, the IEBPTPCH utility program can print the dump. The dump is in a data set named DUMPDS on tape.
SYSMDUMP dumps: This dump is unformatted when created. The system can write the dump to tape or direct access. Use IPCS to format the dump and then view it at a terminal or print it. SYSMDUMP dumps are especially useful for diagnosing errors because IPCS can produce specific information for specific requests. See z/OS MVS IPCS User’s Guide for more information.

Contents of ABEND dumps

You can specify the contents of an ABEND dump by specifying parameters on the ddname in the JCL for the program. This topic discusses the IBM-supplied default contents and contents available through customization.

All three ABEND dumps contain a summary dump, although the SYSMDUMP summary dump contains less information than the SYSABEND and SYSUDUMP summary dumps. The SYSUDUMP consists of only the summary dump. The SYSABEND dump also contains task data, while the SYSMDUMP also contains system data. The SYSMDUMP dump is a synchronous SVC dump and contains data similar to the data in an SVC dump.

Note:

1. ABEND dumps do not include hiperspaces. To include hiperspace in an ABEND dump, read the data from the hiperspace into address space storage that is being dumped.
2. If some needed areas are not included by default, see “Customizing ABEND dump contents” on page 134 for ways to add the areas.

Determining current ABEND dump options

Use a DISPLAY DUMP operator command to get the dump mode and options in effect for SVC dumps and ABEND SYSABEND, SYSMDUMP, and SYSUDUMP dumps. The system displays the mode and options in message IEE857I.

For example, to determine the mode and options, enter the following command:

```
DISPLAY DUMP,OPTIONS
```

If the options listed are not the ones desired, use a CHNGDUMP operator command to change them.

See z/OS MVS System Commands for the DISPLAY and CHNGDUMP operator commands. For a description of these messages, see MVS System Messages.

Default contents of ABEND dumps

The contents of the three ABEND dumps are detailed in the following two tables. Table 25 on page 130 shows dump contents alphabetically by the parameters that specify the areas in the dumps. To select a dump, decide what areas will be used to diagnose potential errors. Find the areas in the tables. The symbols in columns under the dump indicate how the area can be obtained in that dump. The symbols are:

D IBM-supplied default contents
**ABEND dumps**

M  Available on the macro that requests the dump

P  Available in the parmlib member that controls the dump options

X  Available on the CHNGDUMP operator command that changes the options for the dump type

---

**Table 25. Summary: dump contents by parameter**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dump Contents</th>
<th>ABEND Dump to SYSUDUMP</th>
<th>ABEND Dump to SYSABEND</th>
<th>ABEND Dump to SYSMDUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>All the dump options available in a SYSMDUMP dump, except the NOSYM and ALLNUC options</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>ALLNUC</td>
<td>The DAT-on and DAT-off nucleuses</td>
<td></td>
<td></td>
<td>P X</td>
</tr>
<tr>
<td>ALLPA</td>
<td>All link pack areas, as follows:</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Job pack area (JPA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Link pack area (LPA) active for the task being dumped</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Related Supervisor Call (SVC) modules</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALLPDATA</td>
<td>All the program data areas</td>
<td>P X</td>
<td>P X</td>
<td></td>
</tr>
<tr>
<td>ALLSDATA</td>
<td>All the system data areas</td>
<td>P X</td>
<td>P X</td>
<td>P</td>
</tr>
<tr>
<td>ALLVNUC</td>
<td>The entire virtual control program nucleus, including:</td>
<td>M P X</td>
<td>M P X</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Prefixed save area (PSA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• System queue area (SQA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local system queue area (LSQA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB</td>
<td>Control blocks for the task being dumped</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td>CSA</td>
<td>Common service area (CSA) (that is, subpools 227, 228, 231, 241)</td>
<td></td>
<td></td>
<td>P X</td>
</tr>
<tr>
<td>DM</td>
<td>Data management control blocks for the task being dumped:</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Data control block (DCB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Data extent block (DEB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Input/output block (IOB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENQ</td>
<td>Global resource serialization control blocks for the task being dumped:</td>
<td>P X</td>
<td>D P X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Global queue control blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local queue control blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 25. Summary: dump contents by parameter (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dump Contents</th>
<th>ABEND Dump to SYSUDUMP</th>
<th>ABEND Dump to SYSABEND</th>
<th>ABEND Dump to SYSMDUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR</td>
<td>Recovery termination manager (RTM) control blocks for the task being dumped:</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Extended error descriptor (EED) for RTM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Registers from the system diagnostic work area (SDWA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• RTM2 work area (RTM2WA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Set task asynchronous exit (STAE) control block (SCB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRSQ</td>
<td>Global resource serialization control blocks for the task being dumped:</td>
<td></td>
<td></td>
<td>P X</td>
</tr>
<tr>
<td></td>
<td>• Global queue control blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local queue control blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IO</td>
<td>Input/output supervisor (IOS) control blocks for the task being dumped:</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Execute channel program debug area (EXCPD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unit control block (UCB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JPA</td>
<td>Job pack area (JPA): module names and contents</td>
<td>M P X</td>
<td>M P X</td>
<td>M</td>
</tr>
<tr>
<td>LPA</td>
<td>Active link pack area (LPA): module names and contents</td>
<td>M P X</td>
<td>M P X</td>
<td>M P X</td>
</tr>
<tr>
<td>LSQA</td>
<td>Local system queue area (LSQA) allocated for the address space (that is,</td>
<td>M P X</td>
<td>D M P X</td>
<td>D M P X</td>
</tr>
<tr>
<td>NOSYM</td>
<td>No symptom dump (message IEA9951)</td>
<td>P X</td>
<td>P X</td>
<td>P X</td>
</tr>
<tr>
<td>NUC</td>
<td>Read/write portion of the control program nucleus (that is, only non-page-</td>
<td>M P X</td>
<td>M P X</td>
<td>D M P X</td>
</tr>
<tr>
<td></td>
<td>protected areas of the DAT-on nucleus), including:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Communication vector table (CVT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local system queue area (LSQA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Prefixed save area (PSA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• System queue area (SQA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCDATA</td>
<td>Program call information for the task</td>
<td>M P X</td>
<td>M P X</td>
<td>M</td>
</tr>
<tr>
<td>PSW</td>
<td>Program status word (PSW) when the dump was requested</td>
<td>M P X</td>
<td>D M P X</td>
<td>M P X</td>
</tr>
<tr>
<td>Q</td>
<td>Global resource serialization control blocks for the task being dumped:</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>• Global queue control blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local queue control blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Dump Contents</td>
<td>ABEND Dump to SYSUDUMP</td>
<td>ABEND Dump to SYSABEND</td>
<td>ABEND Dump to SYSMDUMP</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| REGS      | Registers at entry to ABEND, that is, when the dump was requested:  
• Access registers  
• Floating-point registers  
• General registers  
• Vector registers, vector status register, and vector mask register for a task that uses the Vector Facility | M P X                  | D M P X                | M                      |
| RGN       | Allocated pages in the private area of each address space being dumped, including subpools 0 - 127, 129 - 132, 203 - 205, 213 - 215, 223 - 225, 229, 230, 236, 237, 244, 249, 251 - 255 | D P X                  |                        |                        |
| SA or SAH | Save area linkage information, program call linkage information, and backward trace of save areas                                                                                                            | M P X                  | D M P X                | M                      |
| SPLS      | Storage allocated in user subpools 0 - 127, 129 - 132, 244, 251, and 252 for the task being dumped  
Note that SUBPLST in the macro parameter list for a SYSABEND or SYSUDUMP dump overrides SPLS in the dump options list, but only for the dump being requested. | M P X                  | D M P X                | M                      |
| SQA       | System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248)  
The control blocks for the failing task in the SQA include:  
• Address space control block (ASCB)  
• Job scheduler address space control block (JSAB) | M P X                  | M P X                  | D M P X                |
| SUBTASKS  | Storage for the task being dumped and program data for all of its subtasks                                                                                                                                   | M P X                  | M P X                  | D M |
| SUM       | Summary dump, see “Default contents of summary dumps in ABEND dumps” on page 133                                                                                                                            | D M P X                | D M P X                | D M P X                |
| SWA       | Scheduler work area (SWA); that is, subpools 236 and 237                                                                                                                                                       | M P X                  | M P X                  | D M P X                |
| TRT       | System trace and generalized trace facility (GTF) trace, as available                                                                                                                                          | M P X                  | D M P X                | D M P X                |

|                       | Summary trace, as available                                                                                                                                                                                   |                        |                        | D M P X                |
Default contents of summary dumps in ABEND dumps

If only a summary dump is requested, as in a SYSUDUMP dump that is not customized, the summary information is together, because it forms the entire dump. When a summary dump is combined with other dump options, the summary dump information is scattered throughout the dump. In Table 26 on page 133, an S indicates that a summary dump is available with the dump type.

<table>
<thead>
<tr>
<th>Summary Dump Contents</th>
<th>ABEND Dump to SYSUDUMP</th>
<th>ABEND Dump to SYSABEND</th>
<th>ABEND Dump to SYSMDUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion code: The system or user completion code if an ABEND macro requested the dump and, if it exists, the accompanying reason code</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Control blocks for the failing task, including:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ASCB (address space control block)</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• CDE (contents directory entry)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• LLE (load list element)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• RB (request block)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• TCB (task control block)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• TIOT (task input/output table)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• XL (extent list)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control blocks for the recovery termination manager (RTM):</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>• EED (extended error descriptor) for RTM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Registers from the system diagnostic work area (SDWA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• RTM2WA (RTM2 work area)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• SCB (set task asynchronous exit (STAE) control block)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dump header, mapped by the AMDDATA macro</td>
<td></td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Dump index</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Dump title: The job and step being dumped, the time and date of the dump, the dump identifier, and the processor</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Load module, if the PSW points to an active load module:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Name</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>• Module Contents</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>• Offset into the load module of the failing instruction</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>• Module pointed to in the last PRB (program request block)</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>PSW (program status word) at entry to ABEND, that is, when the dump was requested. The PSW includes the instruction length code and the interrupt code for the failing instruction.</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Registers at entry to ABEND, that is, when the dump was requested</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Save areas of register contents</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Storage: 4 kilobytes before and 4 kilobytes after the addresses in the PSW and the registers. The dump shows, by ascending address, only the storage that the user is authorized to access. Duplicate addresses are removed.</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>System trace table entries for the dumped address space</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
</tbody>
</table>
Table 26. Default contents of summary dumps in ABEND dumps (continued)

<table>
<thead>
<tr>
<th>Summary Dump Contents</th>
<th>ABEND Dump to SYSUDUMP</th>
<th>ABEND Dump to SYSABEND</th>
<th>ABEND Dump to SYSMDUMP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TCB summary:</strong> Information from the task control blocks (TCB) in the address space being dumped</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Virtual storage map:</strong> The subpools in the address space being dumped:</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Subpool number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Subpool key</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The owning or sharing task control block (TCB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The beginning address and length of each allocated area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The beginning address and length of each free area</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Customizing ABEND dump contents

The ddname of the data set for the ABEND dump determines how the contents can be customized. The system determines the contents of a particular ABEND dump from the options list the system maintains for the type of dump. The dump options list can be customized, cumulatively, by all the ways shown in the following tables; thus, for example, a SYSMDUMP ABEND dump written for an ABEND macro can be completely different from the default SYSMDUMP ABEND dump described in this document.

- Table 27 on page 135
- Table 28 on page 137
- Table 29 on page 138

For more information about the topics described in this section, see the following references:

- See z/OS MVS Initialization and Tuning Reference for parmlib members.
- See z/OS MVS System Commands for the CHNGDUMP operator command.
- See z/OS MVS Programming: Assembler Services Reference ABE-HSP and z/OS MVS Programming: Assembler Services Reference IAR-XCT for the ABEND, SETRP, SNAP, SNAPX, ESTAE, ESTAEX, and ATTACH or ATTACHX with ESTAI macros.
- See z/OS MVS Installation Exits for the IEAVTABX, IEAVADFM, and IEAVADUS installation exits.

Recommendations for customizing ABEND dumps: How an installation customizes dumps should depend on the usual use of each type of dump. The IBM-supplied dump options for ABEND dumps are designed for the following uses:

- SYSABEND dumps: For diagnosis of complex errors in any program running under the operating system
- SYSMDUMP dumps: For diagnosis of system problems when the dump is requested in a program
- SYSUDUMP dumps: For diagnosis of program problems needing simple problem data

For SYSUDUMP dumps, the IBM-supplied IEADMP00 member specifies the default contents as only a summary dump. An installation should consider using the IEADMP00 member as supplied, because it offers a small dump for simple problems.

Program areas in dumps: To request a meaningful dump for a particular program, code an ABEND macro that points to a macro parameter list. Specify in the list the data areas that are needed to diagnose the abnormally ending program but that are not specified in the parmlib member for the dump. Two examples are:

- If the task that is ending has subtasks and they might cause an error, specify PDATA=SUBTASKS in the macro parameter list to dump the subtasks.
To see only the subpools used by the program, specify the subpool numbers in a SUBPLST option for a SYSABEND dump. The SPLS option, which is a default for SYSABEND dumps, writes all user subpools. Leaving SPLS in the dump options may make the dump bigger than needed. Note that SUBPLST in the macro parameter list overrides SPLS in the current dump options.

**Nucleus areas in dumps:** Dump options control the parts of the nucleus that appear in a dump. A diagnostician seldom needs to analyze all of the nucleus. An installation can eliminate nucleus areas from dumps. If the IBM-supplied defaults are used, an SYSMDUMP ABEND dump contains the read/write DAT-on nucleus.

An installation can obtain one copy of the DAT-off nucleus to use in any problem by entering a DUMP operator command.

The ABEND dump options that control dumping of the nucleus areas are:

- **SDATA=NUC**
  - Read/write DAT-on nucleus
- **SDATA=ALLNUC**
  - All of the DAT-on nucleus: read/write and read-only

### Customizing SYSABEND dump contents

Table 27 on page 135 summarizes how to customize the contents of SYSABEND dumps.

<table>
<thead>
<tr>
<th>SYSABEND Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| **Replacing IEAABD00** parmlib member (by using the IEBUPDTE utility). | **Change occurs:** At system initialization  
**What changes:** IEAABD00 contains the IBM-supplied default dump options. Replacing IEAABD00 changes the dump options for SYSABEND. | To add program call data and the link pack area to all SYSABEND dumps, while retaining the IBM-supplied options, use IEBUPDTE to change the IEAABD00 member to contain:  
SDATA=(LSQA, CB, ENQ, TRT, ERR, DM, IO, SUM, PCDATA)  
PDATA=(PSW, REGS, SPLS, ALLPA, SA, LPA) |
| **Using a macro parameter list.**  
The DUMPOPT or DUMPOPX parameter on the ABEND or CALLRTM macro points to the parameter list. The list is usually created by a list-form SNAP or SNAPX macro. | **Change occurs:** At dump request  
**What changes:** The macro parameter list options are added to the dump options list, but only for the dump being requested.  
Note that SUBPLST in the macro parameter list overrides SPLS in the dump options list, but only for the dump being requested. | To add program call data and the link pack area to this SYSABEND dump, code in the program:  
ABEND '76, DUMP,  
DUMPOPT=PARMS  
PARMS SNAP  
SDATA=PCDATA,  
PDATA=LPA, MF=L |
### Table 27. Customizing SYSABEND dump contents (continued)

<table>
<thead>
<tr>
<th>SYSABEND Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| Recovery routines invoked by the recovery termination manager:  
  • FRRs (function recovery routines) for a system component  
  • ESTAE/ESTAI recovery routines established by an ESTAE or ESTAEX macro or the ESTAI parameter of an ATTACH or ATTACHX macro  
  • ARRs (associated recovery routines) | Change occurs: Just before dumping  
What changes: The SETRP macro parameter list options are added to the dump options list, but only for the dump being requested. | To add program call data and the link pack area to this SYSABEND dump, code in the recovery routine:  
SETRP , DUMP=YES,  
DUMPOPT=PARMS  
PARMS SNAP  
SDATA=PCDATA,  
PDATA=LPA, MF=L |
| These routines issue SETRP macros. To customize the dump contents, the DUMPOPT or DUMPOPX parameter on the SETRP macro points to a parameter list. The list is usually created by a list-form SNAP or SNAPX macro. | Change occurs: Immediately when entered  
What changes:  
  • For ADD: CHNGDUMP options are added to the IEAABD00 options, previous CHNGDUMP options, and all macro parameter list options. The options remain added until a CHNGDUMP DEL,SYSABEND operator command is entered.  
  • For OVER: CHNGDUMP options override all other dump options.  
  • For DEL: All CHNGDUMP options are deleted and the dump options in IEAABD00 are used again.  
When more than one CHNGDUMP operator command with SYSABEND is entered, the effect is cumulative. | To add program call data and the link pack area to all SYSABEND dumps until changed by CHNGDUMP DEL,SYSABEND, enter:  
CHNGDUMP SET,ADD,SYSABEND,  
SDATA=PCDATA,PDATA=LPA  
To return to the IEAABD00 options, enter:  
CHNGDUMP DEL,SYSABEND |
| Entering CHNGDUMP operator command with SYSABEND parameter on a console with master authority. | Change occurs: Just before dumping  
What changes: The routine can add or delete options from the dump options, but only for the current dump. | See z/OS MVS Installation Exits. |
| Through IEAVTABX installation exit name list. | Change occurs: During dumping. The routine runs during control block formatting of a dump with the CB option.  
What changes: The routine can add control blocks to the dump. | See z/OS MVS Installation Exits. |
| Through IEAVADFM or IEAVADUS installation exits. IEAVADFM is a list of installation routines to be run. IEAVADUS is one installation routine. | | |

### Customizing SYSMDUMP dump contents

Table 28 on page 137 contains a summary of how to customize the contents of SYSMDUMP dumps.
## Table 28. Customizing SYSMDUMP dump contents

<table>
<thead>
<tr>
<th>SYSMDUMP Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Replacing IEADMR00 parmlib member</strong> (by using the IEBUPDTE utility).</td>
<td><strong>Change occurs:</strong> At system initialization</td>
<td>To add the link pack area to all SYSMDUMP dumps, while retaining all the IBM-supplied defaults, use IEBUPDTE to change the IEADMR00 member to contain:</td>
</tr>
<tr>
<td><strong>What changes:</strong> IEADMR00 contains the IBM-supplied default dump options. Replacing IEADMR00 changes the dump options for SYSMDUMP.</td>
<td><strong>What changes:</strong> IEADMR00 contains the IBM-supplied default dump options. Replacing IEADMR00 changes the dump options for SYSMDUMP.</td>
<td>SDATA=(NUC, SQA, LSQA, SWA, TRT, RGN, SUM, LPA)</td>
</tr>
<tr>
<td><strong>Using a macro parameter list.</strong></td>
<td><strong>Change occurs:</strong> At dump request</td>
<td>To add the link pack area to this SYSMDUMP dump, code in the program:</td>
</tr>
<tr>
<td>The DUMPOPT or DUMPOPX parameter on the ABEND or CALLRTM macro points to the parameter list. The list is usually created by a list-form SNAP or SNAPX macro.</td>
<td><strong>What changes:</strong> The macro parameter list options are added to the dump options list, but only for the dump being requested.</td>
<td>ABEND 76, DUMP, DUMPOPT=PARMS PARMS SNAP PDATA=LPA, MF=L</td>
</tr>
<tr>
<td><strong>Recovery routines</strong> invoked by the recovery termination manager:</td>
<td><strong>Change occurs:</strong> Just before dumping</td>
<td>To add the link pack area to this SYSMDUMP dump, code in the recovery routine:</td>
</tr>
<tr>
<td>• FRRs (function recovery routines) for a system component</td>
<td><strong>What changes:</strong> The SETRP macro parameter list options are added to the dump options list, but only for the dump being requested.</td>
<td>SETRP ,DUMP=YES, DUMPOPT=PARMS PARMS SNAP PDATA=LPA, MF=L</td>
</tr>
<tr>
<td>• ESTAE/ESTAI recovery routines established by an ESTAE or ESTAEX macro or the ESTAI parameter of an ATTACH or ATTACHX macro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ARRs (associated recovery routines)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>These routines issue SETRP macros. To customize the dump contents, the DUMPOPT or DUMPOPX parameter on the SETRP macro points to a parameter list. The list is usually created by a list-form SNAP or SNAPX macro.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Entering CHNGDUMP operator command with SYSMDUMP parameter on a console with master authority.</strong></td>
<td><strong>Change occurs:</strong> Immediately when entered</td>
<td>To add the link pack area to all SYSMDUMP dumps until changed by CHNGDUMP DEL,SYSMDUMP, enter:</td>
</tr>
<tr>
<td><strong>What changes:</strong></td>
<td></td>
<td>CHNGDUMP SET, ADD, SYSMDUMP=(LPA)</td>
</tr>
<tr>
<td>• <strong>For ADD:</strong> CHNGDUMP options are added to the IEADMR00 options, previous CHNGDUMP options, and macro parameter list options. The options remain added until a CHNGDUMP DEL,SYSMDUMP operator command is entered.</td>
<td></td>
<td>To return to the IEADMR00 options, enter:</td>
</tr>
<tr>
<td>• <strong>For OVER:</strong> CHNGDUMP options override all other dump options.</td>
<td></td>
<td>CHNGDUMP DEL, SYSMDUMP</td>
</tr>
<tr>
<td>• <strong>For DEL:</strong> All CHNGDUMP options are deleted and the dump options in IEADMR00 are used again. When more than one CHNGDUMP operator command with SYSMDUMP is entered, the effect is cumulative.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 28. Customizing SYSMDUMP dump contents (continued)

<table>
<thead>
<tr>
<th>SYSMDUMP Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through IEAVTABX installation exit name list.</td>
<td>Change occurs: Just before dumping. What changes: The routine can add or delete options from the dump options, but only for the current dump.</td>
<td>See z/OS MVS Installation Exits.</td>
</tr>
</tbody>
</table>

### Customizing SYSUDUMP dump contents

Table 29 on page 138 contains a summary of how to customize the contents of SYSUDUMP dumps.

### Table 29. Customizing SYSUDUMP dump contents

<table>
<thead>
<tr>
<th>SYSUDUMP Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| Replacing IEADMP00 parmlib member (by using the IEBUPDTE utility). | Change occurs: At system initialization. What changes: IEADMP00 contains the IBM-supplied default dump options. Replacing IEADMP00 changes the dump options for SYSUDUMP. | To add program call data and user subpool storage to all SYSUDUMP dumps, while retaining the summary dump, use IEBUPDTE to change the IEADMP00 member to contain:

```
SDATA=(SUM,PCDATA)
PDATA=SPLS
```

| Using a macro parameter list. | Change occurs: At dump request. What changes: The macro parameter list options are added to the dump options list, but only for the dump being requested. Note that SUBPLST in the macro parameter list overrides SPLS in the dump options list, but only for the dump being requested. | To add program call data and user subpool storage to this SYSUDUMP dump, code in the program:

```
ABEND 76,DUMP,
DUMPOPT=PARMS
PARMS SNAP
SDATA=PCDATA,
PDATA=SPLS,MF=L
```

| Recovery routines invoked by the recovery termination manager: • FRRs (function recovery routines) for a system component • ESTAE/ESTAI recovery routines established by an ESTAE or ESTAEX macro or the ESTAI parameter of an ATTACH or ATTACHX macro • ARRs (associated recovery routines) | Change occurs: Just before dumping. What changes: The SETRP macro parameter list options are added to the dump options list, but only for the dump being requested. | To add program call data and user subpool storage to this SYSUDUMP dump, code in the recovery routine:

```
SETRP ,DUMP=YES,
DUMPOPT=PARMS
PARMS SNAP
SDATA=PCDATA,
PDATA=SPLS, MF=L
```

These routines issue SETRP macros. To customize the dump contents, the DUMPOPT or DUMPOPX parameter on the SETRP macro points to a parameter list. The list is usually created by a list-form SNAP or SNAPX macro.
Table 29. Customizing SYSUDUMP dump contents (continued)

<table>
<thead>
<tr>
<th>SYSUDUMP Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| Entering CHNGDUMP operator command with SYSUDUMP parameter on a console with master authority. | Change occurs: Immediately when entered | To add program call data and user subpool storage to all SYSUDUMP dumps until changed by CHNGDUMP DEL,SYSUDUMP, enter:
\[
\text{CHNGDUMP SET,ADD,SYSUDUMP, SDATA=PCDATA, PDATA=SPLS}
\]
To return to the IEADMP00 options, enter:
\[
\text{CHNGDUMP DEL,SYSUDUMP}
\]  
What changes:
- For ADD: CHNGDUMP options are added to the IEADMP00 options, previous CHNGDUMP options, and all macro parameter list options. The options remain added until a CHNGDUMP DEL,SYSUDUMP operator command is entered.
- For OVER: CHNGDUMP options override all other dump options.
- For DEL: All CHNGDUMP options are deleted and the dump options in IEADMP00 are used again.
When more than one CHNGDUMP operator command with SYSUDUMP is entered, the effect is cumulative.  

<table>
<thead>
<tr>
<th>Through IEAVTABX installation exit name list.</th>
<th>Change occurs: Just before dumping</th>
<th>See z/OS MVS Installation Exits.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change occurs: The routine can add or delete options from the dump options, but only for the current dump.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Through IEAVADFM or IEAVADUS installation exits. IEAVADFM is a list of installation routines to be run and IEAVADUS is one installation routine.</th>
<th>Change occurs: During dumping. The routine runs during control block formatting of a dump with the CB option.</th>
<th>See z/OS MVS Installation Exits.</th>
</tr>
</thead>
<tbody>
<tr>
<td>What changes: The routine can add control blocks to the dump.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analyzing an ABEND dump

Note: A SYSMDUMP ABEND dump is always a synchronous SVC dump. To analyze a SYSMDUMP, see “Analyzing an SVC dump” on page 37.

ABEND dumps written to SYSABEND and SYSUDUMP data sets are useful for analyzing problems in a program running under the operating system. This program can be called any of the following:
- Installation-provided program
- An application program
- A non-authorized program
- A problem program
- A program in the private area

ABEND dumps are written for problems detected in two ways:
- **Software-detected problem**, such as:
  - A nonzero return code from a called module
  - A program check, abend code X'0Cx', that a recovery routine changes to another abend code
  - An erroneous control block queue
  - Not valid input to a system service

ABEND dump 139
• **Hardware-detected problem**, which is a program check, abend code X'0Cx', that a recovery routine does not change to another abend code

### Analysis Procedure

To analyze a SYSABEND or SYSUDUMP, take the following steps:

1. **Collect and analyze logrec error records.**
   
   Check all logrec error records related to the abended task. Determine if any records show an earlier system problem; if so, continue diagnosis with that problem. Because of recovery and percolation, a SYSABEND or SYSUDUMP dump can be the end result of an earlier system problem.

2. **Collect and analyze messages about the problem.** Use time stamps to select messages related to the problem:
   - The job log
   - The system log (SYSLOG) or operations log (OPERLOG)
   
   Check the messages for earlier dumps written while the abended task was running. Determine if these earlier dumps indicate an earlier system problem; if so, continue diagnosis with that problem.

3. **Analyze the dump**, as described in the following steps.
   
   **Note:** After the problem and before the dump, recovery tried to reconstruct erroneous control block chains before ending the task. If the problem proves to be in a system component, a SYSABEND or SYSUDUMP dump cannot be used to isolate it because of the recovery actions; these dumps are useful only for problems in the private area.

4. **Obtain the abend code, reason code, job name, step name, and program status word (PSW) from the dump title** at the beginning of the dump.
   
   If the completion code is USER=dddd, an application program issued an ABEND macro to request the dump and to specify the completion code.
   
   If the completion code is SYSTEM=hhh, a system component ended the application program and a recovery routine in the program requested the dump. The application program probably caused the abend.

   **Reference** See [z/OS MVS System Codes](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary) for an explanation of the abend code.

5. **Analyze the RTM2WA**, as follows:
   
   - In the TCB summary, find the task control block (TCB) for the failing task. This TCB has the abend code as its completion code in the CMP field. In the TCB summary, obtain the address of the recovery termination manager 2 (RTM2) work area (RTM2WA) for the TCB.
   
   - In the RTM2WA summary, obtain the registers at the time of the error and the name and address of the abending program.
   
   - If the RTM2WA summary does not give the abending program name and address, probably an SVC instruction abnormally ended.
   
   - If the RTM2WA summary gives a previous RTM2WA for recursion, the abend for this dump occurred while an ESTAE or other recovery routine was processing another, original abend. In recursive abends, more than one RTM2WA may be created. Use the previous RTM2WA to diagnose the original problem.

   For information about the RTM2WA, SDWA, and TCB data areas, see [z/OS MVS Data Areas](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary) in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

6. **Analyze the dump for the program name.** Obtain the program name from the RTM2WA summary. If the name field is zero, do the following:
   
   - Find the control blocks for the task being dumped.
   
   - The last request blocks are SVRBs. In the WLIC field in an SVRB, find the following SVC interruption codes:
– X’33’ for a SNAP SVC interruption
– X’0C’ for a SYNCH SVC interruption

- The program request block (PRB) for the abending program immediately precedes these SVRBs.
- When the dump contains more than one CDE, determine the first and last address for each CDE. The entry point address is the first address. Add the length to the entry point address to obtain the last address. Compare these addresses to the address in the right half of the PSW in the dump header; the PSW address falls between the first and last addresses of the correct CDE.

Note that the leftmost digit in the PSW address denotes addressing mode and is not part of the address.

- In that CDE, the NAME field gives the program name.

7. **Locate the failing program module** in the hexadecimal dump.

8. **Find the instruction that caused the abend.**

   The PSW in the dump header is from the time of the error. Obtain the address in the right half of the PSW. The leftmost digit denotes addressing mode and is not part of the address.

   For most problems, subtract the instruction length in the ILC field of the dump header from the PSW address to obtain the address of the failing instruction. Do not subtract the instruction length in the following cases; the failing instruction is at the PSW address.

   - Page translation exception.
   - Segment translation exception.
   - Vector operation interruption.
   - Other interruptions for which the processing of the instruction identified by the old PSW is nullified. See z/Architecture Principles of Operation for the interruption action.

   If access registers were being used at the time of the error, so that the access list entry token (ALET) may be incorrect.

   Subtract the failing instruction address from the failing module address. Use this offset to find the matching instruction in the abending program's assembler listing.

9. **For an abend from an SVC or system I/O routine, find the last program instruction.**

   If the abend occurred in a system component running on behalf of the dumped program, find the last instruction that ran in the program, as follows:

   - For an abend from an SVC routine, look in the last PRB in the control blocks for the task being dumped. The right half of the PSW in the RTPSW1 field contains the address of the instruction following the SVC instruction.

   - For an abend from a system I/O routine, look in the save area trace. This trace gives the address of the I/O routine branched to. The return address in that save area is the last instruction that ran in the failing program.

10. **For an abend from an SVC or system I/O routine, determine the cause of the abend,** using the following:

    - For an abend from an SVC, look in the system trace table for SVC entries matching the SVRBs in the control blocks for the task being dumped.

    - For an abend from an I/O routine, look in the system trace table for I/O entries issued from addresses in the failing program. The addresses are in the PSW ADDRESS column.

   If SVC entries match the dumped blocks or the I/O entries were issued from the failing program, the system trace table was not overlaid between the problem and the dump.

   In this case, start with the most recent entries at the end of the trace. Back up to the last SVC entry with the TCB address of the abending task. Go toward the end of the trace, looking for indications of the problem. See Chapter 8, “System trace,” on page 155 for more information.

11. **For a program interrupt, determine the cause of the abend,** using the registers at the time of the error in the RTM2WA and in the SVRB following the PRB for the abending program.
Also, look at the formatted save area trace for input to the failing module.

12. **For an abend in a cross memory environment**, do the following to analyze the dump.

Many services are requested by use of the Program Call (PC) instruction, rather than by SVCs or SRBs. When an abend is issued by the PC routine, the OPSW field in the RB contains the instruction address of the PC routine that issued the abend. The SVRB contains the registers of the PC routine.

Do the following to look for the registers and PSW at the time the PC instruction was issued:
- For a stacking PC, find the registers in the linkage stack. Any entries on the linkage stack are before the RBs in the dump.
- For a basic PC, find the registers in the PCLINK stack. Any entries on the PCLINK stack are after the RBs in the dump.

For a stacking PC, find the linkage stack entry that corresponds to the RB/XSB for the program. The LSED field of the linkage stack entry and the XSBLSBP field in the corresponding XSB have the same value. From the linkage stack entry, obtain the registers and the PSW at the time the stacking PC was issued. The address in the PSW points to the instruction following the PC instruction in the abending program.

For a basic PC, determine the caller from the PCLINK stack. To locate the PCLINK stack element (STKE):
- The STKEs appear in the dump following all of the RBs. If the dump contains more than one STKE, the pointer to the STKE for the PC involved in the problem is in the XSBSTKE field of the XSB associated with the RB for the abending program.
- The RBXSB field in the RB points to the XSB.
- The XSBSEL field in the XSB points to the current STKE.

In the STKE, the STKERET field contains the return address of the caller of the PCLINK service.

For information about the STKE and XSB data areas, see *z/OS MVS Data Areas* in the *z/OS Internet library* (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).
Chapter 6. SNAP dump

This topic (SNAP Dump) contains programming interface information.

A SNAP dump shows virtual storage areas that a program, while running, requests the system to dump. A SNAP dump, therefore, is written while a program runs, rather than during abnormal end. The program can ask for a dump of as little as a one byte field to as much as all of the storage assigned to the current job step. The program can also ask for some system data in the dump.

A SNAP dump is especially useful when testing a program. A program can dump one or more fields repeatedly to let the programmer check intermediate steps in calculations. For example, if a program being developed produces incorrect results, requests for SNAP dumps can be added to the program to dump individual variables. The first time that incorrect storage is encountered should narrow down the section of code causing the error.

Obtaining SNAP dumps

Provide a data set to receive the dump, then arrange to print the dump. The SNAP or SNAPX macros in a program can place their dumps in the same or different data sets; the DCB parameter in each SNAP or SNAPX macro indicates the data set.

When setting up a dump data set, determine if the data set will contain privileged data. If so, protect it with passwords or other security measures to limit access to it.

You can use extended format sequential data sets as dump data sets for SNAP dumps. Extended format sequential data sets have the following features:

- Have a greater capacity than sequential data sets
- Support striping
- Support compression

**Using DSNTYPE=LARGE:** In z/OS V1R7 and later releases, sequential data sets that use DSNTYPE=LARGE are allowable for ABEND dumps when the systems that are involved in processing a DSNTYPE=LARGE data set are migrated to V1R7 prior to their use. If analysis using an earlier release is required, use z/OS V1R7 to transcribe the dump into a data set supported by the earlier release.

**Placing dump data sets in cylinder-managed space:** In z/OS V1R11 and later releases, extended format sequential data sets can be placed in either track-managed space or cylinder-managed space. SNAP dump fully supports placement of dump data sets in cylinder-managed space.

Obtain a SNAP dump by taking the following steps:

1. Code a DD statement in the JCL for the job step that runs the problem program to be dumped with a ddname other than SYSUDUMP, SYSABEND, SYSDUMP, or another restricted ddname. The statement can specify that the output of the SNAP dump should be written to one of the following:
   - Direct access.
   - Printer. Note that a printer is not recommended, except when running under z/VM®, because the printer cannot be used for anything else while the job step is running, whether a dump is written or not. Under z/VM you can use a virtual printer. This allows you to see or print the partial output on a real printer while the program is running while only using a small amount of system resources.
   - SYSOUT. SNAP dumps usually use SYSOUT.
   - Tape.
Example: SYSOUT DD Statement for SNAP Dump: The following example places a SNAP dump in sysout output class A. In the example, output class A is a print class. When the system prints the output class, the system will print any dumps written to the class.

```
//SNAP1 DD SYSOUT=A
```

Example: Tape DD Statement for SNAP Dump: The following example places a SNAP dump on a tape. In the example, TAPE is a group name established by the installation.

```
//SNAP2 DD DSN=DUMPDS,UNIT=TAPE,DISP=(,KEEP,KEEP)
```

The system keeps the data set when the job step ends, whether normally or abnormally. In either case, SNAP dumps are taken throughout processing, regardless of the way the step ends.

Example: Direct Access DD Statement for SNAP Dump: The following example places a SNAP dump on direct access, for example, the 3350 direct access storage.

```
//SNAP3 DD DSN=SNAPSHOT,UNIT=3350,DISP=(,KEEP,KEEP),
//       VOLUME=SER=12345,SPACE=(1680,(160,80))
```

The system writes the dump in a sequential data set using the basic sequential access method (BSAM). The dump data set can be on any device supported by BSAM.

2. In the problem program:

a. Specify a data control block (DCB) for the data set to receive the dump. For a standard dump, which has 120 characters per line, the DCB must specify:

- BLKSIZE=882 or 1632
- DSORG=PS
- LRECL=125
- MACRF=(W)
- RECFM=VBA

For a high-density dump, which has 204 characters per line and will be printed on an APA 3800 printer, the DCB must specify:

- BLKSIZE=1470 or 2724
- DSORG=PS
- LRECL=209
- MACRF=(W)
- RECFM=VBA

b. Code an OPEN macro to open the DCB.

Before you issue the SNAP or SNAPX macro, you must open the DCB that you designate on the DCB parameter, and ensure that the DCB is not closed until the macro returns control. To open the DCB, issue the DCB macro with the following parameters, and issue an OPEN macro for the data set:

```
DSORG=PS,RECFM=VBA,MACRF=(W),BLKSIZE=nnn,LRECL=xxx,
and DDNAME=any name but SYSABEND, SYSDUMP or SYSUDUMP
```

If the system loader processes the program, the program must close the DCB after the last SNAP or SNAPX macro is issued.

c. Code a SNAP or SNAPX assembler macro to request the dump.

Example: Coding the SNAP Macro: In the following example, the SNAP macro requests a dump of a storage area, with the DCB address in register 3, a dump identifier of 245, the storage area's starting address in register 4, and the ending address in register 5:

```
SNAP DCB=(3),ID=245,STORAGE=((4),(5))
```
Repeat this macro in the program as many times as wanted, changing the dump identifier for a unique dump. The system writes all the dumps that specify the same DCB to the same data set.

Example: Two SNAP Dump Requests in a Program: The following example shows a problem program that requests two SNAP dumps. Both SNAP macros in the example specify the same data control block (DCB) to place both dumps in the same data set. Each dump has a different identifier: PIC3 for the first dump, PIC4 for the second. Both dumps show the same areas: the control blocks. Thus, the programmer can see these areas at two points in the program's processing.

<table>
<thead>
<tr>
<th>SNAPDCB</th>
<th>DCB</th>
<th>BLKSIZE=882,DSORG=PS,LRECL=125,MACRF=(W),RECFM=VBA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OPEN SNAPDCB,OUTPUT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LA 3,SNAPDCB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SNAP DCB=(3),ID= PIC3,SDATA=CB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SNAP DCB=(3),ID= PIC4,SDATA=CB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CLOSE SNAPDCB</td>
</tr>
</tbody>
</table>

d. Close the DCB with a CLOSE assembler macro.

For more information, see the following references:

- See z/OS DFSMS Macro Instructions for Data Sets for coding the DCB, OPEN, and CLOSE macros.
- See z/OS MVS Programming: Assembler Services Reference ABE-HSP and z/OS MVS Programming: Assembler Services Reference IAR-XCT for required parameters on the DCB macro and for coding the SNAP or SNAPX macro.

3. Print or view the data set. The output of the SNAP or SNAPX macro is a standard EBCDIC data set with ANSI characters in column one. This data set can be edited.

The dumps are formatted as they are created. Printing depends on the location of the dump when it is created:

Location Printing
SYSOUT
The system prints the dump(s) when printing the output class.

On a tape or direct access data set
Print the dump(s) in a separate job or job step.

Printer
The system prints the dump(s) as they are created.

To view SNAP dumps at a terminal, browse the data set containing the dump.

Example: Printing a SNAP Dump The following JCL prints a SNAP dump. Because the system formats the dump when creating it, the IEBPTPCH utility program can print the dump. The dump is in the SNAPSHOT data set.

```
//PRINT     EXEC  PGM=IEBPTPCH
//SYSPRINT  DD    SYSOUT=A
//SYSUT1    DD    DSN=SNAPSHOT,UNIT=3350,DISP=(OLD,DELETE),
//           VOLUME=SER=12345
//SYSUT2    DD    SYSOUT=A
//SYSIN     DD    *
PRINT    TYPORG=PS
```
Customizing SNAP dump contents

You can customize the contents of SNAP dumps in one of the following ways:

- Through installation exits.
- Through parameters on the SDUMP or SDUMPX macro.

Customizing through installation exits

An installation can customize the contents of SNAP dumps through the IEAVADFM or IEAVADUS installation exits. IEAVADFM is a list of installation routines to be run and IEAVADUS is one installation routine. The installation exit routine runs during control block formatting of a dump when the CB option is specified on the SNAP or SNAPX macro. The routine can format control blocks and send them to the data set for the dump. See z/OS MVS Installation Exits for more information.

Customizing through the SNAP or SNAPX macro

The parameters on the SNAP or SNAPX macro determine the dump contents. The macro can specify any or all of the areas listed in Table 30 on page 146.

Note that the parameters cannot request that a Hiperspace be included in the dump. To include Hiperspace data in a SNAP dump, read the data from the Hiperspace into address space storage that is being dumped. See z/OS MVS Programming: Extended Addressability Guide for more information about manipulating data in Hiperspace storage.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dump Contents</th>
</tr>
</thead>
</table>
| ALLPA     | All link pack areas, as follows:  
  - Job pack area (JPA)  
  - Link pack area (LPA) active for the task being dumped  
  - Related supervisor call (SVC) modules |
| ALLVNUC   | The entire virtual control program nucleus |
| CB        | Control blocks for the task being dumped |
| DM        | Data management control blocks for the task being dumped:  
  - Data control block (DCB)  
  - Data extent block (DEB)  
  - Input/output block (IOB) |
| ERR       | Recovery termination manager (RTM) control blocks for the task being dumped:  
  - Extended error descriptor (EED) for RTM  
  - Registers from the system diagnostic work area (SDWA)  
  - RTM2 work area (RTM2WA)  
  - Set task asynchronous exit (STAE) control block (SCB) |
| IO        | Input/output supervisor (IOS) control blocks for the task being dumped:  
  - Execute channel program debug area (EXCPD)  
  - Unit control block (UCB) |
<p>| JPA       | Job pack area (JPA): module names and contents |
| LPA       | Link pack area (LPA) active for the task being dumped: module names and contents |</p>
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dump Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSQA</td>
<td>Local system queue area (LSQA) allocated for the address space (that is, subpools 203 - 205, 213 - 215, 223 - 225, 229, 230, 233 - 235, 249, 253 - 255)</td>
</tr>
</tbody>
</table>
| NUC       | Read/write portion of the control program nucleus (that is, only non-page-protected areas of the DAT-on nucleus), including:  
|           | • Communication vector table (CVT)  
|           | • Local system queue area (LSQA)  
|           | • Prefixed save area (PSA)  
|           | • System queue area (SQA) |
| PCDATA    | Program call information for the task |
| PSW       | Program status word (PSW) when the dump is requested |
| Q         | Global resource serialization control blocks for the task being dumped:  
|           | • Global queue control blocks  
|           | • Local queue control blocks |
| REGS      | Registers when the dump is requested:  
|           | • Access registers  
|           | • Floating-point registers  
|           | • General registers  
|           | • Vector registers, vector status register, and vector mask register for a task that uses the Vector Facility |
| SA or SAH | Save area linkage information, program call linkage information, and backward trace of save areas |
| SPLS      | Storage allocated in user subpools 0 - 127, 129 -132, 244, 251, and 252 for the task being dumped |
| SQA       | System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248) |
| SUBTASKS  | Storage for the task being dumped and program data for all of its subtasks |
| SWA       | Scheduler work area (SWA) (that is, subpools 236 and 237) |
| TRT       | System trace and generalized trace facility (GTF) trace, as available  
|           | — One or more data spaces identified on the SNAPX macro  
|           | — One or more storage areas, identified by beginning and ending addresses on the SNAP or SNAPX macro  
|           | — One or more subpools, identified by subpool number on the SNAP or SNAPX macro |
Chapter 7. The dump grab bag

A dump contains information about an error that can help you identify a problem type. Using interactive problem control system (IPCS), the information about the error is formatted to provide a quick and effective method of retrieval.

The hints that follow apply to processing all kinds of dumps: SVC dumps, stand-alone dumps, and SYSMDUMP dumps.

This section covers the following topics:

- “Problem data for storage overlays” on page 149
- “Problem data from the linkage stack” on page 150
- “Problem data for modules” on page 151
- “Problem data from recovery work areas” on page 152
- “Problem data for ACR” on page 152
- “Problem data for machine checks” on page 153.

Problem data for storage overlays

Always be aware of the possibility of a storage overlay when analyzing a dump. System problems in MVS are often caused by storage overlays that destroy data, control blocks, or executable code. The results of such an overlay vary. For example:

- The system detects an error and issues an abend code, yet the error can be isolated to an address space. Isolating the error is important in discovering whether the overlay is in global or local storage.
- Referencing the data or instructions can cause an immediate error such as a specification exception (abend X'0C4') or operation code exception (abend X'0C1').
- The bad data is used to reference a second location, which then causes another error.

When you recognize that the contents of a storage location are not valid and subsequently recognize the bit pattern as a certain control block or piece of data, you generally can identify the erroneous process/component and start a detailed analysis.

Analyzing the damaged area

Once you determine that storage is bad or overlaid, try to identify the culprit. First, determine the extent of the bad data. Look for EBCDIC data or module addresses in storage to identify the owner. Any type of pattern in storage can indicate an error and identify the program that is using the damaged storage. Look at the data on both sides of the obviously bad areas. See if the length of the bad area is familiar; that is, can you relate the length to a known control block length, data size, MVC length? If so, check various offsets to determine their contents and, if you recognize some, try to determine the exact control block. In Figure 69 on page 150, for example, storage from CSA shows a pattern of allocated blocks.
Even if you do not recognize the pattern, take one more step. Can you determine the offset from some base that would have to be used in order to create the bit pattern? If so, the fact that there is a certain bit pattern at a certain offset can be helpful.

For example, a BALR register value (X'40D21C58') at an offset X'C' can indicate that a program is using this storage for a register save area (perhaps caused by a bad register 13). Another field in the same overlaid area might trigger recognition.

Repetition of a pattern can indicate a bad process. If you can recognize the bad data you might be able to relate that data to the component or module that is causing the error. This provides a starting point for further analysis.

**Common bad addresses**

The following are commonly known as bad addresses. If you recognize these in the code you are diagnosing, focus your problem source identification on these areas:

- X'000C0000', X'040C0000', or X'070C0000', and one of these addresses plus some offset. These are generally the result of some code using 0 as the base register for a control block and subsequently loading a pointer from 0 plus an offset, thereby picking up the first half of a PSW in the PSA.

Look for storage overlays in code pointed to by an old PSW. These overlays result when 0 plus an offset cause the second half of a PSW to be used as a pointer.

- X'C00', X'D00', X'D20', X'D28', X'D40', and other pointers to fields in the normal functional recovery routine (FRR) stack. Routines often lose the contents of a register during a SETFRR macro expansion and incorrectly use the address of the 24-byte work area returned from the expansion.

- Register save areas. Storage might be overlaid by code doing a store multiple (STM) instruction with a bad register save area address. In this case, the registers saved are often useful in determining the component or module at fault.

**Problem data from the linkage stack**

The linkage stack is used to identify a program that requested a system service, if the service was entered by a branch instruction.

For example, to see the linkage stack entry that is associated with address space identifier (ASID) X'1A', use the IPCS subcommand:

```
SUMMARY FORMAT ASID(X'1a')
```

The resulting dump for the linkage stack associated with the address space (see Figure 70 on page 151) shows one entry, as follows:
BAKR STATE ENTRY
A Branch and Stack (BAKR) instruction caused this entry.

SASN..1A and PASN..1A
At the time of the BAKR, the program was not in cross memory mode. When the branching program is not in cross memory mode, secondary address space number (SASN) and primary address space (PASN) are identical. If the program had been in cross memory mode, SASN and PASN would not have been identical.

PSW..070C0000 80FD7618
The return address of the branch caused by the BAKR is FD7618. This address is in the right half of the program status word (PSW).

<table>
<thead>
<tr>
<th>LINKAGE STACK ENTRY</th>
<th>01</th>
<th>LSED: 7F7490B0</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSE: 7F749010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GENERAL PURPOSE REGISTER VALUES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00-03.... 7FEEB410045040DF40453200004541FFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04-07.... 04504CE48115038000000002804504B50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-11.... 04503A7504502A7604501A7704504630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-15.... 84500A78000000000000000000000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCESS REGISTER VALUES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>00-03.... 00000000000000000000000000000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>04-07.... 00000000000000000000000000000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08-11.... 00000000000000000000000000000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-15.... 00000000000000000000000000000000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15/A ON AQFT PER SYSTEM HUNG 22:30 08/30/88 24 09:42:48 10/14/88

PKM..8000 SASN..001A EAX..0000 PASN..001A PSW..070C0000 80FD7618
TARG... 8450FB12 MSTA... 0451E300 00000000
TYPE... 84
BAKR STATE ENTRY
RFS... 0F38 NES... 0000

Figure 70. Example: Viewing a linkage stack entry

Many system services are called through branches. For branch entry services, use register 14 to identify the calling program. Look for the problem in the calling program. See z/OS MVS Programming: Extended Addressability Guide for more information about the linkage stack.

Problem data for modules
For a module, the system saves and restores status from different locations, depending on the processing mode of the module when it lost control. Use the IPCS STATUS CPU subcommand to find out the mode of the module that had been currently running for each processor. Use the saved status as problem data for diagnosis.

Processing modes
The processing modes follow. Code always runs in one or more of these modes. For example, code running in task or service request block (SRB) mode can also be either locally locked or physically disabled.

- **Task mode** is the most common processing mode. All programs given control by ATTACH, ATTACHX, LINK, LINKX, XCTL, and XCTLX macros run in task mode.
- **SRB mode** is code that runs from one of the service request block (SRB) queues.
- **Physically disabled mode** is reserved for high-priority system code that manipulates critical system queues and data areas. This mode is usually combined with supervisor state and key 0 in the PSW. The combination ensures that the routine can complete its function before losing control. The mode is restricted to just a few modules in the system, for example, interrupt handlers, the dispatcher, and programs that are holding a global spin lock.
- **Locked mode** is for code that runs in the system while holding a lock.
• **Cross memory mode.** Cross memory mode is defined by:
  – **Primary address space:** Address space identifier (ASID) in control register 3
  – **Secondary address space:** ASID in control register 4
  – **Home address space:** Address of the address space control block (ASCB) in the PSAAOLD field
  – **PSW S-bit** (bit 16 of the PSW): Indicator of current addressability:
    - S-bit=0 - To the primary address space
    - S-bit=1 - To the secondary address space

  When primary addressability and secondary addressability are to the home address space and the S-bit=0, the work is not in cross memory mode.

• **Access register (AR) mode,** where a program can use the full set of assembler instructions (except MVCP and MVCS) to manipulate data in another address space or in a data space. Unlike cross memory, access registers allow full access to data in many address spaces or data spaces.

---

**Problem data from recovery work areas**

You can use the recovery work area (RWA) to find the failing module. In most cases, you would use the TCB and RB structure to find the failing module instead of the RWA. Use the RWA in the following situations:

• When an SVC dump is requested in a SLIP trap. In this dump, the current status at the time of the problem is in the recovery save areas or in the SDUMP SQA 4K buffer. See “Reading the SDUMPX 4K SQA buffer” on page 48 for more information.

• When the problem is in the recovery process itself.

• When a stand-alone dump is written because of a suspected loop.

The recovery work areas are:

• Logrec records

• Logrec buffer in the system: obtained by a VERBEXIT LOGDATA subcommand

• System diagnostic work area (SDWA), including the variable recording area (VRA) formatted in logrec records and in the logrec buffer.

• Functional recovery routine (FRR) stacks: described in the next topic.

• Recovery termination manager (RTM) data areas, including the RTM2 work area (RTM2WA): formatted by a SUMMARY FORMAT subcommand or obtained in a formatted ABEND or SNAP dump by the ERR option.

The RTM2WA and SDWA blocks contain registers, PSW, and other time of problem information. Use these blocks in diagnosis when they are associated with a task control block (TCB).

See Chapter 15, “Recording logrec error records,” on page 513 for more information. For information about the control blocks, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary). For details about the IPCS commands, see z/OS MVS IPCS Commands.

---

**Problem data for ACR**

When alternate CPU recovery (ACR) is active at the time of the dump, the search argument in IPCS STATUS WORKSHEET output contains the symptom:

```
FLDS/CSDACR
```
**Pre-Processing phase data**

If ACR is active, problem data for the pre-processing phase are:

- The CSDCPUAL field of the common system data (CSD) indicates which processor failed and which is still running.
- A system trace table entry with ACR in the Ident column indicates that ACR began and identifies the failing processor.
- Use the CSD online mask to determine which CPU's LCCA to examine. Use the IPCS subcommand CBFORMAT to examine the failing CPU's LCA.
- The WSACACR in the CPU work save area vector table (WSAVTC) for both processors' logical configuration communication areas (LCCA) points to a copy of the PSAs and FRR stacks for both processors.
- The LCCADCPU in both processors points to the LCCA of the failing processor and the LCCARCPU points to the LCCA of the running processor.

Note that a dump shows the PSA of the failed processor when the running processor initiated ACR. The normal FRR stack, pointers to other FRR stacks, locks, PSA super bits, and other data reflect the processor at the time of the failure.

**Post-Processing phase data**

ACR issues message IEA858E when it completes and resets the CSDACR flag to X'00'.

**Data obtained by IPCS**

Use the following IPCS subcommand to see all the LCCAs and the CSD:

```
STATUS CPU DATA WORKSHEET
```

For more information about control blocks, see `z/OS MVS Data Areas` in the `z/OS Internet library` (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary). For information about the IPCS commands, see `z/OS MVS IPCS Commands`.

**Problem data for machine checks**

The hardware uses a machine check interruption to tell the control program that it has detected a hardware malfunction. Machine checks vary considerably in their impact on software processing:

- **Soft errors**: Some machine checks notify software that the processor detected and corrected a hardware problem that required no software recovery action.
- **Hard errors**: Other hardware problems detected by a processor require software-initiated action for damage repair. Hard errors also require software recovery to verify the integrity of the process that experienced the failure.

The machine check interrupt code (MCIC) in the PSA FLCMCIC field describes the error causing the interrupt. An MCIC can have more than one bit on to indicate more than one failing condition.

For a machine check, the system writes a logrec error record. The error record contains the MCIC, except when:

- The LRBMTCKS bit in field LRBTERM of the logrec buffer (LRB) is ON to indicate that the machine check old PSW and the MCIC are both zero.
- The LRBMTINV bit in field LRBTERM is ON to indicate that the machine check old PSW is nonzero but the MCIC is zero.

Hard errors cause FRR and ESTAE processing.

See `z/Architecture Principles of Operation` for a complete description of the MCIC.
Dump grab bag
Chapter 8. System trace

System trace provides an ongoing record of hardware events and software events that occurs during system initialization and operation. The system activates system tracing at initialization, which runs continuously, unless your installation has changed the IBM-supplied system tracing. After system initialization, you can use the TRACE operator command on a console with master authority to customize system tracing.

System trace writes trace data in system trace tables in the trace address space. System trace maintains a trace table for each processor.

Because system trace usually runs all the time, it is useful for problem determination. While system trace and the generalized trace facility (GTF) lists many of the same system events, system trace also lists events occurring during system initialization, before GTF tracing can be started. System trace also traces branches and cross-memory instructions, which GTF cannot do.

The following topics explain system trace in detail:

- “Customizing system tracing” on page 155
- “Receiving system trace data in a dump” on page 156
- “Formatting system trace data in a dump” on page 157
- “Reading system trace output” on page 157.

Customizing system tracing

The system starts system tracing during system initialization and the trace runs continually. There are, however, a few things you can do to alter system tracing:

- “Increasing the size of the system trace table” on page 155.
- “Tracing branch instructions” on page 156.

Increasing the size of the system trace table

System trace tables reside in fixed storage on each processor. The default trace table size is 1 MB per processor, but you can change it using the TRACE ST command. You might, however, want to increase the size of the system trace table from the default 1 MB when:

- You find that the system trace does not contain tracing from a long enough time period.
- You want to trace branch instructions (using the BR=ON option on the TRACE ST command when you start tracing).

Do the following to increase the size of the trace table:

- Enter the TRACE ST command to change the size of the system trace table. For example, to increase the size of the trace table from the default 1 megabyte per processor to 2 megabytes per processor:

  \[
  \text{TRACE ST, 2M}
  \]

- Enter the TRACE ST command with the BUFSIZE (or BUFSIZ) parameter to change the total size of the system trace table allocated. For example, in a system that has 10 processors, to restart system tracing and increase the size of the trace table from the default of 10 megabytes (1 megabyte per processor) to 20 megabytes (2 megabytes per processor):

  \[
  \text{TRACE ST, BUFSIZE=20M}
  \]
Remember: Choose a reasonable value for the system trace storage after considering the available central storage and the actual storage required for system trace. Increasing the system trace storage to a large value amount may cause shortage of pageable storage in the system.

Tracing branch instructions

System tracing allows you the option of tracing branch instructions, such as BALR, BASR, BASSM and BAKR, along with other system events. The mode tracing option is separate from branch tracing.

Attention: Branch tracing ON can affect your system performance and use very large amounts of storage. Do not use branch tracing as the default for system tracing on your system. Only use it for short periods of time to solve a specific problem. The default system tracing does not include branch instructions.

IBM provides two health checks, SYSTRACE_BRANCH and SYSTRACE_MODE, to help identify when branch tracing may be affecting your system performance. For example, if branch tracing has been set on for a long time, you will receive message IEAH801E. For more information, see System trace checks (IBMSYSTRACE) in IBM Health Checker for z/OS User's Guide. For information about related messages, see z/OS MVS System Messages, Vol 6 (GOS-IEA).

When you want to trace branch instructions such as BALR, BASR, BASSM and BAKR, do the following:

- Turn on system tracing with branch tracing using the TRACE command from a console with master authority:

  ```
  TRACE ST, BR=ON
  ```

  Because tracing branch instructions tends to significantly increase the number of trace entries being generated, you can increase the size of the trace tables when you turn tracing on.

  - To increase the size of the trace tables for each processor from the default 1 MB to 2 MB, issue:

    ```
    TRACE ST, 2M, BR=ON
    ```

  - To increase the size of total storage for trace buffers (that is, the sum of the storage set aside for trace table entries on all the installed processors) to 2 megabytes:

    ```
    TRACE ST, BUFSIZE=2M, BR=ON
    ```

  For more information, see the following documentation:

  - z/Architecture Principles of Operation describes the branch instruction trace entries and the mode trace entries that MVS combines with them (and are generated by the hardware). MVS enables or disables the production of these entries by manipulating control register bits. The trace table entries that are not 'branch (or mode)' entries that are generated by MVS software through the TRACE or TRACG instructions. See the Tracing topic for information.

  - For a description of the TTE from mapping macro IHATTE, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zoInternetLibrary).

Receiving system trace data in a dump

System trace writes trace data in system trace tables in the trace address space. System trace maintains a trace table for each processor. Obtain the trace data in a dump that included option SDATA=TRT. Table 31 on page 157 shows the dumps that have TRT in their default options and how to request trace data for dumps that do not include the data by default.

System trace data that are requested by RTM and ABDUMPs will only receive the most current 64K of data for each CPU when the number of concurrent snapshots could affect system availability. This is referred to as a mini-trace table snapshot. For more information about working with system trace tables, see the SYSTRACE section in z/OS MVS IPCS Commands.
Table 31. Dumps that have TRT in their default options

<table>
<thead>
<tr>
<th>Dump</th>
<th>How to obtain trace data</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABEND dump to SYSABEND</td>
<td>Default</td>
</tr>
<tr>
<td>ABEND dump to SYMDUMP</td>
<td>Default</td>
</tr>
<tr>
<td>ABEND dump to SYSUDUMP</td>
<td>Default</td>
</tr>
<tr>
<td>SNAP dump</td>
<td>Request SDATA=TRT</td>
</tr>
<tr>
<td>Stand-alone dump</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for SDUMP or SDUMPX macro</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for DUMP operator command</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for SLIP operator command with ACTION=SVCD, ACTION=STDUMP, ACTION=SYNCSVCD, or ACTION=TRDUMP</td>
<td>Default</td>
</tr>
<tr>
<td>Any dump customized to exclude trace data</td>
<td>Request SDATA=TRT</td>
</tr>
</tbody>
</table>

Formatting system trace data in a dump

- For formatted dumps, system trace formats the system trace data and the system prints it directly.
- For unformatted dumps, use the IPCS SYSTRACE subcommand to format and print or view the trace data in the dump.

Reading system trace output

The following topics describe system trace table entries (TTE) as they appear in a dump formatted with the IPCS SYSTRACE subcommand.

- “Example of a system trace in a dump” on page 157
- “Summary of system trace entry identifiers” on page 158 shows a table of the system trace identifiers for each system trace entry in a dump and shows where you can find the format of the entry in this section. If you are looking for a particular entry start with this table, because many of the entries are similar and are grouped together.
- “ACR trace entries” on page 160 through “USRn trace entries” on page 205 shows the format for each type of trace entry. For the detailed format of TTEs, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

Example of a system trace in a dump

Figure 71 on page 158 shows system trace entries. IPCS formatted the entries from an example SVC dump. Note that system trace data in an ABEND dump has the same format. The subcommand issued from the IPCS Subcommand Entry panel was:

SYSTRACE TIME(LOCAL)

The oldest trace entries appear first in the trace; the newest entries are at the end. An asterisk (*) before an identifier indicates an unusual condition; see the format of the entry for an explanation.
Summary of system trace entry identifiers

This topic summarizes all the system trace entries by identifier. Because many trace entries are similar, they are described together. Use Table 32 on page 158 to locate the format for a particular entry.

For example, in the trace entry shown in Figure 72 on page 158, the system trace identifier is SVC. Look up SVC in Table 32 on page 158 to find where the SVC trace entry format is described. In this case, the SVC trace entry is described in “SVC, SVCE, and SVCR trace entries” on page 200.

Because many trace entries are similar, the system trace entry format is summarized.

Figure 72. Example: Finding the format for an SVC entry

Table 32. References for system trace entry format description

<table>
<thead>
<tr>
<th>Identifier (Ident)</th>
<th>Description</th>
<th>For format, see:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACR</td>
<td>Alternate CPU recovery</td>
<td>“ACR trace entries” on page 160</td>
</tr>
<tr>
<td>AINT</td>
<td>Adapter interruption</td>
<td>“AINT trace entries” on page 161</td>
</tr>
<tr>
<td>ALTR</td>
<td>Alteration of trace option</td>
<td>“ALTR trace entries” on page 162</td>
</tr>
<tr>
<td>BR</td>
<td>Branch through a BAKR, BALR, BASR, or BASSM instruction</td>
<td>“BR trace entries” on page 163</td>
</tr>
<tr>
<td>BSG</td>
<td>Branch on subspace group</td>
<td>“BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 164</td>
</tr>
<tr>
<td>CSCH</td>
<td>Clear subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169</td>
</tr>
<tr>
<td>DSP</td>
<td>Task dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 172</td>
</tr>
<tr>
<td>Identifie</td>
<td>r (Ident)</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| EXT      | General external interruptions:  
  • CALL - external call interruption  
  • CLKC - clock comparator interruption  
  • EMS - emergency signal interruption  
  • SS - service signal interruption  
  • TIMR - timer interruption  
  • WTI - warning track interruption | “CALL, CLKC, EMS, EXT, I/O, MCH, RST, SS, TIMR, and WTI trace entries” on page 166 |
| HSCH     | Halt subchannel operation | “CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169 |
| I/O      | Input/output interruption | “CALL, CLKC, EMS, EXT, I/O, MCH, RST, SS, TIMR, and WTI trace entries” on page 166 |
| MCH      | Machine check interruption | “CALL, CLKC, EMS, EXT, I/O, MCH, RST, SS, TIMR, and WTI trace entries” on page 166 |
| MOBR     | Change of addressing mode along with a change of instruction address | “MODE and MOBR trace entries” on page 174 |
| MODE     | Change of addressing mode | “MODE and MOBR trace entries” on page 174 |
| MSCH     | Modify subchannel operation | “CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169 |
| PC       | Program Call control instruction | “BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 164 |
| PCIL     | PCI load instruction | “PCIL trace entries” on page 175 |
| PCIS     | PCI store instruction | “PCIS trace entries” on page 176 |
| PDMX     | PCIE adapter interruption de-multiplexing event | “PDMX trace entries” on page 177 |
| PGM      | Program interruption | “PGM, SPER and SPR2 trace entries” on page 178 |
| PR       | Program Return control instruction | “BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 164 |
| PT       | Program Transfer control instruction | “BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 164 |
| RCVY     | Recovery event | “RCVY trace entries” on page 179 |
| RSCH     | Resume subchannel operation | “CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169 |
| RST      | Restart interruption | “CALL, CLKC, EMS, EXT, I/O, MCH, RST, SS, TIMR, and WTI trace entries” on page 166 |
| SIGA     | Signal adapter operation | “CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169 |
| SPER     | SLIP program event recording | “PGM, SPER and SPR2 trace entries” on page 178 |
| SPIN     | Starting, middle, or stopping of a system spin. | “SPIN trace entries” on page 184 |
| SPR2     | SLIP program event recording, when STDATA is specified | “PGM, SPER and SPR2 trace entries” on page 178 |
| SRB      | Initial service request block dispatch | “DSP, SRB, SSRB, and WAIT trace entries” on page 172 |
| SSAR     | Set Secondary Address Space Number control instruction | “BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 164 |
Table 32. References for system trace entry format description (continued)

<table>
<thead>
<tr>
<th>Identifier (Ident)</th>
<th>Description</th>
<th>For format, see:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCH</td>
<td>Start subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169</td>
</tr>
<tr>
<td>SSRB</td>
<td>Suspended service request block dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 172</td>
</tr>
<tr>
<td>SSRV</td>
<td>System service entered by a Program Call (PC) instruction or a branch</td>
<td>“SSRV trace entries” on page 189</td>
</tr>
<tr>
<td>SUSP</td>
<td>Lock suspension</td>
<td>“SUSP trace entries” on page 199</td>
</tr>
<tr>
<td>SVC</td>
<td>Supervisor call interruption</td>
<td>“SVC, SVCE, and SVCR trace entries” on page 200</td>
</tr>
<tr>
<td>SVCE</td>
<td>SVC error</td>
<td>“SVC, SVCE, and SVCR trace entries” on page 200</td>
</tr>
<tr>
<td>SVCR</td>
<td>SVC return</td>
<td>“SVC, SVCE, and SVCR trace entries” on page 200</td>
</tr>
<tr>
<td>SYNS</td>
<td>Synchronous (zHyperLink) I/O start</td>
<td>“SYNS and SYNE trace entries” on page 202</td>
</tr>
<tr>
<td>SYNE</td>
<td>Synchronous (zHyperLink) I/O end</td>
<td>“SYNS and SYNE trace entries” on page 202</td>
</tr>
<tr>
<td>TIME</td>
<td>Timer services</td>
<td>“TIME trace entries” on page 204</td>
</tr>
<tr>
<td>USRn</td>
<td>User event</td>
<td>“USRn trace entries” on page 205</td>
</tr>
<tr>
<td>WAIT</td>
<td>Wait task dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 172</td>
</tr>
<tr>
<td>XSCH</td>
<td>Cancel subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 169</td>
</tr>
<tr>
<td>?EXPL</td>
<td>The SYSTRACE subcommand cannot identify the system trace entry</td>
<td>N/A</td>
</tr>
</tbody>
</table>

ACR trace entries

An ACR trace entry represents failure of a processor and subsequent entry into the alternate CPU recovery component.

PR   ASID WU-Addr- Ident  CD/D PSW----- Address- Unique-1 Unique-2 Unique-3 PSACLHS- PSALOCAL PASD SASD Time Formot------
pr   fail wu-addr- *ACR   cpu psaeepsw flg-crex psacstk- psaclhs- psalocal         timestamp---------
pca   psasuper psamodew psaclhse

PR

pr: Identifier of the processor that produced the TTE.

ASID

fail: Home address space identifier (ASID) of the failing processor

WU-Addr-

wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident

The TTE identifier, as follows:

ACR

Alternate CPU recovery.

CD/D

cpu: The failing processor address from the PSACPUPA field of the PSA
PSW----- Address-
Blank
Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
• flg-crex: LCCACREX field of the logical configuration communication area (LCCA) for the failing processor.
• psacstk: PSACSTK field from the prefix save area (PSA) from the failing processor.
• psaeeepsw: PSEEPSW field in the PSA. Bytes 1 and 2 contain the failing processor's address. Bytes 3 and 4 contain the external interruption code.
• psamodew: PSAMODEW field in the PSA
• psasuper: PSASUPER field in the PSA

PSACLHS-
psaclhs: String for the current lock held, from the PSACLHS field of the PSA from the failing processor.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA from the failing processor.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA from the failing processor.

PASD
pasd: Primary ASID (PASID) at trace entry.

SASD
sasd: Secondary ASID (SASID) at trace entry.

Time Format
timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

AINT trace entries
An AINT trace entry represents an adapter interruption.
Ident
The TTE identifier, as follows:

AINT
Adapter interruption.

CD/D
aisal: The adapter interruption source mask.

PSW----- Address-
i/o-old-pswaddr / i/o-old-pswcnt1: I/O old PSW.

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
  • isc: Interruption subclass.
  • desc: Description of the adapter types represented by the adapter interruption source mask (IQP, PCIE, Crypto, CF).

PSACLHS-
psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
pasd: Primary ASID (PASID) at trace entry.

SASD
sasd: Secondary ASID (SASID) at trace entry.

Time Format
timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry.
The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

ALTR trace entries
An ALTR trace entry represents alteration of the system trace options. Alter the options with a TRACE ST operator command.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format-</th>
<th>-------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>cp--</td>
<td>wu-addr-</td>
<td>*ALTR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PR
pr: Identifier of the processor that produced the TTE.

ASID
home: Home address space identifier (ASID) associated with the TTE.

WU-Addr-
wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).
Ident
The TTE identifier, as follows:

**ALTR**
Alteration of the trace option. An asterisk (*) always appears before ALTR to indicate an unusual condition.

**CD/D**
Blank

**PSW----- Address**
Blank

**Unique-1/Unique-2/Unique-3**
**Unique-4/Unique-5/Unique-6**

- `tobtropt`: Trace options in control register 12 format, from the TOBTROPT field of the system trace option block (TOB)
- `gpr0----`: General register 0
- `gpr1----`: General register 1
- `pol--`: The number of processor with tracing active or suspended, from the TOBTRPOL field of the TOB
- `buf--`: The number of trace buffers per processor, from the TOBTRBUF field of the TOB

**PSACLHS**
Blank

**PSACLHSE**
Blank

**PSALOCAL**
Blank

**PASD**
pasd: Primary ASID (PASID) at trace entry.

**SASD**
sasd: Secondary ASID (SASID) at trace entry.

**Time Format**
`timestamp---------`: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

**CP--**
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

**BR trace entries**
A BR trace entry represents processing of a Branch and Link (BALR), Branch and Save (BASR), Branch and Save and Set Mode (BASSM), or Branch and Stack (BAKR) instruction, when the R₂ field in the instruction is not zero. These branches are traced only when a TRACE operator command requests branch tracing by `BR=ON`.

```
PR   ASID WU-Addr- Ident  CD/D PSW----- Address-  Unique-1 Unique-2 Unique-3  PSACLHS- PSALOCAL PASD SASD Time Format-------
pr   last wu-addr- BR          address- address- address- address- address- address- etc.

PR
pr: Identifier of the processor that produced the TTE.
ASID
  Last: Last home address space identifier (ASID) in the trace buffer.

WU-Addr-
  wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
  The TTE identifier, as follows:
  BR
    Branch instruction

CD/D
  Blank

PSW----- Address-
  Unique-1/Unique-2/Unique-3
  Unique-4/Unique-5/Unique-6
PSACLHS-
PSACLHSE
PSALOCAL
PASD
SASD
  address-: Successful branch address, repeated for consecutive branches on the BR entry. Addresses appear in the following formats:

<table>
<thead>
<tr>
<th>Addressing mode and location</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-bit address</td>
<td>xxxxx</td>
</tr>
<tr>
<td>31-bit address</td>
<td>xxxxxxxx</td>
</tr>
<tr>
<td>64-bit address with zeros in high order bits</td>
<td>00_xxxxxxxx</td>
</tr>
<tr>
<td>64-bit address with non-zero high order bits</td>
<td>xxxxxxxx_xxxxxxxx</td>
</tr>
</tbody>
</table>

Time Format
  Blank

BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries
  These trace entries represent processing of a cross memory instruction:
  • A BSG trace entry represents a Branch on Subspace group (BSG) control instruction
  • A PC trace entry represents a Program Call (PC) control instruction
  • A PR trace entry represents a Program Return (PR) control instruction
  • A PT trace entry represents a Program Transfer (PT) control instruction
  • A PTI trace entry represents a Program Transfer with Instance (PTI) control instruction
  • An SSAR trace entry represents a Set Second Address Space Number (SSAR) control instruction
An SSIR trace entry represents a Set Secondary Address Space Number with Instance (SSAIR) control instruction.

**PR**: Identifier of the processor that produced the TTE.

**ASID**

last: Last home address space identifier (ASID) associated with the TTE.

**WU-Addr-**

wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**

The TTE identifier, as follows:

**PC**

Program Call control instruction

**PR**

Program Return control instruction

**PT**

Program Transfer control instruction

**PTI**

Program Transfer with Instance (PTI) control instruction

**SSAR**

Set Secondary Address Space Number control instruction

**SSIR**

Set Secondary Address Space Number with Instance (SSAIR) control instruction

**BSG**

Branch on Subspace Group control instruction

**CD/D**

Blank

**PSW----- Address-**

- **alet**: ALET word during BSG execution
- **newsasid**: New SASID from the SSAR instruction
- **return-**: Caller’s return address
- **psw-key**: Program status word (PSW) key
- **pkey-flag**: Program status word (PSW) key and flags. The flag value is either blank or a hexadecimal value of 1-3:
  - 0 - PSW bit 31 was replaced by a zero and PSW bit 31 was a zero before being replaced.
  - 1 - PSW bit 31 was replaced by a one and PSW bit 31 was a zero before being replaced.
System trace

- 2 - PSW bit 31 was replaced by a zero and PSW bit 31 was a one before being replaced.
- 3 - PSW bit 31 was replaced by a one and PSW bit 31 was a one before being replaced.

- pc-addr-: Return address from the PC instruction
- pr-addr-: New instruction address as updated by the PR instruction
- pt-addr-: New instruction address as updated by the PT instruction
- bsg-addr: New instruction address as updated by the BSG instruction

Addresses appear in the following formats:

<table>
<thead>
<tr>
<th>Addressing mode and location</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-bit address</td>
<td>xxxxxxx</td>
</tr>
<tr>
<td>31-bit address</td>
<td>xxxxxxxxxx</td>
</tr>
<tr>
<td>64-bit address with zeros in high order bits</td>
<td>00_xxxxxxxxxx</td>
</tr>
<tr>
<td>64-bit address with non-zero high order bits</td>
<td>xxxxxxxxxx_xxxxxxxxxx</td>
</tr>
</tbody>
</table>

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6

- pc#-----: PC number from the PC instruction
- pr-faddr: Address of the location following the PR instruction
- pt-asid-: New ASID specified on the PT instruction

PSACLHS-
This field will contain descriptive text for some PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

PSACLHSE
Blank

PSALOCAL
This field will contain descriptive text for some PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

PASD
pasd: Primary ASID (PASID) at trace entry. This field will contain descriptive text for some PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

SASD
sasd: Secondary ASID (SASID) at trace entry. This field will contain descriptive text for some PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

Time Format
Blank

CALL, CLKC, EMS, EXT, I/O, MCH, RST, SS, TIMR, and WTI trace entries

The following trace entries represent an interruption:

- These entries represent external interruptions:
  - A CALL trace entry is for an external call
  - A CLKC trace entry is for a clock comparator
  - An EMS trace entry is for an emergency signal
  - An EXT trace entry is for a general external interruption
  - An SS trace entry is for a service signal
  - A TIMR trace entry is for a timer interruption
- A WTI trace entry is for a warning track interruption
- A Key entry for an interrupt key interruption
- A TimA entry for a timing alert interruption
  - An I/O trace entry is for an I/O interruption
  - An MCH trace entry is for a machine check
  - An RST trace entry is for a restart

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format-</th>
<th>Unique-4</th>
<th>Unique-5</th>
<th>Unique-6</th>
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<td>Unique-6</td>
<td>Unique-4</td>
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</table>

**PR**
- Identifier of the processor that produced the TTE.

**ASID**
- Home: Home address space identifier (ASID) associated with the TTE.

**WU-Addr-**
- WU-Addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**
- The TTE identifier, as follows:

**EXT**
- General external interruption. An asterisk before EXT indicates that the interrupt is a malfunction alert (MFA) or is the result of pressing the External Interrupt key.

**I/O**
- I/O interruption. An asterisk before I/O indicates that one of the following bits in IRBFLAGS field of the interrupt request block (IRB) is ON. The IRBFLAGS field is in the Unique-1 column of the I/O entry.
  - IRBN for path not operational
  - IRBSALRT for alert status
MCH
Machine check interruption.

RST
Restart interruption.

CD/D
CALL
External call external interruption

CLCK
Clock comparator external interruption

EMS
Emergency signal external interruption

SS
Service signal external interruption

TIMR
Timer interruption

WTI
Warning track interruption

code
External interruption code

dev
Device number associated with the I/O or, for a co-processor device, the I/O co-processor identifier, for example, ADM

PSW----- Address-
The z/Architecture 128-bit PSW address appears on two lines:
• pswaddr-: Two words, containing the 64-bit address portion of the PSW
• pswctrl-: Two words, containing the 64-bit "control" portion of the PSW

The PSW represents different data, depending on the type of interrupt that was traced:
• ext-old- pswaddr- / ext-old- pswctrl-: External old program status word (PSW)
• i/o-old- pswaddr- / i/o-old- pswctrl-: I/O old PSW
• mch-old- pswaddr- / mch-old- pswctrl-: Machine check old PSW
• rst-old- pswaddr- / rst-old- pswctrl-: Restart old PSW

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
• ccw-addr: Address of the channel command word (CCW) for the I/O
• -cnt: Residual count
• dvch: Device status and subchannel status
• ext-stat: Extended status word
• flg-brsp: Maintenance and service support facility (MSSF) hardware flags and MSSF response code
• flg-ctl-: IRBFLAGS field in the IRB and the subchannel control bytes
• gpr15--- gpr0---- gpr1----: General registers 15, 0, and 1
• machine.chk-code: Machine check interruption code from the FLCMCIC filed in the prefix save area (PSA)
• msf-bcmd: Service processor command word
• mssfasid: Service processor address space ID
• mssfatcb: Service processor TCB address
• pccaemse: PCCAEMSE field from the physical configuration communication area (PCCA)
• pccaemsi: PCCAEMSI field from the PCCA
• pccaemsp: PCCAEMSP field from the PCCA
• pccarph: PCCARPB field from the PCCA
• psaeepsw: PSAEEPSW field in the PSA. For CALL and EMS, bytes 1 and 2 contain the issuing processor's address. For all entries, bytes 3 and 4 contain the external interruption code.
• psaeparm: PSAEPARM field in the PSA, containing the MSSF buffer address
• psamodew: PSAMODEW field in the PSA
• psasuper: PSASUPER field in the PSA
• tqe-asid: ASID of the associated timer queue element (TQE)
• tqe-addr: TQE address
• ucb-addr: Unit control block (UCB) address

PSACLHS
psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
pasd: Primary ASID (PASID) at trace entry.

SASD
sasd: Secondary ASID (SASID) at trace entry.

Time Format
 timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
 cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries
These trace entries represent an input/output operation:
• A CSCH trace entry represents a clear subchannel operation
• An HSCH trace entry represents a halt subchannel operation
• An MSCH trace entry represents a modify subchannel operation
• An RSCH trace entry represents a resume subchannel operation
• An SSCH trace entry represents a start subchannel operation
• An SIGA trace entry represents a signal adapter operation
An XSCH trace entry represents a cancel subchannel operation

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format-</th>
<th>PSACLHSE</th>
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<td>pr</td>
<td>asid wu-addr-</td>
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</tr>
<tr>
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<td>pr</td>
<td>asid wu-addr-</td>
<td>HSCH</td>
<td>dev cc</td>
<td>di iosbaddr</td>
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<td>asc-losb</td>
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<td>timestamp-</td>
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</tr>
</tbody>
</table>

**PR**
- pr: Identifier of the processor that produced the TTE.

**ASID**
- asid: Address space identifier (ASID) related to the I/O.

**WU-Addr-**
- wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**
- The TTE identifier, as follows:
  - **CSCH**
    - Clear subchannel operation
  - **HSCH**
    - Halt subchannel operation
  - **MSCH**
    - Modify subchannel operation
  - **RSCH**
    - Resume subchannel operation
  - **SSCH**
    - Start subchannel operation
  - **XSCH**
    - Cancel subchannel operation
  - **SIGA**
    - Signal adapter operation

An asterisk before RSCH, SSCH, or SIGA indicates that the condition code associated with the I/O was not 0.

**CD/D**
- dev: One of the following:
  - The device number associated with the I/O, which will include the subchannel set identifier when appropriate.
  - ADMF, if the IOSADMF macro was transferring data
PSW----- Address-

- cc: Condition code in bits 2 and 3 associated with the I/O
- di: Driver identifier associated with the I/O
- fc: Function code associated with the I/O
- iosbaddrz: I/O supervisor block (IOSB) address associated with the I/O
- qib-addrz: Queue identification block (QIB) address associated with the I/O

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6

- asc-iosb: IOSB address for the associated SSCH request for the I/O
- bdev: The base device number if the I/O is associated with an alias device.
- cap-addrz: Captured unit control block (UCB) address associated with the SSCH I/O. This field is blank if a below 16 megabyte UCB or actual above 16 megabyte UCB address was used for the start subchannel (SSCH) operation. The address of the actual above 16 megabyte UCB is in the ucb-addrz field.
- f1f2pmom: From the subchannel information block (SCHIB) associated with the I/O, as follows:
  
  f1
  SCHFLG1 flag field

  f2
  SCHFLG2 flag field

  pm
  SCHLPM field

  om
  SCHPOM field

- ioq-addrz: I/O queue (IOQ) address associated with the I/O
- mbi-t2lb:
  
  mbi-
  SCHMBI field from the SCHIB

  t2
  IOSOPT2 field from theIOSB

  lb
  IOSFLB field from the IOSB

- orb-wrd2: Word 2 of the operation request block (ORB) associated with the I/O
- orb-wrd3: Word 3 of the operation request block (ORB) associated with the I/O
- orb-wrd4: Word 4 of the operation request block (ORB) associated with the I/O
- q-mask-1: Read or write queue mask associated with the I/O
- q-mask-2: Read queue mask associated with the I/O
- subsysid: Subsystem ID associated with the I/O
- ucb-addrz: Unit control block (UCB) address associated with the I/O

PSACLUSH-
This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

PSACLHSE
Blank

PSALOCAL
This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.
PASD
This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

SASD
This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

Time Format
- timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
- cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

DSP, SRB, SSRB, and WAIT trace entries
These trace entries represent the dispatch of a unit of work:
- A DSP trace entry represents dispatch of a task
- An SRB trace entry represents the initial dispatch of a service request
- An SSRB trace entry represents dispatch of a suspended service request
- A WAIT trace entry represents dispatch of the wait task

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Identity</th>
<th>CD/D</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>timestamp---------</td>
<td>----</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PR
- pr: Identifier of the processor that produced the TTE.

ASID
- home: Home address space identifier (ASID) associated with the TTE.

WU-Addr-
- wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
- The TTE identifier, as follows:
  - DSP
    - Task dispatch
  - SRB
    - Initial service request dispatch
  - SSRB
    - Suspended service request dispatch
WAIT
    Wait task dispatch

CD/D
    Blank

PSW----- Address-
    The z/Architecture 128-bit PSW address appears on two lines:
    • pswaddr: Two words, containing the 64-bit address portion of the PSW
    • pswctrl: Two words, containing the 64-bit "control" portion of the PSW

    The PSW represents different data, depending on the type of work that was dispatched:
    • dsp-new- pswaddr / dsp-new- pswctrl: Program status word (PSW) to be dispatched
    • srb-new- pswaddr / srb-new- pswctrl: PSW to receive control on the SRB dispatch
    • ssrb-new pswaddr / ssrb-new pswctrl: PSW to receive control on the SSRB redispatch

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
    • gpr0----: General register 0
    • gpr1----: General register 1
    • psamodew: PSAMODEW field in the PSA
    • safnasid: LCCASAFN field in the logical configuration communication area (LCCA) and the related ASID
    • flg-srb: SRBFLGS field from the SRB
    • purgetcb: TCB (located in address space of the scheduler of the SRB or SSRB) that gets control if the SRB or SSRB abends and percolates

PSACLHS-
    • psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.
    • psaclhs4: PSACLHS4 field of the PSA
    • srbh1hi-: SRBHLHI field in the SRB

    This field will contain descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

PSACLHSE
    Blank

PSALOCAL
    psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA. This field will contain descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

PASD
    pasd: Primary ASID (PASID) at trace entry. This field will contain descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

SASD
    sasd: Secondary ASID (SASID) at trace entry. This field will contain descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

Time Format
    timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).
CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

MODE and MOBR trace entries

These trace entries represent a change of addressing mode:

- A MODE trace entry represents a change into or out of 64-bit addressing mode
- A MOBR trace entry represents a change into or out of 64-bit addressing mode along with a change of instruction address

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format-------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>last</td>
<td>wu-addr-</td>
<td>MODE</td>
<td>target</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>etc.</td>
<td></td>
<td></td>
<td>so on</td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>wu-addr-</td>
<td>MOBR</td>
<td>target</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PR
pr: Identifier of the processor that produced the TTE.

ASID
last: Last home address space identifier (ASID) in the trace buffer.

WU-Addr-
wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
The TTE identifier, as follows:

MODE
Addressing mode change instruction

MOBR
Addressing mode change combined with a branch instruction

CD/D
Blank

PSW-----
target: Target addressing mode.

24 OR 31
Target addressing mode is either 24-bit or 31-bit.

64
Target addressing mode is either 64-bit.

Address-
Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
PSACLHS-
PSACLHSE
PSALOCAL
PASD
SASD
address-: Target address. Addresses appear in the following formats:

<table>
<thead>
<tr>
<th>Addressing mode and location</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-bit address</td>
<td>xxxxxxx</td>
</tr>
</tbody>
</table>
### Addressing mode and location

| 31-bit address | xxxxxxxx |
| 64-bit address with zeros in high-order bits | 00_xxxxxxx |
| 64-bit address with nonzero high-order bits | xxxxxxxx_xxxxxxx |

### Time Format

- Blank

| CP-- | Blank |

### PCIL trace entries

A PCIL trace represents a PCI load instruction.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time</th>
<th>Format-</th>
<th>-------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>wu-addr-</td>
<td>PCIL</td>
<td>pfid</td>
<td>cc</td>
<td>traceid</td>
<td>operand1</td>
<td>operand1</td>
<td>operand1</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cp-</td>
<td>pr</td>
<td>home wu-addr-</td>
<td>PCIL</td>
<td>pfid</td>
<td>cc</td>
<td>traceid</td>
<td>operand1</td>
<td>operand1</td>
<td>operand1</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **PR**: Identifier of the processor that produced the TTE.
- **ASID**: Home address space identifier (ASID) associated with the TTE.
- **WU-Addr-**: Address of the task control block (TCB) for the current task or the work element block (WEB).
- **Ident**: The TTE identifier, as follows:
  - **PCIL**: PCI load instruction.
- **CD/D**: pfid: The PCIE function identifier for the PCIE device.
- **PSW-----**: Address-
  - cc: Condition code from the PCI load instruction.
  - reqaddr: Address of the program that requested the PCI load instruction to be issued.
- **Unique-1/Unique-2/Unique-3**
- **Unique-4/Unique-5/Unique-6**
  - traceid: Program defined trace identifier that can be used to determine why the PCI load instruction is being issued.
  - operand1_operand1: First operand on the PCI load instruction.
  - operand2_operand2: Second operand on the PCI load instruction.
  - operand3_operand3: Third operand on the PCI load instruction.
- **PSACLHS-**
  - psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.
- **PSACLHSE**
  - psaclhs: Extended string for the current lock held, from the PSACLHSE field of the PSA.
**PSALOCAL**
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

**PASD**
pasd: Primary ASID (PASID) at trace entry.

**SASD**
sasd: Secondary ASID (SASID) at trace entry.

**Time Format**
timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

**CP--**
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

### PCIS trace entries

A PCIS trace represents a PCI store instruction.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format--</th>
<th>-------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>wu-addr-</td>
<td>PCIS</td>
<td>pfid</td>
<td>cc</td>
<td>reqaddr-</td>
<td>traceid</td>
<td>operand1_operand1</td>
<td>operand2_operand2</td>
<td>operand3_operand3</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>timestamp---------</td>
<td>-------</td>
<td></td>
</tr>
</tbody>
</table>

**PR**
pr: Identifier of the processor that produced the TTE.

**ASID**
home: Home address space identifier (ASID) associated with the TTE.

**WU-Addr-**
wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**
The TTE identifier, as follows:

**PCIS**
PCI store instruction.

**CD/D**
pfid: The PCIE function identifier for the PCIE device.

**PSW----**
Address-

- cc: Condition code from the PCI store instruction.
- reqaddr: Address of the program that requested the PCI store instruction to be issued.

**Unique-1/Unique-2/Unique-3**

**Unique-4/Unique-5/Unique-6**

- traceid: Program defined trace identifier that can be used to determine why the PCI store instruction is being issued.
- operand1_operand1: First operand on the PCI store instruction.
- operand2_operand2: Second operand on the PCI store instruction.
- operand3_operand3: Third operand on the PCI store instruction.
PSACLHS-
psaclhs: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
pasd: Primary ASID (PASID) at trace entry.

SASD
sasd: Secondary ASID (SASID) at trace entry.

Time Format
timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

PDMX trace entries

A PDMX trace represents a PCIE adapter interruption de-multiplexing event.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format--------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>wu-addr-</td>
<td>PDMX</td>
<td>pfid</td>
<td>pdmxaddr</td>
<td>devtype</td>
<td>cback@</td>
<td>cbparm1</td>
<td>cbparm2</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td></td>
<td></td>
<td>timestamp----------</td>
</tr>
<tr>
<td>cp-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>psaclhse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PR
pr: Identifier of the processor that produced the TTE.

ASID
home: Home address space identifier (ASID) associated with the TTE.

WU-Addr-
wu-addr: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
The TTE identifier, as follows:

PDMX
PCIE adapter interruption de-multiplexing event.

CD/D
pfid: PCIE function identifier for the PCIE device.

PSW----- Address-
pdmxaddr: Address of the program that is performing the de-multiplexing.

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
• devtype: PCIE device type.
• cback@: Callback routine address.
• cbparm1: First word of callback routine parameters.
• cbparm2: Second word of callback routine parameters.
PSACLHS-
    psaclhs: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
    psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
    psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
    pasd: Primary ASID (PASID) at trace entry.

SASD
    sasd: Secondary ASID (SASID) at trace entry.

Time Format
    timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
    cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

PGM, SPER and SPR2 trace entries

These trace entries represent a program event:

- A PGM trace entry is for a program interrupt
- An SPER trace entry is for a PER event requested in a SLIP trap
- An SPR2 trace entry is for a PER event requested in a SLIP trap, when the STDATA keyword is specified on the trap

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/O</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>Unique-4</th>
<th>Unique-5</th>
<th>Unique-6</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format--------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>cp--</td>
<td>home</td>
<td>wu-addr-</td>
<td>PGM</td>
<td>code</td>
<td>pswaddr-</td>
<td>ilc-code</td>
<td>tea------</td>
<td>pswctrl-</td>
<td></td>
<td></td>
<td></td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp---------</td>
</tr>
<tr>
<td>pr</td>
<td>cp--</td>
<td>home</td>
<td>wu-addr-</td>
<td>SPER</td>
<td>code</td>
<td>pswaddr-</td>
<td>ilc-code</td>
<td>trap-----</td>
<td>per-addH</td>
<td>per-addL</td>
<td></td>
<td></td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp---------</td>
</tr>
<tr>
<td>pr</td>
<td>cp--</td>
<td>home</td>
<td>wu-addr-</td>
<td>SPR2</td>
<td>code</td>
<td>pswaddr-</td>
<td>var1</td>
<td>var2</td>
<td>var3</td>
<td>var4</td>
<td>var5</td>
<td>spc-exc</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp---------</td>
</tr>
</tbody>
</table>

PR
    pr: Identifier of the processor that produced the TTE.

ASID
    home: Home address space identifier (ASID) associated with the TTE.

WU-Addr-
    wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
    The TTE identifier, as follows:

    PGM
    Program interruption. An asterisk (*) before PGM indicates an unusual condition. PGM trace entries for program interrupts that may be resolved are not flagged. If the program interrupt is not resolved, then a subsequent RCVY trace entry is created and flagged with an asterisk.
SPER
SLIP program event recording

CD/D
- code for PGM entry: Program interruption code
- code for SPER entry: PER number

PSW----- Address-
The z/Architecture 128-bit old PSW appears on two lines:
- pswwaddr: Two words, containing the 64-bit address portion of the PSW
- pswwctrl: Two words, containing the 64-bit “control” portion of the PSW

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
- ilc-code: Instruction length code and interruption code.
- per-addH: high-order bits of the SLIP/PER status address.
- per-addL: low-order bits of the SLIP/PER status address.
- tea-----: Translation exception address. In the high-order bit, 0 indicates primary and 1 indicates secondary.
- trap-----: SLIP/PER trap identifier in the form ID=xxxx.
- var1, var2, var3, var4, var5: Each contains one word of variable data as specified by the STDATA keyword.
- spc-exc: The message SpaceExc if more than five words of variable data are requested in the STDATA keyword.

PSACLHS-
psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
pasd: Primary ASID (PASID) at trace entry.

SASD
sasd: Secondary ASID (SASID) at trace entry.

Time Format
timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

RCVY trace entries
A RCVY trace entry represents entry into a recovery routine following an error or interruption. Several types of recovery events require reentry in a new environment or address space. Table 33 on page 180 summarizes when an RCVY trace event requires reentry. RCVY also writes records to the system trace table for ESTAE type recovery exits and when the ESTAE type recovery exit requests retry.
### Table 33. RCVY trace events that require reentry

<table>
<thead>
<tr>
<th>Trace Entry for Recovery Event</th>
<th>Reentry</th>
<th>Trace Entry for Reentry</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCVY ABT</td>
<td>Required only if the task to be ended resides in an address space other than the current home address space</td>
<td>RCVY ABT, if the unit of work ending is in SRB mode, is locally locked, or has an EUT FRR established</td>
</tr>
<tr>
<td>RCVY ITRM</td>
<td>Always required</td>
<td>RCVY ITRR, if the unit of work ending is locally locked or has an EUT FRR established</td>
</tr>
<tr>
<td>RCVY MEM</td>
<td>Always required</td>
<td>RCVY MEMR</td>
</tr>
<tr>
<td>RCVY ABTR</td>
<td>Always required</td>
<td>RCVY RCMR</td>
</tr>
<tr>
<td>RCVY RCMŁ</td>
<td>Always required</td>
<td>RCVY RCML</td>
</tr>
<tr>
<td>RCVY STRM</td>
<td>Always required</td>
<td>RCVY STRR, if the unit of work ending is in SRB mode, is locally locked, or has an EUT FRR established</td>
</tr>
</tbody>
</table>

**PR**

*pr:* Identifier of the processor that produced the TTE.
ASID
    Home address space identifier (ASID) associated with the TTE.

WU-Addr-
    \texttt{wu-addr-}: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
    The TTE identifier, as follows:

RCVY
    Recovery event. An asterisk (*) always appears before RCVY to indicate an unusual condition.

CD/D
    Type of recovery event, as follows:
    • ABRT: Abort processing for an unrecoverable error during any recovery termination management (RTM) processing
    • ABT: Request for abnormal end of a task by a CALLRTM TYPE=ABTERM macro, with a system or user completion code
    • ABTR: Rescheduling of a CALLRTM TYPE=ABTERM request for end of a task, when the task is not in the home address space
    • DAT: RTM1 entered for a dynamic address translation (DAT) error
    • ESTA: RTM has set up this ESTAE type recovery exit to receive control. Note that when a RCVY ESTA record follows another RCVY ESTA record without an intervening RCVY ESTR record, this implies that the first recovery exit either abended or percolated
    • ESTR: Retry was requested by this ESTAE type recovery exit. The exit and scb fields in this record can be used to help match it to its corresponding RCVY ESTA record.
    • FRR: RTM1 processing to invoke a function recovery routine (FRR)
    • ITRM: The system requested RTM1 to end an interrupted task
    • ITRR: ITRM reentry, to process a request to end an interrupted task
    • MCH: RTM1 entered for a machine check interruption
    • MEM: Request for abnormal memory end by a CALLRTM TYPE=MEMTERM macro, with a completion code
    • MEMR: Processing for an abnormal memory end following a MEM event
    • PROG: RTM1 was entered for a program check interruption
    • RCML: RTM1 was entered to perform special end processing for a task in a failing address space. The failing address space held the local lock of another address space.
    • RCMR: RCML reentry, to process an abnormal end by a resource manager
    • RESM: Resume from an FRR after a RESTART request following an RSRT entry
    • RSRT: RTM entered for a RESTART request from the operator
    • RTRY: Retry from an FRR
    • SABN: The system requested RTM1 to end abnormally the current unit of work
    • SKFE: RTM has bypassed giving control to a FESTAE recovery exit because its address is zero. This situation can happen because of a timing window in FESTAE processing, in which case it is not a concern
    • SPRC: Final percolation from service request block (SRB) recovery
    • SRBT: Request for abnormal termination of a pre-emptable SRB by a CALLRTM TYPE=SRBTERM macro, with a system or user completion code
    • STRM: The system requested RTM1 to end abnormally a suspended task
    • STRR: STRM reentry, to process the abnormal end of a suspended task
PSW----- Address-
For the RESM and RTRY entries, this field contains the z/Architecture 128-bit old PSW, which appears on two lines:

- pswaddr---: Two words, containing the 64-bit address portion of the PSW
- pswctrl---: Two words, containing the 64-bit "control" portion of the PSW
- exit------: Address of an ESTAE type recovery exit. This is always zero for RCVY SKFE entries.
- retry--- retry---: Retry address requested by an ESTAE type recovery exit. When retry is to CVTBSM0F, contains the contents of 64-bit GPR15 at the time of the retry request instead of the address of CVTBSM0F.

The frr-new- psw------ field contains the new program status word (PSW) to give control to the FRR. For all other types of recovery events, the return--- field contains the caller's return address.

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6

- alet------: Contains the ALET of the parameter area for ESTAE type recovery exits with an ALET qualified parameter area pointer. Otherwise, it contains zero.
- asid------: Target ASID for end processing.
  - In a SPRC entry, the ASID is for the task that will be abnormally ended by SRB-to-task percolation. If this field and the tcb------ field are zero, then no SRB-to-task percolation is performed.
- exit------: Contains the ESTAE type recovery exit address
- comp------: System or user completion code
- cpu------: Target processor for a restart error indicated on a request for an FRR resume, after an operator RESTART request
- fpw------: FRR processing word, in the following format:

```
rsxxxxxp xxxxxxxx ssssssss eeeeee
```

- r
  - Bit 0 = 1 means a resource manager entry to the FRR
- s
  - Bit 1 = 1 means the FRR was skipped
- p
  - Bit 7 = 0 means a not serialized SRB-to-task percolation
  - Bit 7 = 1 means a serialized SRB-to-task percolation

- ssssssss
  - The stack index, which is an index of the FRR stack. The index means the following:
    - 0 Normal stack
    - 1 SVC I/O dispatcher super stack
    - 2 Machine check super stack
    - 3 PC FLIH super stack
    - 4 External FLIH super stack 1
    - 5 External FLIH super stack 2
    - 6 External FLIH super stack 3
    - 7 Restart super stack
    - 8 ACR super stack
    - 9 RTM super stack
The entry index, which is an index of the FRR entry on the stack. The index ranges from 0 through 16. If the current stack is a super stack, an index of 0 indicates a super FRR.

- **parm**: Contains the 31-bit parameter address, or the lower 32 bits of the 64-bit parameter address, which is provided to the ESTAE type recovery exit when it gains control.

- **parm64**: Contains the upper 32 bits of the 64-bit parameter address when the ESTAE type recovery exit was established in AMODE 64.

- **pppp**: PSW of the interrupted unit of work.
  - The instruction in the PSW may not be the cause of the failure. For example, an interruption can occur because a time limit expired, so that the interrupted instruction is not at fault.

- **psasuper**: PSASUPER field in the prefix save area (PSA)

- **rc**: Return code from CALLRTM

- **reas**: Reason code accompanying the completion code appearing in the entry. If not provided, NONE.

- **srbidtoken**: Uniquely identifies the preemptable SRB, provided via the IEAMSC HD macro and consisting of four unique words on the second line for the RCVY SRBT trace entry only.

- **tasn**: Target ASID for RCML reentry

- **tcb**: Target task control block (TCB) for end processing
  - In a SPRC entry, the TCB is for the task that will be abnormally ended by SRB-to-task percolation. If this field and the asid field are zero, then no SRB-to-task percolation is performed.
  - In a STRM or STRR entry, a TCB address of zero indicates that the request was for ending of a suspended SRB.

- **trk**: RTM1 error tracking area

- **scb**: Contains the address of the STAE control block that represents this ESTAE type recovery exit. Note that for ARR and IEAARR recovery routines, RTM creates a 'pseudo-SCB'. Thus the same SCB address can be seen for multiple ARR or IEAARR recovery exits.

- **sdwa**: Contains the address of the system diagnostic work area that is provided to the ESTAE type recovery exit. If no SDWA is available to the exit, the field contains 0000000C

**PSACLHS**

- **psaclhs**: String for the current lock held, from the PSACLHS field of the PSA.

**PSACLHSE**

- **psaclhse**: Extended string for the current lock held, from the PSACLHSE field of the PSA.

**PSALOCAL**

- **psalocal**: Locally locked address space indicator, from the PSALOCAL field of the PSA.

**PASD**

- **pasd**: Primary ASID (PASID) at trace entry.

**SASD**

- **sasd**: Secondary ASID (SASID) at trace entry.

**Time Format**

- **timestamp**: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

**CP**

- **cp**: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.
SPIN trace entries

A SPIN trace entry represents the starting (at least one second in), the middle (when special processing is done), or the stopping of a system spin attempting to obtain a resource. The spinning module will identify the resource within the trace entry.

| PR | ASID | WU-Addr- | Ident | CD/D | PSW----- | Address- | Unique-1 | Unique-2 | Unique-3 | Unique-4 | Unique-5 | Unique-6 | PSACLHS- | PSALOCAL | PASD | SASD | Time | Forex | CP-- |
|----|------|----------|-------|------|----------|----------|---------|---------|---------|---------|---------|---------|---------|----------|----------|------|------|------|-------|------|
| pr | home | wu-addr- | SPIN  | SRC/| SPIN    | return-- | spin-dur | holder-- | rstrscid | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | ACO/| SPIN    | return-- | spin-dur | holder-- | infncode | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | BBR/| SPIN    | return-- | spin-dur | cpu-spin | infncode | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | INT/| SPIN    | return-- | spin-dur | cpu-spin | infncode | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | LKX/| SPIN    | return-- | spin-dur | lockword | lock-add | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | RI/ | SPIN    | return-- | spin-dur | cpu-spin | req-code | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | SG0/| SPIN    | return-- | spin-dur | cpu-spin | para-reg | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | SPN/| SPIN    | return-- | spin-dur | cpu-spin | reg0--- | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |
| pr | home | wu-addr- | SPIN  | MTC/| SPIN    | return-- | spin-dur | phycpu-- | asid---- | psalhs- | psalocal | pasd | sasd | timestamp | cp-- |

PR
pr: Identifier of the processor that produced the TTE.

ASID
home: Home address space identifier (ASID) associated with the TTE.

WU-Addr-
wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
The TTE identifier, as follows:

SPIN
System spin.

CD/D
The CD/D field indicates the spinning module, using the last two or three characters of its module name, followed by a forward slash (/) and S (start), M (middle), or P (stop). For more information about each spinning module, see “Spinning modules” on page 185.

PSW----- Address-
return--: Caller’s return address

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
For more information about each spinning module, see “Spinning modules” on page 185.

PSACLHS-
psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
pasd: Primary ASID (PASID) at trace entry.

SASD
sasd: Secondary ASID (SASID) at trace entry.
Time Format

timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry.
The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

Spinning modules

The following section summarize information about the spinning modules.

BLWRESRC

CD/D

SRC/S
The start spin entry of the BLWRESRC module.

SRC/P
The stop spin entry of the BLWRESRC module.

Unique-1

spin-dur
Spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2

holder--
CPU that is a current holder.

Unique-3

rstrscid
The restart resource ID of the caller (input parameter 1).

IEAVEAC0

CD/D

AC0/S
The start spin entry of the IEAVEAC0 module.

AC0/P
The stop spin entry of the IEAVEAC0 module.

Unique-1

spin-dur
The spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2

holder--
CPU that is a current holder.

Unique-3

infncode
The input function code.

Unique-4

ascb-add
Current_ASCB
System trace

Unique-5
inp-parm
  input_parm

IEAVEBRR
CD/D
  BBR/S
  The start spin entry of the IEAVEBRR module.
  BBR/P
  The stop spin entry of the IEAVEBRR module.

Unique-1
spin-dur
  The spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2
cpu-spin
  The CPU address being spun for.

Unique-3
infncode
  The input function code.

Unique-4
reg1----
  input reg 1: when applicable, the ASID in bits 16-31.

IEAVEINT
CD/D
  INT/S
  The start spin entry of the IEAVEINT module.
  INT/P
  The stop spin entry of the IEAVEINT module.

Unique-1
spin-dur
  The spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2
cpu-spin
  The CPU address being spun for.

IEAVELKX
CD/D
  LKX/S
  The start spin entry of the IEAVELKX module.
  LKX/P
  The stop spin entry of the IEAVELKX module.

Unique-1
spin-dur
  Spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).
Unique-2
  lockword
  The lock word that contains the CPU address being spun for.

Unique-3
  lock-add
  Input reg 11 (lockword address).

Unique-4
  pllhsom-
  Lock held obtained mask (PLLHSOM, via input reg 12).

Unique-5
  plclhsp-
  Lock held string pointer (PLCLHSP, via input reg 12).

Unique-6
  lock-ent
  Input reg 13. The lock routine entry point address.

IEAVERI
CD/D
  RI/S
  The start spin entry of the IEAVERI module.
  RI/M
  The middle spin entry of the IEAVERI module.
  RI/P
  The stop spin entry of the IEAVERI module.

Unique-1
  spin-dur
  The spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2
  cpu-spin
  The CPU address being spun for.

Unique-3
  req-code
  Input register 0. Request code and, when appropriate, ASID.

Unique-4
  rcv-addr
  Input reg 12. Receiving routine's entry point address.

Unique-5
  pccaaddr
  Input reg 1. PCCA address of the receiving CPU. If this identifies the same CPU as Unique 2,
  Unique 2 value can be used.

IEAVESGP
CD/D
  SGP/S
  The start spin entry of the IEAVESGP module.
  SGP/P
  The stop spin entry of the IEAVESGP module.
System trace

Unique-1

spin-dur
Spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2

cpu-spin
The CPU address being spun for.

Unique-3

para-reg
Input reg 1. Parameter register for status and prefix order codes.

Unique-4

sigpcode
Input reg 2. The SIGP order code.

Unique-5

sigpstat
The status returned from the last SIGP

IEAVESPN

CD/D

SPN/S
The start spin entry of the IEAVESPN module.

SPN/P
The stop spin entry of the IEAVESPN module.

Unique-1

spin-dur
The spin duration so far (bytes 3, 4, 5, and 6 of time since the start of spin).

Unique-2

cpu-spin
The CPU address being spun for.

Unique-3

reg0----
Input reg 0.

Unique-4

reg1----
Input reg 1.

Unique-5

reg3----
Input reg 3.

IEAVTMTC

CD/D

MTC/S
The start spin entry of the IEAVTMTC module.

MTC/P
The stop spin entry of the IEAVTMTC module.

Unique-1

spin-dur
The spin duration so far (bytes 3,4,5, and 6 of time since the start of spin).
**Unique-2**

**phycpu--**

The physical CPU number of some CPU that is still running with the terminating ASCB for "S" and 0 for "P". If an ACR condition is encountered, value can also be 0 for "S".

**Unique-3**

**asid----**

The ASID that is the target of CALLRTM TYPE=MEMTERM.

**SSRV trace entries**

An SSRV trace entry represents entry to a system service. The service can be entered by a PC instruction or a branch.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format-------</th>
</tr>
</thead>
<tbody>
<tr>
<td>cp--</td>
<td></td>
<td></td>
<td></td>
<td>CP--</td>
<td>Unique-4</td>
<td>Unique-5</td>
<td>Unique-6</td>
<td>PSACLHSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PR**

*pr*: Identifier of the processor that produced the TTE.

**ASID**

*home*: Home address space identifier (ASID) associated with the TTE.

**WU-Addr-**

*wu-addr-*: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**

The TTE identifier, as follows:

**SSRV**

Request for a system service

**CD/D**

*ssid*: One of the following SSRV entry identifiers:

<table>
<thead>
<tr>
<th>ssid (hexadecimal)</th>
<th>Macro for SSRV Request</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>WAIT</td>
<td>Task management</td>
</tr>
<tr>
<td>0002</td>
<td>POST</td>
<td>Task management</td>
</tr>
<tr>
<td>0004</td>
<td>GETMAIN</td>
<td>Virtual storage management</td>
</tr>
<tr>
<td>0005</td>
<td>FREEMAIN</td>
<td>Virtual storage management</td>
</tr>
<tr>
<td>000A</td>
<td>GETMAIN, FREEMAIN</td>
<td>Virtual storage management</td>
</tr>
<tr>
<td>005F</td>
<td>SYSEVENT</td>
<td>System resource manager</td>
</tr>
<tr>
<td>0078</td>
<td>GETMAIN, FREEMAIN</td>
<td>Virtual storage management</td>
</tr>
<tr>
<td>007A</td>
<td>SPI, SPIINT</td>
<td>Service processor interface</td>
</tr>
<tr>
<td>0100</td>
<td>ETCON</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0101</td>
<td>ETCRE</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0102</td>
<td>ATSET</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0103</td>
<td>AXSET</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0104</td>
<td>AXEXT</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>ssid (hexadecimal)</td>
<td>Macro for SSRV Request</td>
<td>Component</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>0105</td>
<td>AXFRE</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0106</td>
<td>AXRES</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0107</td>
<td>ETDES</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0108</td>
<td>ETDIS</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>0109</td>
<td>LXFRE</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>010A</td>
<td>LXRES</td>
<td>PC/AUTH</td>
</tr>
<tr>
<td>010E</td>
<td>SUSPEND</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>010F</td>
<td>RESUME</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0110</td>
<td>SCHEDULE</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0111</td>
<td>SCHEDULE</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0112</td>
<td>SCHEDULE</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0113</td>
<td>DSGNL</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0114</td>
<td>RISGNL</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0115</td>
<td>RPSGNL</td>
<td>Supervisor control</td>
</tr>
<tr>
<td>0116</td>
<td>SCHEDULE</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>0117</td>
<td>SCHEDULE</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>0118</td>
<td>SUSPEND</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>0119</td>
<td>RESUME</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011A</td>
<td>RESUME</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011B</td>
<td>RESUME</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011C</td>
<td>SCHEDULE</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011D</td>
<td>IEAMSCHD</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011E</td>
<td>Pause (IEAVPSE / IEAVPSE2 / IEA4PSE / IEA4PSE2)</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011F</td>
<td>Release (IEAVRLS / IEAVRLS2 / IEA4RLS / IEA4RLS2)</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>0120</td>
<td>Timer DIE</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>0128</td>
<td>WAIT</td>
<td>Task management</td>
</tr>
<tr>
<td>0129</td>
<td>POST</td>
<td>Task management</td>
</tr>
<tr>
<td>012A</td>
<td>POST</td>
<td>Task management</td>
</tr>
<tr>
<td>012B</td>
<td>POST</td>
<td>Task management</td>
</tr>
<tr>
<td>012C</td>
<td>ASCBCHAP</td>
<td>Task management</td>
</tr>
<tr>
<td>012D</td>
<td>STATUS</td>
<td>Task management</td>
</tr>
<tr>
<td>012E</td>
<td>STATUS</td>
<td>Task management</td>
</tr>
<tr>
<td>0132</td>
<td>STORAGE OBTAIN</td>
<td>Virtual storage management</td>
</tr>
<tr>
<td>0133</td>
<td>STORAGE RELEASE</td>
<td>Virtual storage management</td>
</tr>
<tr>
<td>0146</td>
<td>SPI, SPIINT</td>
<td>Service processor interface</td>
</tr>
<tr>
<td>014B</td>
<td>IARV64</td>
<td>Real storage management</td>
</tr>
<tr>
<td>ssid (hexadecimal)</td>
<td>Macro for SSRV Request</td>
<td>Component</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>014C</td>
<td>ISGENQ</td>
<td>Global resource serialization</td>
</tr>
<tr>
<td>014D</td>
<td>ENQ/RESERVE</td>
<td>Global resource serialization</td>
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<tr>
<td>014E</td>
<td>DEQ</td>
<td>Global resource serialization</td>
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<tr>
<td>014F</td>
<td>SYSCALL</td>
<td>UNIX System Services</td>
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<tr>
<td>0150</td>
<td>ICYDIE</td>
<td>DFSMS Media Manager</td>
</tr>
<tr>
<td>0151</td>
<td>CHANGKEY</td>
<td>Real storage management</td>
</tr>
<tr>
<td>1050</td>
<td>CF CPU command or internal request</td>
<td>Reconfiguration</td>
</tr>
</tbody>
</table>

PSW----- Address- return--:

- For PC/AUTH, supervisor control, and task management: Caller’s return address if the service was entered by a branch; 0 if the service was entered by a PC instruction
- For virtual storage management: For SSRV 132 (Storage Obtain) and SSRV 133 (Storage Release), it is the ALET. For other VSM SSRVs (004, 005, 00A, 078), it is the caller’s return address.
- For z/OS UNIX System Services: the syscall code.
- For real storage management: Bytes as follows:

<table>
<thead>
<tr>
<th>0</th>
<th>Request type identifier:</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>GETSTOR</td>
</tr>
<tr>
<td>02</td>
<td>GETSHARED</td>
</tr>
<tr>
<td>03</td>
<td>DETACH</td>
</tr>
<tr>
<td>04</td>
<td>PAGEFIX</td>
</tr>
<tr>
<td>05</td>
<td>PAGEUNFIX</td>
</tr>
<tr>
<td>06</td>
<td>PAGEOUT</td>
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<tr>
<td>07</td>
<td>DISCARDDATA</td>
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<td>08</td>
<td>PAGEIN</td>
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<td>09</td>
<td>PROTECT</td>
</tr>
<tr>
<td>0A</td>
<td>SHAREMEMOBJ</td>
</tr>
<tr>
<td>0B</td>
<td>CHANGEACCESS</td>
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<tr>
<td>0C</td>
<td>UNPROTECT</td>
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<td>0D</td>
<td>CHANGEGUARD</td>
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<tr>
<td>0F</td>
<td>GETCOMMON</td>
</tr>
<tr>
<td>11</td>
<td>PCIEFIX</td>
</tr>
<tr>
<td>12</td>
<td>PCIEUNFIX</td>
</tr>
</tbody>
</table>

1 GETSTOR GETSHARED Request flags:

- 1... .... COND=YES request
- .1... .... FPROT=NO request
- ..1... .... CONTROL=AUTH request (only applies to GETSTOR)
- ...1 .... SVCDUMPRGN=NO request (only applies to GETSTOR)
- .... 1... CHANGEACCESS = GLOBAL request (only applies to GETSHARED)
<table>
<thead>
<tr>
<th>Request type identifier</th>
<th>DETACH Request flags</th>
<th>SHAREMEMOBJ Request flags</th>
<th>CHANGEGUARD Request flags</th>
<th>PAGEFIX Request flags</th>
<th>DISCARDDATA Request flags</th>
<th>CHANGEACCESS Request flags</th>
<th>GETCOMMON Request flags</th>
<th>PCIEFIX Request flags</th>
<th>Keys Used flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUARDLOC=HIGH request (only applies to GETSTOR)</td>
<td>COND=YES request</td>
<td>MATCH=USERTOKEN request</td>
<td>AFFINITY=SYSTEM request</td>
<td>OWNER=NO request</td>
<td>COND=YES request</td>
<td>SVCDUMPRGN=NO request</td>
<td>COND=YES request</td>
<td>TOGUARD request</td>
<td>FROMGUARD request</td>
</tr>
<tr>
<td>COND=YES request</td>
<td>MATCH=USERTOKEN request</td>
<td>AFFINITY=SYSTEM request</td>
<td>OWNER=NO request</td>
<td>LONG=NO request</td>
<td>CLEAR=NO request</td>
<td>KEEPREAL=NO request</td>
<td>COND=YES request</td>
<td>TOGUARD request</td>
<td>FROMGUARD request</td>
</tr>
<tr>
<td>READONLY request</td>
<td>SHAREDWRITE request</td>
<td>HIDDEN request</td>
<td>GETCOMMON Request flags</td>
<td>COND=YES request</td>
<td>FPROT=NO request</td>
<td></td>
<td>GETCOMMON Request flags</td>
<td>COND=YES request</td>
<td>FPROT=NO request</td>
</tr>
<tr>
<td>COND=YES request</td>
<td>MATCH=USERTOKEN request</td>
<td>AFFINITY=SYSTEM request</td>
<td>OWNER=NO request</td>
<td>LONG=NO request</td>
<td>CLEAR=NO request</td>
<td>KEEPREAL=NO request</td>
<td>COND=YES request</td>
<td>TOGUARD request</td>
<td>FROMGUARD request</td>
</tr>
<tr>
<td>COND=YES request</td>
<td>MATCH=USERTOKEN request</td>
<td>AFFINITY=SYSTEM request</td>
<td>OWNER=NO request</td>
<td>LONG=NO request</td>
<td>CLEAR=NO request</td>
<td>KEEPREAL=NO request</td>
<td></td>
<td>TOGUARD request</td>
<td>FROMGUARD request</td>
</tr>
<tr>
<td>COND=YES request</td>
<td>MATCH=USERTOKEN request</td>
<td>AFFINITY=SYSTEM request</td>
<td>OWNER=NO request</td>
<td>LONG=NO request</td>
<td>CLEAR=NO request</td>
<td>KEEPREAL=NO request</td>
<td></td>
<td>TOGUARD request</td>
<td>FROMGUARD request</td>
</tr>
<tr>
<td>KEY specified</td>
<td>USERTOKEN specified</td>
<td>TTOKEN specified</td>
<td>CONVERTSTART specified</td>
<td>GUARDSIZE64 request</td>
<td>CONVERTSIZE64 request</td>
<td>MOTKN specified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USERTOKEN specified</td>
<td>TTOKEN specified</td>
<td>CONVERTSTART specified</td>
<td>GUARDSIZE64 request</td>
<td>CONVERTSIZE64 request</td>
<td>MOTKN specified</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTOKEN specified</td>
<td>CONVERTSTART specified</td>
<td>GUARDSIZE64 request</td>
<td>CONVERTSIZE64 request</td>
<td>MOTKN specified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Request type identifier:</td>
<td>Miscellaneous Byte</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Storage Key for GETSTOR, GETSHARED, and GETCOMMON requests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– Number of ranges in range list for range list requests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– 0 for all other requests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- For CONFIGURE CPU: Bytes as follows:

<table>
<thead>
<tr>
<th>Bytes 0 and 1</th>
<th>Target CPU ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte 2</td>
<td>Internal flags</td>
</tr>
<tr>
<td>Byte 3</td>
<td>Bits 0-3 Reserved</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bits 4-7 Direction and source</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Online or Offline at MSI time</td>
</tr>
<tr>
<td>1</td>
<td>Online Operator request</td>
</tr>
<tr>
<td>2</td>
<td>Offline Operator request</td>
</tr>
<tr>
<td>3</td>
<td>Online WLM request</td>
</tr>
<tr>
<td>4</td>
<td>Offline WLM request</td>
</tr>
</tbody>
</table>

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6

data----: Data. The unique trace data for each event is obtained from data areas. The areas for PC/AUTH, supervisor control, and task management are in the z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

- For an SSRV request to the PC/AUTH component: the PCTRC data area
- For an SSRV request to supervisor control: the SPTRC data area
- For an SSRV request to task management: the TMTRC data area
- For an SSRV request to virtual storage management, the data is:
  - Under Unique-1: Information input to the VSM STORAGE (OBTAIN and RELEASE) service: Bytes as follows:

<table>
<thead>
<tr>
<th>0</th>
<th>Flags:</th>
</tr>
</thead>
<tbody>
<tr>
<td>X...</td>
<td>....</td>
</tr>
<tr>
<td>.1...</td>
<td>....</td>
</tr>
<tr>
<td>..1.</td>
<td>....</td>
</tr>
<tr>
<td>..0.</td>
<td>....</td>
</tr>
<tr>
<td>..1</td>
<td>....</td>
</tr>
<tr>
<td>....</td>
<td>1...</td>
</tr>
<tr>
<td>....</td>
<td>0...</td>
</tr>
<tr>
<td>....</td>
<td>.1..</td>
</tr>
<tr>
<td>....</td>
<td>..00</td>
</tr>
</tbody>
</table>
System trace

<table>
<thead>
<tr>
<th>0</th>
<th>Flags:</th>
</tr>
</thead>
<tbody>
<tr>
<td>....</td>
<td>..01</td>
</tr>
<tr>
<td>....</td>
<td>..10</td>
</tr>
<tr>
<td>....</td>
<td>..11</td>
</tr>
</tbody>
</table>

1 Storage key (bits 0 through 3). Ignore when CALLRKY=YES is flagged in byte 0.

2 Subpool number

3 Request flags:

- 1... .... ALET operand specified
- .1.. .... Storage can be backed anywhere
- ..00 .... Storage must have callers residency
- ..01 .... Storage must have a 24-bit address
- ..10 .... The request is for an explicit address
- ..11 .... Storage can have a 24- or 31-bit address
- .... 1... Maximum and minimum request
- .... .1.. Storage must be on a page boundary
- .... ..1. Unconditional request
- .... ....0 OBTAIN request
- .... ....1 RELEASE request

- Under Unique-2:
  - In an SSRV trace entry for a VSM STORAGE OBTAIN or GETMAIN, one of the following:
    - The length of the storage successfully obtained
    - The maximum storage requested, if the storage was not obtained
  - In an SSRV trace entry for a VSM STORAGE RELEASE or FREEMAIN:
    - the length of the storage to be released, or zero if a subpool release was requested.

- Under Unique-3:
  - In an SSRV trace entry for a VSM STORAGE OBTAIN or GETMAIN, one of the following:
    - The address of the storage successfully obtained, if you specified address; otherwise, zero.
    - The minimum storage requested, if the storage was not obtained
  - In an SSRV trace entry for a VSM STORAGE RELEASE or FREEMAIN:
    - The address of the storage to be released.

- Under Unique-4:
  - Left 2 bytes under Unique-4: ASID of the target address space
  - Next byte under Unique-4: Reserved
  - Right byte under Unique-4:
    - If the GETMAIN/FREEMAIN/STORAGE OBTAIN/STORAGE RELEASE is unconditional, an abend will be issued and the SSRV trace entry 3rd byte of Unique-4 will contain X'FF'. If the GETMAIN/FREEMAIN/STORAGE OBTAIN/STORAGE RELEASE is conditional, no abend will be issued and the SSRV trace entry 3rd byte of Unique-4 will contain the actual return code from the storage service.

- For an SSRV request to real storage management (SSID 14B), the IARV64 data is:
  - Under Unique-1
- Return Code/Abend Code (4 bytes)
- Under Unique-2
- Reason Code (4 bytes)
- Under Unique-3
- ALET specified on the IARV64 request (4 bytes)
- Additional Unique fields depending on the IARV64 service that follows:
  - GETSTOR/GETSHARED/GETCOMMON
    - Origin address of the memory object - 8 bytes
    - Size of the memory object - 8 bytes
    - User token - 8 bytes
  - DETACH
    - Memory object start address (for MATCH=SINGLE requests) zeroes (for MATCH=USERTOKEN requests) - 8 bytes
    - User token - 8 bytes
  - PAGEFIX, PAGEUNFIX, PAGEOUT, PAGEIN, DISCARDATA, CHANGEACCESS, PROTECT, UNPROTECT, PCIEFIX, PCIEUNFIX
    - Address of rangelist - 8 bytes
    - VSA from 1st range list entry - 8 bytes
    - Number of blocks from 1st range list entry - 8 bytes
  - CHANGEGUARD
    - Memory object start (if ConvertStart was not specified), or convert start address (if ConvertStart was specified) - 8 bytes
    - Number of segments to be converted - 8 bytes
  - SHAREMEMOBJ
    - Range list address - 8 bytes
    - VSA from 1st range list entry - 8 bytes
    - User token - 8 bytes

- In an SSRV trace entry for global resource serialization with SSID (14C), the ISGENQ data is:
  - Under Unique-1:
    - Return address (4 bytes)
  - Under Unique-2:
    - Two bytes of flags as follows:

<table>
<thead>
<tr>
<th>1</th>
<th>Flags:</th>
</tr>
</thead>
<tbody>
<tr>
<td>01..</td>
<td>....</td>
</tr>
<tr>
<td>10..</td>
<td>....</td>
</tr>
<tr>
<td>11..</td>
<td>....</td>
</tr>
<tr>
<td>..1.</td>
<td>....</td>
</tr>
<tr>
<td>...0</td>
<td>0...</td>
</tr>
<tr>
<td>...1</td>
<td>0...</td>
</tr>
<tr>
<td>...1</td>
<td>1...</td>
</tr>
</tbody>
</table>
| .... | 1.. | CONTROL=SHARED
Note: If the last bit of byte one and the first bit of byte two are both off, the system default for SYNCHRES is used.

ISGENQ reason code (2 bytes): If a list request was provided, this field will provide the reason code for the particular list entry in error. If more than one entry is in error, it will provide the highest reason code.

- Under Unique-3:
  - Primary ASID (2 bytes)
  - The last 2 bytes may represent
    - X'FFFF' if an incomplete trace entry. An incomplete entry may be the result of a program check or an error was detected. The entry will be populated only with data we know we can trust. Therefore, some flags may only be partially filled in. To avoid confusion, having a X'FFFF' as a device number and having the reserve request bit off will inform the user the entry is incomplete. (2 bytes)
    - X'0000' if not a reserve request (2 bytes)
    - Device number if a reserve request (2 bytes)

- Under Unique-4
  - First 4 bytes of the QNAME (4 bytes). For a list request, this represents the first QNAME in the request.

- Under Unique-5
  - Last 4 bytes of the QNAME (4 bytes). For a list request, this represents the first QNAME in the request.

- In an SSRV trace entry for global resource serialization with SSID (14D) the ENQ and SSID (14E) the DEQ, the information is:
  - Under Unique-1:
    - Return address (4 bytes)
  - Under Unique-2:
    - Refer to the PEL mapping for explanation of PELLAST and PELXFLG1. See z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).
    - 3 bytes of flags.
- Byte 1 is:

<table>
<thead>
<tr>
<th>1</th>
<th>Flags:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...</td>
<td>....</td>
</tr>
<tr>
<td>.0..</td>
<td>....</td>
</tr>
<tr>
<td>.1..</td>
<td>....</td>
</tr>
<tr>
<td>.0..</td>
<td>....</td>
</tr>
<tr>
<td>.0..</td>
<td>1...</td>
</tr>
<tr>
<td>.1..</td>
<td>0...</td>
</tr>
<tr>
<td>..1</td>
<td>0...</td>
</tr>
<tr>
<td>...1</td>
<td>1...</td>
</tr>
<tr>
<td>....</td>
<td>.000</td>
</tr>
<tr>
<td>....</td>
<td>.001</td>
</tr>
<tr>
<td>....</td>
<td>.010</td>
</tr>
<tr>
<td>....</td>
<td>.011</td>
</tr>
<tr>
<td>....</td>
<td>.100</td>
</tr>
<tr>
<td>....</td>
<td>.101</td>
</tr>
<tr>
<td>....</td>
<td>.110</td>
</tr>
<tr>
<td>....</td>
<td>.111</td>
</tr>
</tbody>
</table>

- Byte 2 represents PELLAST
  - Bit 4 is ignored.
- Byte 3 represents PELXFLG1
  - Bit 8 is ignored.

- ENQ return code (SSID14D) (1 byte) or DEQ return code (SSID 14E) (1 byte)
  - If a list request was provided, this field will provide the Return Code for the particular list entry in error. If more than one entry is in error, it will provide the highest Return Code.
  - If ABEND, this field is in the form X’Fn’ where n signifies the first hex digit of the ABEND code. For example, a X’F7’ signifies a X’738’ ABEND and X’F4’ signifies a X’438’ ABEND.

- Under Unique-3:
  - Primary ASID (2 bytes)
  - The last 2 bytes may represent
    - X’FFFF’ if an incomplete trace entry. An incomplete entry may be the result of a program check or an error was detected. The entry will be populated only with data we know we can trust. Therefore, some flags may only be partially filled in. To avoid confusion, having a X’FFFF’ as a device number and having the reserve request bit off will inform the user the entry is incomplete. (2 bytes)
    - X’0000’ if not a reserve request (2 bytes)
    - Device number if a reserve request (2 bytes)

- Under Unique-4
  - First 4 bytes of the QNAME (4 bytes). For a list request, this represents the first QNAME in the request.

- Under Unique-5
- Last 4 bytes of the QNAME (4 bytes). For a list request, this represents the first QNAME in the request.

- For an SSRV request to UNIX system services, the data is:
  - Under Unique-1
    The address of the PPRT control block
  - Under Unique-2:
    For an 8 byte parameter of an AMODE 64 caller, the low four bytes of the first parameter, otherwise the first four bytes of the first parameter, if available. Zero, if parameter not available.
  - Under Unique-3
    For an 8 byte parameter of an AMODE 64 caller, the low four bytes of the second parameter, otherwise the first four bytes of the second parameter, if available. Zero, if parameter not available.
  - Under Unique-4
    For an 8 byte parameter of an AMODE 64 caller, the low four bytes of the third parameter, otherwise the first four bytes of the third parameter, if available. Zero, if parameter not available.

- For an SSRV request to DFSMS Media Manager, the data is:
  - Under Unique-1
    The address of the IOSB control block
  - Under Unique-2:
    High order word of MMRE address (Media Manager Request Element) or zero
  - Under Unique-3
    Low order word of MMRE address
  - Under Unique-4
    High order word of MMIB address (Media Manager Information Block) or zero
  - Under Unique-5
    Low order word of MMIB address

- For an SSRV request to real storage management (SSID 151), the CHANGKEY data is:
  - Under Unique-1
    The address of the first byte of the first page of the virtual storage area whose key is to be changed
  - Under Unique-2
    The address of the first byte of the last page of the virtual storage area whose key is to be changed
  - Under Unique-3
    - Byte 0: If at least one page in the range was GETMAIN assigned, bits 0 - 4 contain the original storage key and fetch protection status, and bits 5 - 7 are undefined; otherwise, byte 0 contains zero.
    - Byte 1: Bits 0 - 4 contain the new storage key and fetch protection status, and bits 5 - 7 are undefined.
    - Bytes 2 - 3: Diagnostic flags.
  - Under Unique-4
    Diagnostic flags

- In an SSRV trace entry for CONFIGURE CPU with SSID (1050), the information is:
- Under Unique-1
  Contents of an internal return code field.
- Under Unique-2
  Shows which 8-byte block of CSD_CPU_ALIVE.
- Under Unique-4 through Unique-5
  The 8-byte contents of CSD_CPU_ALIVE mask at the 8-byte block offset in Unique-2 as updated by the CF CPU command.

**PSACLHS**

desc------: String for the current lock held, from the PSACLHS field of the PSA. This field will contain descriptive text for some SSRV trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**PSACLHSE**
Blank.

**PSALOCAL**
desc------: Locally locked address space indicator, from the PSALOCAL field of the PSA. This field will contain descriptive text for some SSRV trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**PASD**
pasd: Primary ASID (PASID) at trace entry. This field will contain descriptive text for some SSRV trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**SASD**
sasd: Secondary ASID (SASID) at trace entry. This field will contain descriptive text for some SSRV trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**Time Format**
timestamp----------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

**CP--**
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

**SUSP trace entries**

An SUSP trace entry represents a request for a suspend type lock when the requestor had to be suspended because the lock was not available.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/O</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format--------</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>wu-addr-</td>
<td>SUSP</td>
<td>return-</td>
<td>rb-addr-</td>
<td>suspndid</td>
<td>rel-addr</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>timestamp-</td>
<td>psaclhse</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PR**
pr: Identifier of the processor that produced the TTE.

**ASID**
home: Home address space identifier (ASID) associated with the TTE.

**WU-Addr-**
wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).
System trace

Ident
The TTE identifier, as follows:

SUSP
Lock suspension

CD/D
Blank

PSW----- Address-
return--: Caller's return address

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6

• rb-addr: Address of the suspended request block (RB)
• rel-addr: Address associated with the type of lock suspension:
  – 0: For LOCL lock
  – ASCB address: For CML lock
  – Lockword address: For CEDQ, CLAT, CMS, and CSMF locks
• ssrbaddr: Address of the suspended service request block (SSRB)
• suspndid: Identifier of the lock suspension type: CEDQ, CLAT, CML, CMS, CSMF, or LOCL

PSACLHS-
psaclhs--: String for the current lock held, from the PSACLHS field of the PSA.

PSACLHSE
psaclhse: Extended string for the current lock held, from the PSACLHSE field of the PSA.

PSALOCAL
psalocal: Locally locked address space indicator, from the PSALOCAL field of the PSA.

PASD
Blank

SASD
Blank

Time Format

timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry.
The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the
physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP
is not provided for SYSUDUMP, SYSABEND, or SNAP.

SVC, SVCE, and SVCR trace entries
These trace entries represent a supervisor event:

• An SVC trace entry is for processing of a Supervisor Call (SVC) instruction
• An SVCE trace entry is for an error during processing of an SVC instruction
An SVCR trace entry is for return from SVC instruction processing.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format------</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>home</td>
<td>wu-addr</td>
<td>SVC</td>
<td>code</td>
<td>svc-old-</td>
<td>pswaddr-</td>
<td>gpr15---</td>
<td>gpr0----</td>
<td>gpr1----</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp--------</td>
</tr>
<tr>
<td>CP</td>
<td>home</td>
<td>wu-addr</td>
<td>SVCE</td>
<td>code</td>
<td>svc-old-</td>
<td>pswaddr-</td>
<td>gpr15---</td>
<td>gpr0----</td>
<td>gpr1----</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp--------</td>
</tr>
<tr>
<td>CP</td>
<td>home</td>
<td>wu-addr</td>
<td>SVCR</td>
<td>code</td>
<td>ret-new-</td>
<td>pswaddr-</td>
<td>gpr15---</td>
<td>gpr0----</td>
<td>gpr1----</td>
<td>psaclhs-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp--------</td>
</tr>
</tbody>
</table>

**PR**: Identifier of the processor that produced the TTE.

**ASID**: Home address space identifier (ASID) associated with the TTE.

**WU-Addr**: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**: The TTE identifier, as follows. An asterisk before SVC, SVCE, or SVCR indicates that the SVC is for an abend (SVC D) and the abend is not for a normal end of task, that is, bit X'08' in the leftmost byte of register 1 (in the Unique-3 column) is not on.

**SVC**: Supervisor call (SVC) interruption

**SVCE**: SVC error

**SVCR**: SVC return

**CD/D**: code:
- For SVC and SVCE, and for SVCR when not X'FFxx': SVC number.
- For SVCR when X'FF00': completion of the system-initiated processing involved with ATTACH, LINK, SYNCH, or XCTL processing before the target routine getting control.
- For SVCR when X'FF01': initial system-initiated processing involved with XCTL processing prior to the target routine getting control.

**PSW----- Address-**: The z/Architecture 128-bit old PSW, which appears on two lines:
- pswaddr: Two words, containing the 64-bit address portion of the PSW
- pswctrl: Two words, containing the 64-bit "control" portion of the PSW

The contents of this field varies, depending on the type of supervisor event and the value of code:
- ret-new- pswaddr / ret-new- pswctrl:
  - For SVC and SVCE, and for SVCR when code is not X'FFxx': Program status word (PSW) to receive control when the SVC is dispatched again.
  - For SVCR when code is X'FF00': PSW of the target routine that will get control as a result of ATTACH, LINK, SYNCH, or XCTL processing.
  - For SVCR when X'FF01': PSW of a system routine that will get control as a result of initial system processing involved with XCTL.
System trace

- svc-old-pswaddr / svc-old-pswctrl: SVC old PSW

**Unique-1/Unique-2/Unique-3**

**Unique-4/Unique-5/Unique-6**

gpr15--- gpr0---- gpr1----: General registers 15, 0, and 1, except for SVCE, other than SVCE D (ABEND macro), for which gpr15 contains one of the following values:

- **00000004** - issuer of SVC was in SRB mode
- **00000008** - issuer of SVC was locked
- **0000000C** - issuer of SVC was disabled
- **00000010** - issuer of SVC was in cross memory mode
- **00000014** - issuer of SVC was in EUT FRR mode
- **00000018** - issuer of SVC was in AR mode

**env-data**: Characteristics of failing environment, from the PSAMODEW field of the PSA.

**PSACLHS**

psaclhs: For SVCE, string for the current lock held, from the PSACLHS field of the PSA. This field will contain descriptive text for some SVC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**PSACLHSE**

psaclhse: For SVCE, extended string for the current lock held, from the PSACLHSE field of the PSA.

**PSALOCAL**

psalocal: For SVCE, locally locked address space indicator, from the PSALOCAL field of the PSA. This field will contain descriptive text for some SVC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**PASD**

pasd: Primary ASID (PASID) at trace entry. This field will contain descriptive text for some SVC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**SASD**

sasd: Secondary ASID (SASID) at trace entry. This field will contain descriptive text for some SVC trace entries. The descriptive text will not appear in SNAP, SYSUDUMP, or SYSABEND output.

**Time Format**

timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

**CP**

cp---: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

**SYNS and SYNE trace entries**

These trace entries represent a synchronous I/O (zHyperLink) event:

- A SYNS trace entry represents the start of a synchronous I/O operation.
- A SYNE trace entry represents the end of a synchronous I/O operation.
PR
pr: Identifier of the processor that produced the TTE.

ASID
home: Home address space identifier (ASID) related to the I/O.

WU-Addr-
wu-addr -: Address of the task control block (TCB) for the current task or the work element block (WEB).

Ident
The TTE identifier, as follows:

SYNS
Start of synchronous (zHyperLink) I/O operation.

SYNE
End of synchronous (zHyperLink) I/O operation. An asterisk before SYNE indicates that the operation did not complete successfully.

CD/D
dev: The device number associated with the request.

PSW----- Address-
The z/Architecture 128-bit old PSW, which appears on two lines:

• t: The type of synchronous I/O request:
  
  I
  An initiate type request. An initiate request is used when multiple synchronous I/O requests need to be performed in parallel. There is one initiate request issued for each synchronous I/O to be started in parallel. Normally, the system traces only the start of an initiate request (SYNS event). However, if the initiate request fails, the end of the initiate request is also traced (SYNE event).

  C
  A complete type request. A complete request is used to wait for previously initiated requests to complete. There is one complete request issued for each synchronous I/O that was initiated successfully. The system traces only the end of the complete request (SYNE event).

  O
  A standalone (only) type request. The system traces the start (SYNS event) and end (SYNE event) of a standalone request.

• dd: Driver identifier associated with the I/O
• op: Operation to be performed
• pfid: PCIE function identifier
• funchand: PCIE function handle

Unique-1/Unique-2/Unique-3
Unique-4/Unique-5/Unique-6
• iosbaddr: IOSB address for the I/O request.
• len1: First data length field
• len2: Second data length field
• rr: Record count
• rc: Response code
• rcq: Response code qualifier

Time Format
timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the same format as the time stamp on logrec data set records.
## TIME trace entries

A TIME trace entry represents a dynamic time-of-day (TOD) clock adjustment by the timer services component.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>WU-Addr-</th>
<th>Ident</th>
<th>CD/D</th>
<th>PSW-----</th>
<th>Address-</th>
<th>Unique-1</th>
<th>Unique-2</th>
<th>Unique-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>Time Format-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unique-4</td>
<td>Unique-5</td>
<td>Unique-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-------------</td>
</tr>
<tr>
<td>cp-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-------------</td>
</tr>
</tbody>
</table>

- **PR**: Identifier of the processor that produced the TTE.
- **ASID**: Home address space identifier (ASID) associated with the TTE.
- **WU-Addr-**: Address of the task control block (TCB) for the current task or the work element block (WEB).
- **Ident**: The TTE identifier, as follows:
  - **TIME**: Timer service
- **CD/D**: code: Contains a value of 1, indicating that word1 and word2 contain the amount of time that the system advances the time-of-day (TOD) clock when the TOD clock and the External Time Reference (ETR) get out of synchronization.
- **PSW-----**: Address- return: Return address of the program that issued the PTRACE macro
- **Unique-1/Unique-2/Unique-3**
- **Unique-4/Unique-5/Unique-6**: word1, word2: For a code value of 1, the amount of time that the system advances the TOD clock when the TOD clock and the ETR get out of synch.
- **PSACLHS-**: Blank
- **PSALHSE**: Blank
- **PSALOCAL**: Blank
- **PASD**: pasd: Primary ASID (PASID) at trace entry.
- **SASD**: sasd: Secondary ASID (SASID) at trace entry.
- **Time Format**: timestamp---------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).
**CP--**
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

**USRn trace entries**

A USRn trace entry represents processing of a PTRACE macro in an authorized program. The trace entry contains data from the macro.

| PR CP-| ASID WU-Addr- Ident CD/D PSW----- Address- | Unique-1 Unique-2 Unique-3 PSACLHS- PSALOCAL PASD SAD SAD Time Format----- |
|------|--------------------------------|-------------------|-------------------|-----------|---------|---------|---------|
| ca- | home wu-addr- USRn return-- data---- data---- data---- pasd sasd timestamp-------- |
| ca- | home wu-addr- USRn return-- idc- rbc data---- data---- pasd sasd timestamp-------- |

**PR**

pr: Identifier of the processor that produced the TTE.

**ASID**

home: Home address space identifier (ASID) associated with the TTE.

**WU-Addr-**

wu-addr-: Address of the task control block (TCB) for the current task or the work element block (WEB).

**Ident**

The TTE identifier, as follows:

**USRn**

User event. n is a number from X'0' to X'F'.

**CD/D**

Blank

**PSW----- Address-**

return: Return address of the program that issued the PTRACE macro

**Unique-1/Unique-2/Unique-3**

**Unique-4/Unique-5/Unique-6**

- data----: User-defined data from the PTRACE macro
- idc-: PTRACE identification count
- rbc: Relative byte count

**PSACLHS-**

This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

**PSACLHSE**

Blank.

**PSALOCAL**

This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

**PASD**

pasd: Primary ASID (PASID) at trace entry. This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.
SASD
sasd: Secondary ASID (SASID) at trace entry. This field contains descriptive text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

Time Format
timestamp----------: Time-of-day (TOD) clock value when system trace created the trace entry. The value is in the format that was specified for TIME. If TIME was not specified, the default format is TIME(HEX).

CP--
cp--: Four hex digits of the processor model dependent information, which is intended to identify the physical CP that made the trace entry. CP is only provided when formatting SYSTRACE under IPCS. CP is not provided for SYSUDUMP, SYSABEND, or SNAP.

Multiple trace entries for a user event
A single user event appears in more than one trace entry if the PTRACE macro requests recording of more than 5 fullwords of trace data. For example, the following PTRACE macro requests recording of 11 fullwords of trace data:

```
PTRACE TYPE=USER3,REGS=(2,12),SAVEAREA=STANDARD
```

For this macro, system trace places three entries in the trace table. The entries contain the following:

- The first entry contains the 5 fullwords of trace data in registers 2 through 6.
- The second entry contains the 5 fullwords of trace data in registers 7 through 11.
- The third entry contains the fullword of trace data in register 12.

If the program issuing the PTRACE macro is interrupted, the three trace entries may not be consecutive in the trace table. The multiple entries contain continuation information as the data for Unique-1. The format of the continuation information is as follows:

```
nnn  hhh
```

- **nnnn** The PTRACE identification count. This is a hexadecimal number assigned by PTRACE to all entries for one macro processing.
- **hhh** The byte offset, in hexadecimal, of the next byte of trace data, which is under Unique-2. For the first entry, the offset is X'000'. For the second entry, the offset is X'014'. For the third entry, the offset is X'028'.

For example, Figure 73 on page 206 shows three trace entries from the preceding PTRACE macro.
Chapter 9. Master trace

Master trace maintains a table of all recently issued system messages. This creates a log of external system activity; the other traces log internal system activity. Master trace is activated automatically at system initialization, but you can turn it on or off using the TRACE command.

Master trace can help you diagnose a problem by providing a log of the most recently issued system messages. For example, master trace output in a dump contains system messages that may be more pertinent to your problem than the usual component messages issued with a dump.

The following sections contain more information about how to request, customize, and use the master trace.

Master trace and the hardcopy log

Master trace lists the same messages that the system saves automatically and permanently in the hardcopy log, but the entries are maintained in a wraparound table, which means that master trace overwrites old entries when the table is full. You can use master trace data in a dump as a substitute for the hardcopy log when the dump contains the required messages. If the master trace table wraps and overwrites the messages related to your problem before you can request a dump, the dump will not contain useful messages.

Consider the following conditions:

• The master trace table wraps at 9 p.m.
• The system issues messages related to a problem between 9:10 and 9:20 p.m.
• The system issues an SVC dump at 9:30 p.m.

In this example, the messages pertinent to the problem will be in the master trace data in the dump, since the problem occurred between the time the trace table wrapped and the time the dump was issued.

To print the system-managed data set containing the hardcopy log, use the JESDS parameter of the OUTPUT JCL statement.

Customizing master trace

At initialization, the master scheduler sets up a master trace table of 24 kilobytes. A 24-kilobyte table holds about 336 messages, assuming an average length of 40 characters. You can change the size of the master trace table or specify that no trace table be used by changing the parameters in the SCHEDxx parmlib member.

You can also change the size of the table using the TRACE command. For example, to change the trace table size to 36 kilobytes, enter:

```
TRACE MT,36K
```

See z/OS MVS Initialization and Tuning Reference for more information about the SCHEDxx member.

Requesting master trace

Start, change, or stop master tracing by entering a TRACE operator command from a console with master authority. For example, to start the master tracing:

```
TRACE MT
```
To stop master tracing:

TRACE MT, OFF

You can also use the TRACE command to obtain the current status of the master trace. The system displays the status in message IEE839I. For example, to ask for the status of the trace, enter:

TRACE STATUS

In the output shown in Figure 74 on page 208, master tracing is active with a trace table of 140 kilobytes, as indicated by **MT=(ON,140K)**.

**Figure 74. Example: TRACE STATUS output**

If you want to check the current status of system, master, and component tracing, use the DISPLAY TRACE command. The system displays the status in message IEE843I. For example, to ask for the status of the three traces, enter:

DISPLAY TRACE

In Figure 75 on page 208, master tracing is active with a master trace table of 140 kilobytes, as indicated by **MT=(ON,140K)**.

**Figure 75. Example: DISPLAY TRACE output**

See *z/OS MVS System Commands* for details about the TRACE and DISPLAY operator commands. See *z/OS MVS System Messages, Vol 7 (IEB-IEE)* for information about IEE839I and IEE843I messages.

### Receiving master trace

Master trace writes trace data in the master trace table, which resides in the master scheduler address space (ASID 1). You can obtain master trace data in a stand-alone, SVC, or unformatted dump, if the dump options list includes TRT to request trace data. Format the master trace data by specifying the IPCS VERBEXIT MTRACE subcommand or using the IPCS Trace Processing selection panel. Table 34 on page 208 shows the dumps that contain master trace data.

<table>
<thead>
<tr>
<th>Dump</th>
<th>Master trace data in the dump?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand-alone dump</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for SDUMP or SDUMPX macro</td>
<td>Default</td>
</tr>
</tbody>
</table>
Table 34. Summary of dumps that contain master trace data (continued)

<table>
<thead>
<tr>
<th>Dump</th>
<th>Master trace data in the dump?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVC dump for DUMP operator command</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for SLIP operator command with ACTION=SVCD,</td>
<td>Default</td>
</tr>
<tr>
<td>ACTION=STDUMP, ACTION=SYNCSVCD, or ACTION=TRDUMP</td>
<td></td>
</tr>
<tr>
<td>Any unformatted dump customized to exclude trace data</td>
<td>Yes, Request SDATA=TRT</td>
</tr>
<tr>
<td>ABEND dump to SYSABEND</td>
<td>Not available</td>
</tr>
<tr>
<td>ABEND dump to SYSMDUMP</td>
<td>Not available</td>
</tr>
<tr>
<td>ABEND dump to SYSUDUMP</td>
<td>Not available</td>
</tr>
<tr>
<td>SNAP dump</td>
<td>Not available</td>
</tr>
</tbody>
</table>

See z/OS MVS IPCS Commands for information about the VERBEXIT MTRACE subcommand. See z/OS MVS IPCS User’s Guide for information about the panel.

Reading master trace data

The following topics in this section show the format of master trace entries:

- “Master trace output formatted in a dump” on page 209
- “Master trace table in storage” on page 210

Master trace output formatted in a dump

The entries in the master trace table are listed in first-in, first-out (FIFO) order, which resembles a hardcopy log. The messages might not be in chronological order because presumably the messages were not put in the master trace table in the order the messages were issued.

Figure 76 on page 210 shows an example of master trace data in a dump that is formatted by IPCS. The subcommand that is issued on the IPCS Subcommand Entry panel:

```verb
VERBEXIT MTRACE
```
### MASTER TRACE TABLE

<table>
<thead>
<tr>
<th>TAG</th>
<th>IMM DATA</th>
<th>MESSAGE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.76 $HASP468 JES2 INIT DECK PROCESSED</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C000000 SCOTT01 03147 21:24:22.77 INTERNAL 00000290 REPLY 0002,N1 AUTH=(NET=YES),NAME=SCOTT01</td>
</tr>
<tr>
<td>000</td>
<td>00000009</td>
<td>NRC040000 SCOTT01 03147 21:24:22.77 INTERNAL 00000090 IEE680I REPLY TO 0002 IS;N1 AUTH=(NET=YES),NAME=SCOTT01</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.77 $HASP466 CONSOLE STMT 126 N1 AUTH=(NET=YES), NAME=SCOTT01</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.78 $HASP826 NODE(1) NAME=SCOTT01,AUTH=(DEVICE=YES, JOB=YES), TRACE=NO</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.78 $HASP826 REPLY PARAMETER STATEMENT, CANCEL, OR END</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.78 $HASP826 END</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.78 $HASP826 CONSOLE.OSV142.PARMLIB KEPT</td>
</tr>
<tr>
<td>000</td>
<td>00000013</td>
<td>N C040000 SCOTT01 03147 21:24:22.78 $HASP826 SYS1.PARMLIB KEPT</td>
</tr>
</tbody>
</table>

The meaning of the highlighted text in the preceding example is as follows:

**TAG**
A halfword that contains the identity of the caller. **TAG** can be:

- **000** Reserved
- **001** WTO SVC
- **002** Master scheduler
- **003** Trace command

Current identifiers are defined in the macro, IEZMTPRM, which maps the parameter list.

**IMM DATA**
A fullword of immediate data, consisting of the 32 bits defined by the caller. The significance of the immediate data is defined by the caller.

**MESSAGE DATA**
The message. If a problem occurs during processing, the line that follows the message indicates the problem.

### Master trace table in storage
This topic describes master trace data as it is recorded in the master trace table in the master scheduler address space. You can use this information to write your own formatting or analysis routines for master trace information. Master trace places entries in FIFO order. Thus, a current entry is in front of the older entries. When the table is full, master trace wraps, and resumes recording entries at the end of the table.

Note that the messages may not be in chronological order because the messages may not be put in the master trace table in the order in which they are issued.
You can locate the master trace table from the communication vector table (CVT), as shown in Table 35 on page 211.

Table 35. How to locate master trace table from CVT

<table>
<thead>
<tr>
<th>At the location:</th>
<th>In field:</th>
<th>Find the following address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVT+X’94’</td>
<td>CVTMSER</td>
<td>IEEBASEA (master scheduler resident data area)</td>
</tr>
<tr>
<td>IEEBASEA+ X’8C’</td>
<td>BAMTTBL</td>
<td>Start of the master trace table</td>
</tr>
</tbody>
</table>

The unformatted master trace table in the master scheduler address space contains a header and, for each message logged in the table, an entry. The following two topics show the fields in the header and an entry. The master trace table header and entries are mapped by the MTT mappings in the IEEZB806 macro, which can be found in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

Header in the master trace table

<table>
<thead>
<tr>
<th>TABLE ID</th>
<th>CURRENT</th>
<th>START</th>
<th>END</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBPOOL</td>
<td>LENGTH</td>
<td>WRAP TIME</td>
<td></td>
</tr>
<tr>
<td>WRAP POINT</td>
<td>RESERVED1</td>
<td>DATA LENGTH</td>
<td>RESERVED2..</td>
</tr>
</tbody>
</table>

**TABLE ID**
A fullword field containing MTT. MTT is an eye-catcher to mark the beginning of the master trace table.

**CURRENT**
A fullword field containing the address of the current (most recently stored) entry.

**START**
A fullword field containing the address of the first byte of the trace area.

**END**
A fullword field containing the address of the first byte beyond the end of the trace area.

**SUBPOOL**
A one-byte field containing the number of the subpool in which this table resides.

**LENGTH**
A three-byte field containing the length, in bytes, of the table header and the area containing the entries. This length is the default table size or the size specified on the TRACE command.

**WRAP TIME**
A double word field containing a time, either when the table was initialized or when the last table wrap occurred. The time is in the XXHH:MM:SS.T form:

- **XX**
  Possible values can be IT or WT.
  - **IT**
    Indicates the time that the table was initialized.
  - **WT**
    Indicates the time the table last wrapped.

- **HH**
  hours

- **MM**
  minutes
Master trace

SS
seconds

T
tenths of a second

WRAP POINT
A fullword field containing the address of the first byte of the last entry stored before the most recent table wrap.

Note: This address is initialized to zero and remains zero until the first table wrap.

RESERVED1
A fullword reserved field.

DATA LENGTH
A fullword field containing the length, in bytes, of the data area part of the table.

RESERVED2
A 21-word field.

Entry in the master trace table

<table>
<thead>
<tr>
<th>FLAGS</th>
<th>TAG</th>
<th>IMM DATA</th>
<th>LEN</th>
<th>CALLER-PASSED DATA</th>
</tr>
</thead>
</table>

Entry header
10-byte header for the entry.

FLAGS
A halfword that contains the flags that are set by the caller in the parameter list that is passed to master trace.

TAG
A halfword that contains the identity of the caller. TAG can be:

Tag
   Caller
0000
   Reserved
0001
   WTO SVC
0002
   Master scheduler
0003
   Trace command

Current identifiers are defined in the macro, IEZMTPRM, which maps the parameter list.

IMM DATA
A fullword that contains 32 bits defined by the caller. Master trace stores these bits in the table without checking them for validity. The significance of IMMEDIATE DATA is defined by the caller; likely values are a counter, a control block address, or flags describing the passed data.

LEN
A halfword that contains the length of the caller-passed data.

CALLER-PASSED DATA
A variable-length field that contains the data that is provided by the caller.

The master trace table entries vary in length. If the caller specifies the length of the caller-passed data as zero, the entry in the master trace table consists of only the 10-byte header.
Chapter 10. The Generalized Trace Facility (GTF)

The generalized trace facility (GTF) is a service aid you can use to record and diagnose system and program problems. GTF is part of the MVS system product, and you must explicitly activate it by entering a START GTF command.

Use GTF to record a variety of system events and program events on all of the processors in your installation. If you use the IBM-supplied defaults, GTF lists many of the events that system trace lists, showing minimal data about them. However, because GTF uses more resources and processor time than system trace, IBM recommends that you use GTF when you experience a problem, selecting one or two events that you think might point to the source of your problem. This will give you detailed information that can help you diagnose the problem. You can trace combinations of events, specific incidences of one type of event, or user-defined program events that the GTRACE macro generates. For example, you can trace:

- Channel programs and associated data for start and resume subchannel operations, in combination with I/O interruptions
- I/O interruptions on one particular device
- System recovery routine operations

The events that GTF traces are specified as options in a parmlib member. You can use the IBM supplied parmlib member or provide your own. Details of GTF operation, which include storage that is needed, where output goes, and recovery for GTF are defined in a cataloged procedure in SYS1.PROCLIB.

GTF can trace system and program events both above and below 16 megabytes. For each event it traces, GTF produces trace records as its output. You can have GTF direct this output to one of the following places:

- A trace table in virtual storage.
- A data set on a tape or direct access storage device (DASD).

Choose a trace table for your GTF output when maintaining good system performance is very important to your installation. The trace table cannot contain as much GTF trace data as a data set, but will not impact performance as much as a data set because there is no I/O overhead.

Choose a data set or sets when you want to collect more data than will fit in a trace table. Writing trace data to a data set does involve I/O overhead, so choosing this option will impact system performance more than a trace table.

GTF can use only one table in virtual storage, but can use up to 16 data sets. If you specify more than one data set, all of them must reside on devices of the same class, tape, or DASD.

Other components, such as OPEN/CLOSE/EOV and VSAM have special GTF support. See z/OS DFSMSdfp Diagnosis for complete details.

GTF and IPCS

You can use IPCS to merge, format, display, and print GTF output. See z/OS MVS IPCS User’s Guide and z/OS MVS IPCS Commands for information about the COPYTRC, GTFTRACE, and MERGE subcommands, and the trace processing option of the IPCS dialog.

GTF and the GTRACE macro

You can use GTF in combination with the GTRACE macro, provided you activate GTF with TRACE=USR. Then, your programs can issue GTRACE macros to generate trace records, which GTF can store in the trace table. See z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG for information about coding the GTRACE macro.
GTF and system trace
You can use GTF in combination with system trace. System trace records predetermined system events, and provides minimal details about each event. Supplement system trace information by selecting specific GTF options to provide more detailed information about system and user events. For further information about system trace, see Chapter 8, “System trace,” on page 155.

Using IBM defaults for GTF
IBM supplies both a SYS1.PARMLIB (also called parmlib) member that contains predefined GTF trace options and a cataloged procedure for GTF, should you want to use IBM's defaults for GTF operation. You can override some of the default options by specifying certain parameters on the START command that activates GTF.

The IBM-supplied parmlib member of GTF trace options
IBM supplies the GTFPARM parmlib member, which contains the GTF trace options shown in Figure 77 on page 214.

```
TRACE=SYSM,USR,TRC,DSP,PCI,SRM
```

*Figure 77. IBM-Supplied GTFPARM parmlib member*

Briefly, the following options request GTF traces. For more details about these trace options, see “GTF trace options” on page 228.

- **SYSM**: Selected system events
- **USR**: User data that the GTRACE macro passes to GTF
- **TRC**: Trace events associated with GTF
- **DSP**: Dispatchable units of work
- **PCI**: Program-controlled I/O interruptions
- **SRM**: Trace data associated with the system resource manager (SRM)

The IBM-supplied cataloged procedure
IBM supplies the GTF cataloged procedure, which resides in SYS1.PROCLIB. The cataloged procedure defines GTF operation, output location, recovery facilities, trace output data sets, and the parmlib member that contains GTF options and defaults. Figure 78 on page 214 illustrates the content of the IBM supplied cataloged procedure.

```
//GTFNEW PROC MEMBER=GTFPARM
//IEFPROC EXEC PGM=AHLGTF,PARM='MODE=EXT,DEBUG=NO,TIME=YES',
// TIME=1440,REGION=4M,
// /IEFWER DD DSN=SYS1.TRACE,UNIT=SYSDA,SPACE=(TRK,20),
// DISP=(NEW,KEEP)
//SYSLIB DD DSN=SYS1.PARMLIB(&MEMBER),DISP=SHR
```

*Figure 78. IBM-Supplied GTF Cataloged Procedure*
The statements in this cataloged procedure are:

**PROC**
Defines the GTF cataloged procedure.

**EXEC**

**PGM=AHLGTF**
Calls for the system to run program AHLGTF.

**PARM='MODE=EXT,DEBUG=NO,TIME=YES',**
The parameters selected specify that GTF direct trace data to a data set on tape or DASD, attempt recovery if it encounters an error, and give every trace record a time stamp. See the explanation for the EXEC statement under “Setting up a cataloged procedure” on page 216 for detailed information.

**TIME=1440**
The amount of time, in seconds, that GTF will remain active.

**REGION=4M**
Specifies the maximum size of the storage that GTF can use.

**IEFRDER DD**
Defines the trace output data set:

- The common data set name is SYS1.TRACE.
- The data set can reside on a DASD if:
  - The primary space amount is large enough for the data set to contain at least 20 physical blocks. After completely filling the primary space, GTF will overlay previously written records with new trace records, starting at the beginning of the output data set.
  - The set is in basic format, large format sequential, or does not have a DSORG value.
  - The set is a VSAM linear data set with a control interval size (CISIZE) of 32 KB.
- The data set can reside on a tape if the tape has IBM standard labels or no labels. If GTF fills the volume, the system will request another volume to continue writing. GTF does not overlay the trace records of this GTF written instance.

Restrictions to **IEFRDER**:
- A DSNTYPE=LARGE data set can only be used if the trace is both written and processed on an V1R7 system or a later release.

**SYSLIB DD**
Defines the IBM-supplied GTFPARM parmlib member that contains GTF trace options and their default values. Multiple instances of GTF can be active at the same time. Each instance of GTF requires a unique trace dataset. The default trace dataset in the cataloged procedure can be overridden by specifying a different data set on the START command, or by setting up a cataloged procedure for each instance of GTF to be activated.

### Customizing GTF

You can customize GTF to the needs of your installation by either overriding IBM’s defaults through the START GTF command, or providing your own parmlib member and cataloged procedure for GTF. Customize GTF in one of the following ways:

- **Predefine the GTF trace options in a parmlib or data set member.** See “Defining GTF trace options” on page 216.
- **Set up a cataloged procedure.** See “Setting up a cataloged procedure” on page 216.
- **Override the defaults in the IBM supplied GTF cataloged procedure using the START command.** See “Using the START command to invoke GTF” on page 222.
- **Determine how much storage GTF needs for the trace options you choose.** See “Determining GTF’s storage requirements” on page 220.
• Specify trace options directly through the console after entering the START command. See “Specifying or changing GTF trace options through system prompting” on page 223.

Defining GTF trace options

If you supply your own parmlib member or data set containing GTF trace options, you can select any of the options listed in “GTF trace options” on page 228. Each instance of GTF can be activated with the same or different set of options.

The member containing predefined trace options does not have to reside in the parmlib member. GTF will accept any data set specified in the SYSLIB DD statement of the cataloged procedure, or in the START command, as long as that data set’s attributes are compatible with those of SYS1.PARMLIB.

Setting up a cataloged procedure

Set up your own GTF cataloged procedure when you want to control details of GTF operation such as:

• Amount of storage needed for tracing
• Recovery for GTF
• Number and type of trace output data sets.

If you choose to supply your own cataloged procedure, include the following statements:

PROC  
Defines your cataloged procedure.

EXEC

PGM=AHLGTF
  Calls for the system to run program AHLGTF.

PARM='parm, parm...
  Options specified on the PARM parameter specify where GTF writes trace data and the amount of storage needed for GTF to collect and save trace data in various dump types. parm can be any of the following:

MODE={INT|EXT|DEFER}
SADMP={nnnnnnK|nnnnnnM|40K}
SDUMP={nnnnnnK|nnnnnnM|40K}
NOPROMPT
ABDUMP={nnnnnnK|nnnnnnM|0K}
BLOK={nnn|nnnnnK|nnnnnnM|40K}
SIZE = {nnnnnnK|nnnnnnM|1024K}
TIME=YES
DEBUG={YES|NO}

MODE={INT|EXT|DEFER}
  Defines where GTF writes the trace data. MODE=INT directs data to a trace table in virtual storage, and MODE=EXT directs data to a data set on tape or DASD.
  
  If MODE=INT, each instance of GTF will direct the trace data to a separate trace table in virtual storage, and will ignore any DD statements that define GTF output data sets. Choose this option when it is very important to you to maintain good system performance while GTF runs. The trace table cannot contain as much GTF trace data as a data set, but will not impact performance as much as a data set because there is no I/O overhead.
  
  If MODE=EXT or MODE=DEFER, each instance of GTF directs the output to a separate trace data set defined by GTfoutxx or IEFRDER DD statements. MODE=EXT is the default value. Choose MODE=EXT or MODE=DEFER when you want to collect more data than will fit in a trace table. Writing trace data to a data set does involve I/O overhead, so choosing one of these options will impact system performance more than MODE=INT.
MODE=DEFER will place the trace data in the GTF address space until you enter the STOP GTF command. Every instance of GTF runs in its own address space. During GTF end processing, each instance of GTF will transfer the data from its address space to the output data set.

The amount of data transferred for MODE=EXT or MODE=DEFER is one of the following:

- The default amount
- The amount specified on the SADMP|SA keyword

When the trace output data set is full, GTF continues as follows:

- **Direct access**: GTF resumes recording at the beginning of the data set, when the primary allocation is full. Thus, GTF writes over earlier trace data.
- **Tape**: GTF writes an end-of-file record. The tape is rewound and unloaded, then a new volume is mounted on the tape unit. If GTF has only one tape data set and only one unit for the data set, GTF does not write trace records while the tape is unavailable, thus losing trace data.

GTF can write to multiple tape units in two ways:

- Multiple GTFOUTxx DD statements can specify tape data sets. When GTF fills one data set, it changes to the next data set.
- The IEFRDER DD statement can specify two tape units; in this case, GTF resumes writing the current trace data on the other unit, while rewinding and unloading the full volume.

**SADMP|SA=nnnnnnK|nnnnM|40K**

Specifies the amount of storage needed to save GTF trace data for stand-alone dumps. Specify the amount of storage in terms of either kilobytes (K) or megabytes (M). The minimum amount is 40K, and the maximum is 2048M minus 400K, or 2096752K. GTF rounds up the amount to the block size boundaries for DASD data sets, or 32K boundaries for tape data sets or internal mode. The default value for this parameter is 40K (rounded up to the correct boundary).

**SDUMP|SD={nnnnnnK|nnnnM|40K}**

Specifies the amount of storage needed to save GTF trace data for SVC dumps. Specify the amount of storage in terms of either kilobytes (K) or megabytes (M). The minimum amount is zero, and the maximum cannot exceed the maximum amount of storage defined by the SADMP parameter. GTF rounds up the amount to the block size boundaries for DASD data sets, or 32K boundaries for tape data sets or internal mode. The default value for this parameter is 40K (rounded up to the correct boundary).

**NOPROMPT|NP**

If specified, indicates that you will not be prompted to specify trace options. Message AHL125A and AHL100A will not be issued. Use this parameter when you have a parmlib member set up with the desired GTF options and you want to avoid multiple replies in a sysplex environment.

**ABDUMP|AB={nnnnnnK|nnnnM|0K}**

Specifies the amount of GTF trace data to be formatted in an ABEND or SNAP dump. Specify the amount of trace data in terms of either kilobytes (K) or megabytes (M). The minimum amount is zero, and the maximum cannot exceed the maximum amount of storage defined by the SADMP parameter. GTF rounds up the amount to the block size boundaries for DASD data sets, or 64K boundaries for tape data sets or internal mode. The default value for this parameter is 0K, which means that no GTF data will appear in ABEND or SNAP dumps.

For ABEND or SNAP dumps, GTF formats only those records that are directly associated with the failing address space. GTF does not format the channel program trace data associated with the failing address space.

**BLOK={nnnnn|nnnnnK|nnnnnM|40K}**

Specifies the amount of virtual storage (E)CSA that GTF will use to collect trace data. Specify this storage amount in 4096-byte pages (nnnn), or in bytes (nnnnnK or nnnnnM). The
maximum amount is 99999; the default is 40K. If the amount is less than 40K, GTF will use the default.

**SIZE={nnnnnK|nnnnnM|1024K}**

Specifies the size of the buffers. Specify this amount in bytes (nnnnnK or nnnnnM). The range for the size keyword is 1M to 2046M. The maximum amount is 2046M; the default is 1024K. If the amount is less than 1024K, GTF will use the default.

**TIME=YES**

Specifies that every GTF trace record have a time stamp, as well as the block time stamp associated with every block of data. The time stamp is the eight-byte time of day (TOD) clock value at the local time in which GTF puts the record into the trace table. GTF does not accept TIME=NO; all output records will have time stamps. Local time is calculated using a time zone offset that GTF establishes at the time that the trace starts. If the system time zone offset is changed during tracing, e.g. in response to daylight saving time going into effect, local times formatted by GTF will not correspond with system times afterward.

When you use IPCS to format and print the trace records, a time stamp record follows each trace record. You can use these time stamp records to calculate the elapsed time between trace entries. The time stamp record is described in “Time stamp records” on page 249.

**DEBUG={YES|NO}**

Specifies whether GTF should attempt recovery after it encounters an error. If DEBUG=YES, GTF will not attempt any recovery. Instead, GTF will issue an error message and end after encountering any error, so that the contents of the trace table immediately prior to the error remain intact.

If DEBUG=NO, which is the default, GTF does the following:

- For errors in GTF processing, GTF continues processing after doing one or more of the following:
  - Flipping the trace record or trace record field associated with the error
  - Issuing a message to the console to inform that an error occurred
  - Suppressing the error or function in which the error occurred.

- For errors that do not occur in GTF itself, GTF ends abnormally. If GTF stops processing, that will not cause any other task to also stop.

**TIME=1440**

Specifies unlimited processor time for GTF.

**REGION=nnnnK|M**

Specifies the maximum size of the storage that GTF can use. If the REGION parameter is omitted, then the GTF program defaults to using the REGION value that was specified during the system installation. For information about determining the value for REGION, see “Determining GTF's storage requirements” on page 220. For general information about the REGION parameter, see z/OS MVS JCL Reference.

**IEFRDER DD or GTFOUTxx DD**

Defines the trace output data set or data sets. This statement is required only if you do one of the following:

- Specify MODE=EXT or MODE=DEFER
- Use the default MODE=EXT

IEFRDER DD can be used, but does not have to be used, for one trace output data set. Additional data sets must be defined on GTFOUTxx DD statements, where xx is one or two characters that are valid in DDNAMES. The trace output data set or data sets must be unique and cannot be shared across active instances of GTF. See “Guidelines for defining GTF trace output data sets in a cataloged procedure” on page 219 for guidance on how to define output data sets for GTF.
SYSLIB DD
Optionally include a SYSLIB DD statement to define the IBM-supplied member, or the installation-supplied member, that contains GTF trace options. If the member exists, GTF will use the options in that member. If the member does not exist, GTF will issue an error message and stop.

If you code a procedure that does not contain a SYSLIB DD statement, GTF issues message AHL100A to prompt for options after the START GTF command. In response, you can supply the desired trace options through the console. See “Specifying or changing GTF trace options through system prompting” on page 223 for examples of specifying options through the console.

Guidelines for defining GTF trace output data sets in a cataloged procedure
The trace output data sets must be specific to each instance of GTF and can be defined in the cataloged procedure. Each instance of GTF to be started must have a separate cataloged procedure, or if the same cataloged procedure is used, then a different trace data set must be supplied with the START command.

Use the following guidelines for specifying trace output data sets on the IEFRDER DD or GTFOUxx DD statements:

• You can define up to 16 output data sets for GTF to use. If you define more than 16 data sets, GTF will accept the first 16 and ignore the rest.
• If GTF cannot open all of the data sets, it issues a message that identifies those that are unopened, and continues processing with those that are open.
• Do not specify the RLSE option while using the SPACE parameter because the output data sets are opened and closed more than once while GTF runs.

Note: If the GTF trace output resides on an SMS volume, you should ensure that the SMS management class does not allow partial release.

• Do not request secondary extents for trace data sets. GTF will only use the first extent.

To obtain the maximum degree of control over the number of trace entries for which space is allocated, specify space allocation in blocks, using a block length that matches the BLKSIZE of your trace data set. Do not specify any secondary space. Use the CONTIG option to request contiguous blocks. For example, if your BLKSIZE is 8192, code the SPACE keyword as follows:

```
SPACE=(8192, (500, 0), , CONTIG)
```

• All data sets must be in the same device class: either DASD or tape, but not both. If you mix device classes, GTF will ignore the tapes and use only DASD. However, the data sets can have different device types; for example, you can mix 3380 and 3390 device types.
• If the data set is on a DASD:
  – The data set can be sequential, basic format, large format, or extended format. Basic format is limited to 65535 tracks on the volume. Large format is limited to 16,777,215 tracks per volume. The extended format limit is much higher. Extended format data sets can be compressed format, striped, or both. You cannot use the WRAP option in compressed format.
  – The data set must be linear if it is VSAM and must have a 32 KB control interval size. The data set might be extended format, striped, and might have the extended addressing option to allow it to be larger than 4 GB.

• When WRAP processing is requested, the primary space request is consulted and only control intervals that are contained within that space are used. Unlike non-VSAM data sets used for WRAP processing, the primary space does not have to be satisfied using a single extent. A data set must be empty or defined with the REUSE attribute. If neither of the two conditions exists, GTF rejects the use of the data set.

When WRAP processing is not requested, control intervals are filled until GTF is stopped or the data set is full.

Note: GTF and CTRACE accept a single VSAM linear data set as output. VSAM’s support for striping can increase data rate without the complexity that is associated with the use of distinct data sets.
GTF and CTRACE support placement of NOWRAP traces in cylinder-managed space. WRAP traces placed in VSAM linear data sets can reside in cylinder-managed space too. WRAP traces in non-VSAM data sets cannot be placed in large format data sets, extended format data sets, or cylinder-managed space.

To ensure the most efficient GTF processing, do not specify any particular block size for the output data set or data sets in either:
- The cataloged procedure for GTF
- The JCL, TSO/E commands, or interactive system productivity facility/program development facility (ISPF/PDF) panels that you might use to preallocate the data sets.

The system computes an optimal block size when it opens each data set.

**Note:** If you want GTF to use an unlabeled tape as the output data set, you must specify the logical record length and block size when you allocate that data set.

- If you define more than one data set, you should ensure that the number of paths to the data sets equals the number of data sets.
- You can specify the number of channel programs for each output data set using the NCP parameter on each DD statement. The NCP value determines the rate at which GTF transfers data to the output data sets. For example, if you want to transfer data to your data sets at a rate of 25 buffers per second and you have 5 data sets, you will need to specify an NCP value of 5. GTF then transfers data to the 5 data sets at a rate of 5 buffers per second per data set for a total rate of 25 buffers per second.

The maximum value for NCP is 255. If you do not specify a value for NCP, or if you specify a value less than four, GTF will use the following default values:
- For tape: four
- For DASD: the number of output blocks per track, which is multiplied by four.

- If, when you enter the START command, you override any of the DD statements for multiple output data sets, you must use symbolic parameters in those DD statements. See “Using the START command to invoke GTF” on page 222 for more information.

### Determining GTF's storage requirements

The storage that GTF requires depends on the trace options that you choose. Modern systems consume large amounts of virtual storage, and GTF is no exception. Use the REGION parameter to specify at least 20 MB of available storage for GTF. Then, if you need to impose constraints on the private storage of the GTF address space, use the REGION parameter to restrict GTF's usage. If the REGION parameter is omitted, then the GTF program defaults to using the REGION value that was specified during the system installation. For general information about the REGION parameter, see z/OS MVS JCL Reference.

After determining the GTF trace options, use Figure 79 on page 221 to determine several storage requirements for either your cataloged procedure or the START GTF command. There are several types of storage to calculate:

- Extended pageable link pack area (EPLPA)
- System queue area (SQA)
- Extended common service area (ECSA)
- Region storage

Use the formulas in Figure 79 on page 221 to calculate the amount of storage needed for each storage type. Then add them all together to arrive at the final figure to specify on the REGION parameter. For information about the options mentioned in the figure, see “GTF trace options” on page 228.
Starting GTF

Multiple instances of GTF can be active in a system at the same time. When you activate GTF, each instance operates as a system task, in its own address space. The only way to activate GTF is to enter a START GTF command from a console with master authority. Using this command, select either IBM’s procedure or your cataloged procedure for GTF. The cataloged procedure defines GTF operation; you can accept the defaults that the procedure establishes, or change the defaults by specifying certain parameters on the START GTF command.
Because GTF sends messages to a console with master authority, enter the command only on a console that is eligible to be a console with master authority. Otherwise, you cannot view the messages from GTF that verify trace options and other operating information.

Each instance of GTF can be assigned a unique identifier that is specified on the START GTF command after the GTF keyword. This will allow you to recognize and control specific instances of GTF. If a unique identifier is not specified, the operating system assigns the default, which is the device number of the device where the trace data set resides. See the example in the topic “Starting GTF with trace output to an existing data set on tape” on page 224 for an instance of GTF with the default identifier.

Using the START command to invoke GTF

The START command, without any parameters other than the IBM-supplied procedure name and an identifier, uses the defaults of the cataloged procedure. If that source JCL contains a DD statement for the data set member of predefined trace options, GTF will issue a message that lists those options, and will allow you to override them. Otherwise, GTF will prompt you to specify trace options directly through the console. See “Specifying or changing GTF trace options through system prompting” on page 223 for more information.

To invoke GTF, enter the following START command. For information about the command and parameters you can use to change the GTF cataloged procedure, see z/OS MVS System Commands.

{START|S}{GTF|membername}[.identifier]

Guidelines for overriding JCL statements in the GTF cataloged procedure

You can override the parameters of only one output data set using the keyword=option parameter on the START command. If you have defined more than one output data set, and you used IEFDRER as the DDNAME for one of the DD statements, the keywords specified on the START command will override the attributes of the data set that IEFDRER defines. If you want to alter the attributes of another data set, or more than one data set, you must:

- Use symbolic parameters in the JCL DD statements for those attributes you want to change. You cannot use DD statement keywords as symbolic parameters; for example, you cannot code UNIT=&UNIT;
- Assign values to the symbolic parameters in the EXEC or PROC statements in the cataloged procedure.
- Specify keywords in the START command to override the symbolic parameter values specified on the EXEC or PROC statements.

Examples of overriding the JCL statements in the GTF cataloged procedure

The following shows examples of setting up a cataloged procedure when you want to override JCL statements in the procedure using the keyword=option parameter on the START command. Note that the DD statement parameters in both of the following procedures are for example only; the needs of your installation might require you to provide DD parameters in addition to, or other than, DSNAME, UNIT, and DISP.

If you want to alter just one data set using the START command, your cataloged procedure could look like Figure 80 on page 222.

```plaintext
//GTFABC    PROC   MEMBER=GTFPARM
//IEFPROC   EXEC   PGM=AHLGTF,REGION=2880K,TIME=1440,
//              PARM=('MODE=EXT,DEBUG=NO')
//IEFRDER   DD     DSNAME=SYS1.GTFTRC,UNIT=SYSDA,
//              SPACE=(4096,20),DISP=(NEW,KEEP)
//SYSLIB    DD     DSN=SYS1.PARMLIB(&MEMBER),DISP=SHR
//GTFOUT1   DD     DSNAME=SYS1.TRACE1,UNIT=SYSDA,DISP=(NEW,KEEP)
//GTFOUT2   DD     DSNAME=SYS1.TRACE2,UNIT=SYSDA,DISP=(NEW,KEEP)
//GTFOUT3   DD     DSNAME=SYS1.TRACE3,UNIT=SYSDA,DISP=(NEW,KEEP)
```

Figure 80. Example: altering one data set
Enter **START GTFABC,,,UNIT=TAPE**, to alter only the data set that IEFRDER defines.

If you want to alter the attributes of more than one data set with the START command, use the JCL statements in Figure 80 on page 222 in your cataloged procedure.

```
//GTFABC PROC MEMBER=GTFPARM,NAME1='SYS1.TRACE1',
//NAME2='SYS1.TRACE2',NAME3='SYS1.TRACE3',
//IEFPROC EXEC PGM=AHLGTF,REGION=2880K,TIME=1440,
//DEVICE='SYSDA',DSPS='OLD'
//PARM=('MODE=EXT,DEBUG=NO')
//SYSLIB DD   DSN=SYS1.PARMLIB(&MEMBER),DISP=SHR
//GTFOUT1 DD   DSNAME=&NAME1,UNIT=&DEVICE,DISP=&DSPS;
//GTFOUT2 DD   DSNAME=&NAME2,UNIT=&DEVICE,DISP=&DSPS;
//GTFOUT3 DD   DSNAME=&NAME3,UNIT=&DEVICE,DISP=&DSPS;
```

Figure 81. Example: Altering More Than One Data Set

Enter **START GTFABC,,,DEVICE=TAPE**, to override the default value of the UNIT parameter for each output data set in your cataloged procedure.

See [z/OS MVS JCL Reference](https://www.ibm.com) for more information about using symbolic parameters in JCL statements.

### Specifying or changing GTF trace options through system prompting

After you enter the START command, GTF issues message AHL100A or AHL125A which allows you to specify or change trace options. If the cataloged procedure or START command did not contain a member of predefined options, GTF issues message AHL100A, which allows you to enter trace options. If the procedure or command did include a member of predefined options, GTF identifies those options by issuing the console messages AHL121I and AHL103I. Then you can accept the options, or reject and specify new options.

GTF allows overlapping of trace options when multiple instances are active. This sequence of messages appears as:

```
AHL121I TRACE OPTION INPUT INDICATED FROM MEMBER memname OF PDS dsname
AHL103I TRACE OPTIONS SELECTED -
keywd=value,...,keywd=value
keywd,keywd,...,keywd
AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
```

**Note:** If you specify NOPROMPT or NP on the START GTF command, the system will not issue message AHL125A to request the respecification of trace options or the continuation of initialization.

If you choose to reject any options in the member, you are rejecting all of the options specified in that member. Respecifying trace options does not modify the options in the data set member.

The format of the response is:

```
TRACE=trace option[,trace option]...
```

The trace options determine the amount of storage GTF requires. See “Determining GTF’s storage requirements” on page 220.

GTF will accept the trace options listed under “GTF trace options” on page 228.

### Examples of starting GTF

In this topic you will find the following examples:

- “Starting GTF with a cataloged procedure and parmlib member” on page 224
- “Starting GTF with internal tracking” on page 224
- “Starting GTF with trace output to an existing data set on tape” on page 224
- “Starting GTF with trace options stored in SYS1.PARMLIB” on page 225
- “Starting GTF without trace options in a member” on page 225
Starting GTF with a cataloged procedure and parmlib member

Figure 82 on page 224 shows GTF started with a cataloged procedure that indicates the GTFPARM parmlib member. The trace options are specified in the parmlib member record. In this example, message AHL103I displays the options specified in the GTFPARM member: TRACE=SYSM, DSP, PCI, SRM, TRC, USR. This example shows the messages and the reply generated by the initial START command, and the GTFPARM specifications that are in effect. This instance of GTF can be recognized by the EXAMPLE 1 identifier.

```
START GTF.EXAMPLE1
AHL121I TRACE OPTION INPUT INDICATED FROM MEMBER GTFPARM OF PDS SYS1.PARMLIB
AHL103I TRACE OPTIONS SELECTED--SYSM,USR,TRC,DSP,PCI,SRM
00 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
   REPLY 00,U
AHL103I GTF INITIALIZATION COMPLETE
```

*Figure 82. Example: Starting GTF with a Cataloged Procedure*

Starting GTF with internal tracking

Figure 83 on page 224 shows GTF, with identifier EXAMPLE2, started with MODE=INT. The trace data is maintained in virtual storage and is not recorded on an external device. In this example, you can override the trace options given in the supplied parmlib member:

```
START GTF.EXAMPLE2,,,(MODE=INT),DSN=NULLFILE
AHL121I TRACE OPTION INPUT INDICATED FROM MEMBER memname OF PDS dsname
AHL103I TRACE OPTIONS SELECTED - SYSM,USR,TRC,DSP,PCI,SRM
00 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
   REPLY 00,TRACE=IO,SSCH,SVC,DSP
AHL103I TRACE OPTIONS SELECTED -- DSP,SVC,IO,SSCH
01 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
   REPLY 01,U
AHL031I GTF INITIALIZATION COMPLETE
```

*Figure 83. Example: Starting GTF with internal tracking*

Starting GTF with trace output to an existing data set on tape

Figure 84 on page 225 shows how the START command is used to direct GTF trace output to an existing data set on tape rather than to an existing data set on a DASD. The device type and volume serial number are supplied. The disposition and name of the trace data set are changed from DISP=(NEW,KEEP) and DSNAME=SYS1_TRACE to DISP=(OLD,KEEP) and DSNAME=TPOUTPUT. The specified tape has a volume serial of TRCTAP and resides on a 3400 tape drive. Note that the GTFPARM parmlib member is used to specify the trace options.

Here the GTF keyword is not followed by a unique identifier and defaults to volume serial number.
Figure 84. Example: Start GTF, trace output to an existing data set on tape

Starting GTF with trace options stored in SYS1.PARMLIB

Figure 85 on page 225 shows how to store trace options in a member of SYS1.PARMLIB. This can save you time when starting GTF. First store one or more combinations of trace options as members in SYS1.PARMLIB, and include a SYSLIB DD statement in the cataloged procedure. When you start GTF, GTF will then retrieve the trace options from SYS1.PARMLIB, instead of prompting you to supply them through the console. GTF displays the trace options for you, and then issues message AHL125A, to which you can reply U to accept the parmlib options.

This example shows the job control statements and utility JCL statements needed to add trace options to SYS1.PARMLIB using IEBUPDTE.

Figure 85. Example: Starting GTF with trace options stored in SYS1.PARMLIB

A sample SYSLIB DD statement to be included in a GTF cataloged procedure might look like this:

```
//SYSLIB DD DSN=SYS1.PARMLIB(GTFA),DISP=SHR
```

The new member name can also be specified on the START command while using the IBM-supplied GTF procedure, as in the following example:

```
S GTF,,,(MODE=EXT,TIME=YES),MEMBER=GTFA
```

For more information see the following references:

- See z/OS DFSMSdftp Utilities for descriptions of the statements.
- See z/OS MVS JCL Reference for descriptions of the statements.
- See z/OS MVS Initialization and Tuning Reference for further information about SYS1.PARMLIB.

Starting GTF without trace options in a member

Figure 86 on page 226 shows an installation-written procedure where there is no predefined member with trace options specified. The procedure contains no SYSLIB DD statement. When GTF is started with a procedure containing no SYSLIB DD statement, message AHL100A is issued to prompt for GTF trace options.
In this example, an installation-written cataloged procedure, USRPROC, is invoked to start GTF in external mode to a direct access data set, ABCTRC, on device 250. The trace options selected result in trace data being gathered for:

- All SVC and IO interruptions
- All SSCH operations
- All matching SLIP traps with a tracing action specified or SLIP traps in DEBUG mode
- All dispatcher events
- All issuers of the GTRACE macro will have their user data recorded in the trace buffers.

The trace data is written into the data set ABCTRC. (Note that when the end of the primary extent is reached, writing continues at the beginning.)

```
START USRPROC,250,333005,(MODE=EXT),DSN=ABCTRC
00 AHL100A SPECIFY TRACE OPTIONS
REPLY 00,TRACE=SVC,SSCH,IO,DSP,SLIP,USR
AHL103I TRACE OPTIONS SELECTED--USR,DSP,SVC,IO,SLIP,SSCH
01 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
REPLY 01,U
AHL031I GTF INITIALIZATION COMPLETE
```

Figure 86. Example: Starting GTF without trace options in a member

### Starting GTF to trace VTAM remote network activity

GTF can trace VTAM activity only if VTAM is started with the GTF option. See z/OS Communications Server: SNA Operation for details. In Figure 87 on page 226, GTF options are not stored in parmlib; the trace options are entered at the console. Three GTF options are required to record all VTAM traces:

- RNIO must be specified so that the VTAM I/O trace can function for an NCP or a remote device attached to the NCP.
- IO or IOP must be specified so that the VTAM I/O trace can function for a local device.
- USR or USRP must be specified so that the VTAM buffer and the NCP line traces can function.

You must enter the START GTF command before a trace can be activated from VTAM.

```
START MYPROC.EXAMPLE8,,,(MODE=EXT)
00 AHL100A SPECIFY TRACE OPTIONS
REPLY 00,TRACE=RNIO,IO,USR
AHL103I TRACE OPTIONS SELECTED--IO,USR,RNIO
01 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
REPLY 01,USR=(FF0,FF1),END
AHL031I GTF INITIALIZATION COMPLETE
```

Figure 87. Example: Starting GTF to trace VTAM remote network activity
Stopping GTF

You can enter the STOP command at any time during GTF processing. The amount of time you let GTF runs depends on your installation and the problem you are trying to capture, but a common time is between 15 and 30 minutes.

If you are running GTF to gather information related to a problem for which a SLIP trap has been defined, you can instruct SLIP to stop all instances of GTF when the trap conditions are satisfied. For additional information, see the SLIP command documentation in z/OS MVS System Commands.

To stop GTF processing, enter the STOP command. The STOP command must include either the GTF identifier specified in the START command, or the device number of the GTF trace data set if you specified MODE=EXT or MODE=DEFER to direct output to a data set. If you have not specified the GTF identifier in the START command, then those instances of GTF will have the same identifier: the volume serial number.

If you are not sure of the identifier or the device number of the trace data set, enter the following command:

```
DISPLAY A, LIST
```

Figure 88 on page 227 shows the output produced by the DISPLAY A, LIST command. In this example, the identifier for GTF is EVENT1.

```
CNZ4105I 16.47.46 DISPLAY ACTIVITY   FRAME LAST   F      E   SYS=SY1
JOBS     M/S    TS USERS    SYSAS    INITS   ACTIVE/MAX VTAM     OAS
00000    00005    00000      00016    00008    00000/00300       00000
LLA      LLA      LLA      NSW  S  VLF      VLF      VLF      NSW  S
JES2     JES2     IEFPROC  NSW  S  SDSF     SDSF     SDSF     NSW  S
GTF      EVENT1   IEFPROC  NSW  S
```

Figure 88. Example: recognizing GTF identifier in DISPLAY A, LIST output

You must enter the STOP command at a console with master authority. The general format of the STOP command is as follows:

```
{STOP|P} identifier
```

For example, to stop GTF for the identifier EVENT1 (as shown in Figure 88 on page 227), enter the command:

```
STOP EVENT1
```

When the STOP command takes effect, the system issues message AHL006I. If the system does not issue message AHL006I, then GTF tracing continues, remaining active until a STOP command takes effect or the next initial program load (IPL). When this happens, you will not be able to restart GTF tracing. In this case, you can use the FORCE ARM command to stop GTF.

If there were several functions started with the same identifier on the START command, using the same identifier on the STOP command will stop all those functions.

If the volume serial number is used on the STOP command, all instances of GTF with trace data directed to a data set on that volume serial are stopped. This is independent of the identifier assigned to each instance of GTF.

For example, if three instances of GTF are active with the identifiers EX1, EX2, and EX3 directing trace data to different data sets to the same volume with volume serial number 1020, then the following command will stop all the 3 instances of GTF.

```
STOP 1020
```
See z/OS MVS System Commands for more information about the STOP and FORCE ARM commands.

You can also use an identifier to stop GTF. In this example, the following command starts GTF tracing with the identifier EXAMPLE and with trace data maintained in the GTF address space. The DSN keyword is entered to prevent allocation of an external trace data set as specified in the cataloged procedure.

```
START GTF.EXAMPLE,,,(MODE=INT),DSN=NULLFILE
```

To stop GTF tracing, you would issue the following command:

```
STOP EXAMPLE
```

In some instances, you may need to display the active jobs before stopping GTF. The example shown in Figure 89 on page 228 starts GTF tracing with trace data recorded on an external device, data set GTF.TEST01. Another instance of GTF with an identifier EX1 is started with trace data directed to another data set on the same volume. Note that you do not have to specify MODE=EXT, because it is the default.

```
S GTF,,DSNAME=GTF.TEST01,VOLUME=SER=IPCS01,DISP=OLD
S GTF.EX1,DSNAME=GTF.TEST02,VOLUME=SER=IPCS01
```

*Figure 89. Example: Starting instances of GTF*

Because it is not apparent which is the GTF recording device, you have to display active jobs with the DISPLAY A,LIST command before stopping GTF. In Figure 90 on page 228, the device number for GTF is 0227.

```
CNZ4105I 16.54.36 DISPLAY ACTIVITY FRAME LAST F E SYS=SY1
JOBS M/S TS USERS SYSSAS INITIS ACTIVE/MAX VTAM OAS 00000 00006 00000 00028 00008 00002/00300 00003 IGVDGNPP IGVDGNPP IGVDGNPP OWT S VLF VLF VLF NSW S VTAM VTAM VTAM NSK S J273 J273 IEFPROC NSW S GTF 0227 IEFPROC NSK S GTF EX1 IEFPROC NSW S
```

*Figure 90. Example: DISPLAY A,LIST command output*

If you only want to stop only the second instance of GTF, issue the following command:

```
STOP EX1
```

If you want to stop both instances, issue the following command:

```
STOP 227
```

**GTF trace options**

This topic describes the GTF options you can specify through either system prompting in response to the START GTF command or in a predefined parmlib or data set member. However, GTF will not use certain combinations of options; see Table 36 on page 232 for a list of those combinations.

Some GTF trace options also require keywords. If you specify options requiring keywords in the member or data set containing the predefined options, it must also contain the associated keywords. These are explained in "Prompting keywords" on page 233.

**ASIDP**

Requests that GTF tracing be limited to a subset of address spaces. ASIDP requests GTF prompting for one to five address space identifiers (ASID) in which you want GTF tracing to occur. ASIDP works only with a GTF option that generates tracing, such as SVC or IO. For information about responding to GTF prompts, see “Prompting keywords” on page 233.
CCW
Requests tracing of channel programs and associated data for I/O events. CCW is valid only if the other trace options include SSCH, SSCHP, IO, or IOP. See Table 36 on page 232.

CCWP
Requests tracing of channel programs and associated data for I/O events, and requests GTF prompting for the following information:
- Tracing channel command words (CCW) or device command words (DCW) for start subchannel (SSCH) operations or I/O interruptions or both
- Tracing the request and response blocks for synchronous I/O (zHyperLink) end events
- Maximum number of CCWs or device command words (DCW) for each event
- Maximum number of bytes of data for each CCW or DCW or synchronous I/O request
- Optional input/output supervisor block (IOSB), input/output block extension (IOBE, zHPF channel programs, and synchronous I/O requests only), and error recovery procedure work area (EWA) tracing
- Size of the program controlled interrupt (PCI) table
For information about responding to GTF prompts, see “Prompting keywords” on page 233.
CCWP is valid only if the other trace options include SSCH, SSCHP, IO, or IOP. See Table 36 on page 232.

CSCH
Requests recording for all clear subchannel operations. See Table 36 on page 232 for more information on combining this option with other GTF options.

DSP
Requests recording for all dispatchable units of work: service request block (SRB), local supervisor routine (LSR), task control block (TCB) and Supervisor Call (SVC) prolog dispatch events. If you specify both the SYSM and DSP trace options, GTF records minimal trace data for DSP. Otherwise, GTF records comprehensive trace data for DSP.

EXT
Requests comprehensive recording for all external interruptions. See Table 36 on page 232 for more information on combining this option with other GTF options.

HSCH
Requests recording for all halt subchannel operations. See Table 36 on page 232 for more information on combining this option with other GTF options.

IO
Requests recording of all non-program-controlled I/O interruptions and synchronous I/O (zHyperLink) end events. Unless you also specify the PCI trace option, GTF does not record program-controlled interruptions. See Table 36 on page 232 for more information on combining this option with other GTF options.

IOX
Requests recording of all non-program-controlled I/O interruptions providing a summary of a complete channel program for the I/O interruption in an I/O summary trace record. Unless you also specify the PCI trace option, GTF does not record program-controlled interruptions.

IOP
Requests GTF prompting for specific device numbers for which you want GTF to record non-program-controlled I/O interruptions and synchronous I/O (zHyperLink) end events. Unless you specify the PCI trace option, GTF does not record program-controlled interruptions. See Table 36 on page 232 for more information on combining this option with other GTF options. For information about responding to GTF prompts, see “Prompting keywords” on page 233.

IOXP
Requests GTF prompting for specific device numbers for which you want GTF to record non-program-controlled I/O interruptions providing a summary of a complete channel program for the I/O interruption in an I/O summary trace record. Unless you specify the PCI trace option, GTF does not
record program-controlled interruptions. For more information on responding to GTF prompts, see “Prompting keywords” on page 233.

If an installation chooses to specify either IO or IOP in addition to IOX or IOXP, they will receive IOX records for DASD and tape devices and IO records for all other devices.

**JOBNAMEP**
Requests that GTF tracing be limited to a subset of jobs. JOBNAMEP requests GTF prompting for one through five job names for which you want GTF tracing to occur.

These job names can be generic, as well as specific, job names. If you want to specify generic job names, use * or % in the job name.

The asterisk is a placeholder for one or more valid job name characters, or indicates no characters. For example, if you enter JOBNAMEP=I*MS*, GTF will process trace data for address spaces with job names IABMS01, IAMMS, IMS, IMSA, IMS00012, and so on. However, if you enter JOBNAMEP=*MASTER*, that job name represents only the master address space.

The percent symbol is a placeholder for a single valid job name character. For example, if you enter JOBNAMEP=I%MS%%, GTF will process trace data for address spaces with job names IAMS01 and IXMBSBC, but not job names IMS001 or I999MS. The combination %* is a placeholder for at least one character.

JOBNAMEP works only with a GTF option that generates tracing, such as SVC or IO. For information on responding to GTF prompts, see “Prompting keywords” on page 233.

**MSCH**
Requests recording for all modify subchannel operations. See Table 36 on page 232 for more information on combining this option with other GTF options.

**PCI**
Requests recording of intermediate status interruptions in the same format as other I/O trace records that GTF creates. Specifically, PCI causes GTF to record program-controlled I/O interruptions, initial status request interruptions, resume subchannel operation instruction, and suspend channel program interruptions. When you select specific devices as a result of prompting for I/O events (IOP trace option), GTF records intermediate status interruptions for only those devices. PCI is valid only when the other trace options include IO, IOP, SYS, SYSM, or SYSP.

**PCIE**
Requests tracing of PCI load and store instructions, adapter interrupts, and PCIE de-multiplexing requests.

**PFIDP**
Requests that GTF tracing of PCIE-related events be limited to a subset of the PCIE function identifiers (PFIDs). PFIDP requests GTF prompting for 1 to 256 PFIDs or PFID ranges in which you want GTF tracing to occur. PFIDP is only valid when the PCIE trace option is specified. For information on responding to GTF prompts, see “Prompting keywords” on page 233.

**PI**
Requests comprehensive recording for all program interruptions (0-255). See Table 36 on page 232 for more information on combining this option with other GTF options.

**PIP**
Requests GTF prompting for those interruption codes for which you want GTF to record program interruptions. For information about responding to GTF prompts, see “Prompting keywords” on page 233. See Table 36 on page 232 for more information on combining this option with other GTF options.

**RNIO**
Requests recording of all Virtual Telecommunications Access Method (VTAM) network activity. If you specify both the SYSM and RNIO trace options, GTF will record minimal trace data for RNIO. Otherwise, GTF records comprehensive trace data for RNIO.

**RR**
Requests comprehensive recording of data associated with all invocations of recovery routines (such as STAE and ESTAE routines). GTF creates a trace record describing the activity of the recovery routine.
when control passes from the recovery routine back to the recovery termination manager (RTM). See Table 36 on page 232 for more information on combining this option with other GTF options.

{SIO|SIOP}
If you specify the SIO or SIOP trace option, GTF processes that request as a request for SSCH or SSCHP. GTF issues message AHL138I to indicate this substitution. Subsequent messages refer to the original SIO or SIOP trace option.

**Note:** The SIO keyword is provided only for compatibility; it is recommended that you use the SSCH keyword instead. The SIOP option is provided only for compatibility; it is recommended that you use the SSCHP option instead.

**SLIP**
Requests that a trace entry be made each time:
- A match occurs for a SLIP trap with ACTION=TRACE
- A SLIP trap with the SLIP DEBUG option is checked

The amount of data and the type of SLIP trace record to be built is specified on the SLIP command.

**SRM**
Requests recording of trace data each time the system resource manager (SRM) is invoked. If you specify both the SYSM and SRM trace options, GTF records minimal trace data for SRM. Otherwise, GTF records comprehensive trace data for SRM.

**SSCH**
Requests recording for start subchannel and resume subchannel operations and synchronous I/O (zHyperLink) start events. See Table 36 on page 232 for more information on combining this option with other GTF options.

**SSCHP**
Requests GTF prompting for the specific device numbers for which you want GTF to record start subchannel and resume subchannel operations, and synchronous I/O (zHyperLink) end events. For information about responding to GTF prompts, see “Prompting keywords” on page 233. See Table 36 on page 232 for more information on combining this option with other GTF options.

**SVC**
Requests comprehensive recording for all SVC interruptions. See Table 36 on page 232 for more information on combining this option with other GTF options.

**SVCP**
Requests GTF prompting for those SVC numbers for which you want data recorded. For information about responding to GTF prompts, see “Prompting keywords” on page 233. See Table 36 on page 232 for more information on combining this option with other GTF options.

**SYS**
Requests recording of comprehensive trace data for all of the following:
- Clear subchannel operations
- External interruptions
- Halt subchannel operations
- I/O interruptions
- Modify subchannel operations
- Program interruptions
- Recovery routines
- Start subchannel and resume channel operations
- SVC interruptions.

Because specifying SYS automatically causes GTF to trace all of these events, GTF will ignore the following trace options if you specify them in any form: CSCH, HSCH, MSCH, SSCH, EXT, IO, PI, RR, SVC. See Table 36 on page 232 for more information on combining this option with other GTF options.
SYSM
Requests recording of minimal trace data for the same events as SYS.

Because specifying SYSM automatically causes GTF to trace all of these events, GTF will ignore the following trace options if you specify them in any form: CSCH, HSCH, MSCH, SSCH, EXT, IO, PI, RR, SVC.

If you specify DSP, RNIO, or SRM in addition to SYSM, GTF produces minimal, rather than comprehensive, trace data for those events.

SYSP
Requests recording for the same events as the SYS option, but causes GTF to prompt for selection of specific SVC, IO, SSCH, and PI events that you want recorded. For information about responding to GTF prompts, see “Promoting keywords” on page 233.

Because specifying SYSP automatically causes GTF to trace all of these events, GTF will ignore the following trace options if you specify them in any form: CSCH, HSCH, MSCH, SSCH, EXT, IO, PI, RR, SVC. See Table 36 on page 232 for more information on combining this option with other GTF options.

TRC
Requests recording of those trace events that are associated with GTF itself. Unless you request TRC, GTF will not trace these events. TRC works only with a GTF option that generates tracing, such as SVC or IO.

USR
Requests recording of all data that the GTRACE macro passes to GTF. You must specify USR or USRP to trace data from the GTRACE macro. Use USRP for specific events. If USR is used instead of USRP, the trace data set might be full of unwanted records. When you code the GTRACE macro but do not specify USR or USRP, GTF ignores the GTRACE macro. See Table 36 on page 232 for more information on combining this option with other GTF options.

Reference
See z/OS MVS Programming: Assembler Services Reference ABE-HSP for information about coding the GTRACE macro.

USRP
Requests GTF prompting for specific event identifiers (EID) of the data that the GTRACE macro passes to GTF. The EIDs represent user, program product, or IBM subsystem and component events. See Table 39 on page 238 for a list of EID values.

See Table 36 on page 232 for more information on combining this option with other GTF options. For information about responding to GTF prompts, see “Promoting keywords” on page 233.

XSCH
Requests recording all cancel subchannel operations.

See Table 36 on page 232 for more information on combining this option with other GTF options. For information about responding to GTF prompts, see Table 37 on page 233.

Combining GTF options
Table 36 on page 232 shows those TRACE options that GTF will not use in combination. If two or more options from the same row are specified, GTF uses the option that has the lower column number and ignores the other options. For example, if you specify both SYSP and PI (see row D), GTF uses SYSP (column 2) and ignores PI (column 5).

<table>
<thead>
<tr>
<th>Row</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>SYSM</td>
</tr>
</tbody>
</table>
### Table 36. Combining GTF options. (continued)

<table>
<thead>
<tr>
<th>Row</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>SYSM</td>
</tr>
<tr>
<td>C</td>
<td>SYSM</td>
</tr>
<tr>
<td>D</td>
<td>SYSM</td>
</tr>
<tr>
<td>E</td>
<td>SYSM</td>
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<tr>
<td>F</td>
<td>SYSM</td>
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<td>G</td>
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<tr>
<td>I</td>
<td>SYSM</td>
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<tr>
<td>J</td>
<td>SYSM</td>
</tr>
<tr>
<td>K</td>
<td>CCWP</td>
</tr>
<tr>
<td>L</td>
<td>USRP</td>
</tr>
</tbody>
</table>

If an installation chooses to specify either IO or IOP in addition to IOX or IOXP, they will receive IOX records for DASD and tape devices and IO records for all other devices.

### Prompting keywords

When you specify any of the trace options listed in Table 37 on page 233, GTF prompts for specific values by issuing message AHL101A:

```
AHL101A SPECIFY TRACE EVENT KEYWORDS - keyword=,...,keyword=
```

The keywords issued in the message correspond to the trace options specified. Enter only the trace event keywords appearing in the message text. The trace options and their corresponding keywords are:

### Table 37. GTF trace options and corresponding prompting keywords.

<table>
<thead>
<tr>
<th>Trace Option</th>
<th>Prompting Keyword</th>
<th>Number of Prompting Values Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASIDP</td>
<td>ASID=</td>
<td>5</td>
</tr>
<tr>
<td>CCWP</td>
<td>CCW=</td>
<td>N/A</td>
</tr>
<tr>
<td>IOP, IOXP, SYSP</td>
<td>IO=SSCH=</td>
<td>Unlimited</td>
</tr>
<tr>
<td>IOP, IOXP, SSCHP, SYSP</td>
<td>IO=SSCH=</td>
<td>Unlimited</td>
</tr>
<tr>
<td>JOBNAMEP</td>
<td>JOBNAME=</td>
<td>5</td>
</tr>
<tr>
<td>PFIDP</td>
<td>PFID=</td>
<td>256</td>
</tr>
<tr>
<td>PIP, SYSP</td>
<td>PIP=</td>
<td>50</td>
</tr>
<tr>
<td>SSCHP, SIOP, SYSP</td>
<td>SIO=</td>
<td>Unlimited</td>
</tr>
<tr>
<td>SSCHP, SIOP, SYSP</td>
<td>SSCH=</td>
<td>Unlimited</td>
</tr>
<tr>
<td>SVCP, SYSP</td>
<td>SVC=</td>
<td>50</td>
</tr>
<tr>
<td>USRP</td>
<td>USR=</td>
<td>50</td>
</tr>
</tbody>
</table>
Table 37. GTF trace options and corresponding prompting keywords. (continued)

<table>
<thead>
<tr>
<th>Trace Option</th>
<th>Prompting Keyword</th>
<th>Number of Prompting Values Allowed</th>
</tr>
</thead>
</table>

**Note:**
1. The SIO keyword is provided only for compatibility; it is recommended that you use the SSCH keyword instead. The SIOP option is provided only for compatibility; it is recommended that you use the SSCHP option instead.
2. Tracing a PAV base device number will cause all PAV aliases associated with that base device number to also be traced. If I/O tracing is needed to locate issues related to PAV alias device numbers when they are not associated with a PAV base device number, specify the device numbers of the PAV alias devices explicitly.

**Guidelines for specifying values for prompting keywords:** Use the following guidelines when replying to message AHL101A for prompting keywords:

- If you do not specify a reply for each of the keywords displayed in message AHL101A, GTF records all the events for that trace option, which increases the amount of storage that GTF requires. IBM recommends that you specify values for each keyword displayed, selecting the values that will help you debug your problem.

- You can only enter values for keywords displayed in message AHL101A.

- GTF limits the number of specific values that you can supply through prompting, see Table 37 on page 233 for the maximum number of values allowed for each keyword. If you specify more than the maximum values, GTF issues a message to which you reply by respecifying values for all appropriate keywords.

- Keep in mind that prompting increases the amount of storage that GTF requires, because storage requirements depend on the trace options you specify. See “Determining GTF’s storage requirements” on page 220 for further information.

- Within a given reply, each keyword that you specify must be complete. If you need more values for a keyword than will fit into one reply, repeat the keyword in the next reply, and code the additional values for that keyword. The following are examples of correct replies:

  ```plaintext
  REPLY 01 IO=(191-193), SVC=(1,2,3,4,5)
  REPLY 01 SVC=(6,7,8,9,10)
  ```

  The maximum number of values that GTF allows for a keyword does not change, regardless of whether you enter one or more replies to specify all the values for the keyword.

- After supplying all keywords and values, you must enter the END keyword, which signifies that the event definition is complete. If the system does not find the END keyword in a reply, the system issues message AHL102A to prompt for additional event keywords and values. When the system finds the END keyword, the system issues message AHL103I to list all of the trace options that are in effect.

For sample prompting sequences, see “Examples of sample prompting sequences” on page 238.

Use the following keywords when GTF prompts for values by issuing message AHL101A:

**ASID=(asid1[,asidn]...[,asid5])**

Specifies one through five identifiers for address spaces in which you want GTF tracing to occur. The values ‘asid1’ through ‘asid5’ are hexadecimal numbers from X’0001’ to the maximum number of entries in the address space vector table (ASVT). If you specify ASIDP, but do not specify ASID= before replying END, GTF traces all address space identifiers.

If the number of values for ASIDP requires more than one line, and a particular ASID value is incorrect, GTF allows you to respecify the correct value without having to reenter all ASIDs.

If you specify both ASIDP and JOBNAMEP, GTF will trace address spaces that ASIDP did not identify, if some of the jobs that JOBNAMEP identifies run in other address spaces.

**CCW=(S|I|SI), CCWN=nnnnn[,DATA=nnnnn][,IOSB][,PCITAB=n])**

Generalized Trace Facility
Specifies different options for tracing channel programs. If you specify CCW= more than once, GTF uses the last specification of CCW=.

If you specify CCWP, but do not specify a value for keyword CCW=, GTF's default CCW tracing depends on what other trace options were specified. The following table shows the defaults for CCW tracing depending on other trace options specified:

<table>
<thead>
<tr>
<th>Other Trace Options Selected</th>
<th>CCW Subparameter Defaults</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCH or SSCHP</td>
<td>S</td>
</tr>
<tr>
<td>IO or IOP or IOX or IOXP</td>
<td>I</td>
</tr>
<tr>
<td>SSCH or SSCHP or IO or IOP or IOX or IOXP</td>
<td>SI</td>
</tr>
<tr>
<td>PCI</td>
<td>PCITAB=1</td>
</tr>
<tr>
<td>SSCH or SSCHP or IO or IOP or IOX or IOXP</td>
<td>CCWN=50</td>
</tr>
<tr>
<td>SSCH or SSCHP or IO or IOP or IOX or IOXP</td>
<td>DATA=20</td>
</tr>
</tbody>
</table>

**Examples**:
- TRACE=IO,CCWP
  CCW defaults to: CCW=(I,CCWN=50,DATA=20)
- TRACE=IOP,SSCH,PCI,CCWP
  CCW defaults to: CCW=(SI,CCWN=50,DATA=20,PCITAB=1)

If you specify an option more than once in one line, GTF uses the last specification of that option. An exception is that GTF uses the first specification of S, I, or SI. If a line contains an error, GTF prompts you to respecify the value.

**S|I|SI**
- Specifies the type of I/O event for which you want channel programs traced. If you specify more than one option, GTF uses the first option.
  - **S**
    Specifies GTF tracing of channel programs for start subchannel and resume subchannel operations. CCW=S works only with the SSCH or SSCHP trace options.
  - **I**
    Specifies GTF tracing of channel programs for I/O interruptions, including program-controlled interruptions if you specify PCI as a trace option, and synchronous I/O (zHyperLink) end events. CCW=I works only with the IO or IOP trace options.
  - **SI**
    Specifies GTF tracing of channel programs for start subchannel and resume subchannel operations and I/O interruptions, and synchronous I/O (zHyperLink) end events. CCW=SI works only with either SSCH or SSCHP and either IO or IOP as trace options.

**CCWN=nnnnn**
- Specifies the maximum number of CCWs or DCWs traced for each event. The value nnnnn is any decimal number from 1 to 32767. The default is 50.

**DATA=nnnnn**
- Specifies the maximum number of bytes of data traced for each CCW or DCW, or indirect data address word. The value nnnnn is any decimal number from 0 to 32767. The default is 20.
  - For non-zHPF channel programs, GTF traces nnnnn bytes of data for each CCW, or each indirect data address word (IDAW), or modified indirect data address word (MIDAW). For zHPF channel programs, GTF traces nnnnn bytes of data for each DCW, or each transport indirect data address word (TIDAW). For synchronous I/O operations, GTF traces nnnnn bytes for each synchronous I/O data address word (SDAW).
  - For start subchannel or resume subchannel operations, GTF does not trace data for read, read backwards, or sense commands in the channel programs. If no data is being transferred, regardless of the type of I/O operation, GTF does not trace data for read, read backwards, or sense commands.
For synchronous I/O operations, GTF only traces data at the end of the synchronous I/O operation (synchronous I/O end event) if the operation is successful (response code X'0010').

When the data count in the CCW or DCW or the amount of data associated with the indirect data address word is equal to or less than $n \times n$, GTF traces all data in the data buffer. When the data count in the CCW or DCW or the amount of data associated with the indirect data address word is greater than $n \times n$, GTF traces data only from the beginning and end of the data buffer. If you examine the traced data, you can tell whether the channel completely filled the buffer on a read operation.

GTF uses a different CCW or DCW tracing method for a data transfer that is in progress when an I/O interruption occurs. Instead of using the data count in the CCW or DCW, GTF tracing depends on the transmitted data count. The transmitted data count is the difference between the data count in the CCW or DCW and the residual count in the subchannel status word (SCSW), for non-zHPF channel programs and the transport status block (TSB), for zHPF channel programs.

- When the residual count is greater than the data count in the CCW or DCW, then GTF traces all of the data in the CCW or DCW.
- When the transmitted data count is less than or equal to $n \times n$, GTF traces all of the transmitted data.
- When the transmitted data count is greater than $n \times n$, GTF traces data only from the beginning and end of the transmitted data.

**IOSB**

Specifies tracing of the input/output supervisor block (IOSB), the input/output block extension (IOBE), for zHPF channel programs and synchronous I/O requests, and, if available, the error recovery procedure work area (EWA), for all events. If you do not specify IOSB, then GTF performs IOSB and EWA tracing only if GTF encounters an exceptional condition when tracing a channel program.

**PCITAB=n**

Specifies a decimal number of 100-entry increments for GTF to allocate in an internal program-controlled interruption (PCI) table. The value of $n$ is an integer from 1 to 9. The default is 1 (100 entries).

The PCI table keeps track of the channel programs that use PCI. One entry in the PCI table contains information about a program-controlled interruption in one channel program. An entry in the PCI table includes a CCW address and an IOSB address.

**IO=(DEVCLASS=xxxx,DEVCLASS=xxxx,devnum1 [,devnum2,...,devnum])**

Specifies devices for which you want I/O interruptions or synchronous I/O end events traced. Devices are specified by entering a device number or a device class.

The device number must be specified in hexadecimal and is not the same as the subchannel number. If you specify any combination of IO= and SSCH=, and IO=SSCH=, the combined number of device numbers for all prompting keywords is unlimited. Specify device numbers individually, or as a range of device numbers with a dash (-) or colon (:) separating the lowest and highest number in the range. For example, to trace I/O interruptions for device numbers 193 through 198, you specify IO=(193-198).

The device class must be specified with the DEVCLASS= keyword parameter, which provides the ability to trace all devices in the specified device class. The allowable keyword parameters are:

- **TAPE** (magnetic tape devices)
- **COMM** (communications)
- **DASD** (direct access storage device)
- **DISP** (display)
- **UREC** (unit/record)
- **CTC** (channel to channel)

If you specify IOP, IOXP, or SYSP and does not specify IO= in the response to the prompting messages, GTF processing proceeds as if you specified IO, IOX or SYS event keywords respectively.

For the following examples, the I/O device numbers and associated device types listed below are used:
I/O Device Number  
Device Type  
230  
3390 DASD  
450  
3490 Tape Drive  
575  
3480 Tape Drive  
663  
3380 DASD  
020  
3274 Communications Controller

In this example, the resulting trace includes information for all DASD devices and one 3490 tape drive at address 450.

\[ IO=(DEVCLASS=DASD,450) \]

In the following example, the resulting trace includes information for all DASD and TAPE devices and the communications controller at address 020.

\[ IO=(DEVCLASS=DASD,DEVCLASS=TAPE,020) \]

In this example, the resulting trace includes information for the devices at addresses 450, 575, and 663.

\[ IO=(450-663) \]

\[ IO=SSCH=(DEVCLASS=xxxx,DEVCLASS=xxxx,devnum1[,devnum..., [,devnum]) \]

Specifies devices for which you want I/O interruptions and start subchannel operations, and synchronous I/O start and end events traced. See the IO= prompting keyword for a description of how to specify devices to be traced.

\[ JOBNAME=(jobname1[,jobnamen][[jobname5]) \]

Specifies one through five job names for which you want GTF tracing to occur. The values \textit{job1} through \textit{job5} must be valid job names.

These job names can be generic, as well as specific, job names. If you want to specify generic job names, you must use * or % in the job name.

The asterisk is a placeholder for one or more valid job name characters, or indicates no characters. For example, if the you enter JOBNAMEP=I*MS*, GTF will process trace data for address spaces with job names IABMS01, IAMS, IMS, IMSA, IMS00012, and so on. However, if you code JOBNAMEP=*MASTER*, that job name represents only the master address space.

The percent symbol is a placeholder for a single valid job name character. For example, if you code JOBNAMEP=I%MS%%, GTF will process trace data for address spaces with job names IAMS01 and IXMSBC, but not job names IMS001 or I999MS. The combination %* is a placeholder for at least one character.

If you specify JOBNAMEP, but do not specify JOBNAME before replying END, GTF traces all job names.

If the number of values for JOBNAMEP requires more than one line, and a particular job name value is incorrect, GTF allows you to respecify the correct value without having to reenter all job names.

If you specify both ASIDP and JOBNAMEP, GTF will trace jobs that JOBNAMEP did not identify, if some of the address spaces that ASIDP identifies contain jobs that JOBNAMEP did not identify.
PFID=(pfid1[,pfidn]...[,pfid256])
Specifies 1 to 256 PFIDs or PFID ranges for which you want GTF tracing to occur. The values are hexadecimal numbers from 0 to FFFFFFFF. Leading zeroes are allowed. For example: 1, 01, and 00000001 are all accepted. If a PFID range is specified, the first number in the range must be lower than the second number in the range.
Duplicate PFID values are ignored. Overlapping PFID ranges are accepted without issuing an error message.
If you specify PFIDP, but do not specify PFID= before replying END, GTF traces all PFIDs. If the number of values for PFIDP requires more than one line, and a particular PFID value is incorrect, GTF allows you to re-specify the correct value without having to reenter all PFIDs.

PI=(code0[,coden]...[,code50])
Specifies 1 through 50 program interruption codes, in decimal notation, that you want traced. If you specify PIP or SYSP, and do not specify PI= in response to this prompting message, GTF traces all program interruptions.

SSCH=(DEVCLASS=xxxx,DEVCLASS=xxxx,devnum1[,devnumn....,devnum])
Specifies devices for which you want start subchannel operations and synchronous I/O start events traced. See the IO= “Prompting keywords” on page 233 for a description of how to specify devices to be traced.

SVC=(svcnum1[,svcnumn]...[,svcnum50])
Specifies 1 through 50 SVC numbers, in decimal notation, that you want traced. If you specify SVCP or SYSP, and do not specify SVC= in response to the prompting message, GTF traces all SVC numbers. Both SVC entry and exit are be recorded.

USR=(event1[,eventn]...[,event50])
Specifies 1 through 50 user event identifiers (EIDs) for which you want user data traced. The values for USR are three-digit hexadecimal numbers, as follows:

| Table 39. Event identifiers and the types of events they represent |
|---------------------|-----------------|
| Identifier (Hex)     | Type of Event   |
| 000-3FF              | User            |
| 400-5FF              | Reserved for program products |
| 600-FFF              | Reserved for IBM subsystems and components |

If you specify USRP and do not specify USR= in response to the prompting message, all instances of GTRACE issued with TEST=YES will return with an indication that tracing is not active.

Examples of sample prompting sequences
This example shows how to store prompting keywords in a SYS1.PARMLIB member.

If you start GTF with options requiring prompting keywords stored in SYS1.PARMLIB, these prompting keywords must also appear in the parmlib member. If prompting keywords are used in the parmlib member without the replies included, GTF will not obtain the replies from the console. GTF will use the options without the prompting (for example, SVCP becomes SVC). A SYSLIB DD statement in your cataloged procedure causes GTF to read the prompting keywords from the specified parmlib member. The second and subsequent logical records in the member should contain only the prompting keywords.
GTF uses either the END keyword, or end-of-file on the member as the indicator that there is no more prompting input from parmlib. If the number of events for one keyword require more than one record, respecify the keyword in a subsequent prompting record with the additional events, as follows:

Record #1 TRACE=IOP,SVCP,SSCH
Record #2 IO=(D34,D8C),SVC=(1,2,3)
Record #3 SVC=(4,5,6,7,8,9,10),END

Do not respecify the keyword through the system console at this point, because GTF will then override all of the options and keywords in the parmlib member.

When GTF finishes reading the options and prompting keywords in the parmlib member, it displays the options through message AHL103I:

AHL103I TRACE OPTIONS SELECTED--IO=P,SVCP,SSCH
AHL103I IO=(D34,D8C),SVC=(1,2,3,4,5,6,7,8,9,10)

This message may be a multiple-line message, depending on the number of options you select. If the set of devices specified for IO= and SSCH= are identical, message AHL103I will show them as if specified by use of IO=SSCH.

After GTF displays all of the options specified, you then have the opportunity to accept the parmlib options, or completely change the options by respecifying them through the console by replying to the following message:

AHL125A RESPECIFY TRACE OPTIONS OR REPLY U.

In Figure 91 on page 240, you started GTF in external mode to the data set defined in the cataloged procedure. You selected two trace options in reply 00:

- SYSP requests that GTF trace specific system event types.
- USRP requests that GTF trace specific user entries that the GTRACE macro generates.

Message AHL101A instructed you to specify values for the SVC, IO, SSCH, PI, and USR keywords. In reply 01 to message AHL101A, you selected:

- Five SVCs
- Two devices for non-program-controlled I/O interruptions
- One device for SSCH operations
- Three user event identifiers.

GTF does not record any other SVC, IO, and SSCH events. Because you did not specify any program interruption codes for PI=, GTF would trace all program interruptions.
In Figure 92 on page 240 you started GTF in external mode, using the trace options defined in the data set specified in the cataloged procedure. You are prompted for the information as follows:

- Message AHL100A prompts for trace options.
- In reply 00, you selected six trace options: SSCHP, IOP, PCI, CCWP, SVC, and JOBNAMEP.
- Message AHL101A prompts to specify values for the IO, SSCH, CCW and JOBNAME prompting keywords.
- In reply 01, you select one device for tracing both IO and SSCH events and limit GTF tracing to one job.
- In reply 02, you specify five options for CCW tracing.

The final result of these specifications is that GTF traces CCWs for both start subchannel operations and I/O interruptions at device 580 for the job BACKWARD, and all SVCs in BACKWARD’s address space. GTF would allocate 200 entries in the PCI table, and trace up to 100 CCWs or DCWs, up to 40 bytes of data for each CCW or DCW, and the IOSB, IOBE, and EWA.
Receiving GTF traces

GTF writes trace data in GTF trace tables in the GTF address space in storage. GTF trace data in storage are printed or viewed as part of a dump, if the dump options list includes TRT to request trace data. The following table shows the dumps that have TRT in their default options. For unformatted dumps that are printed or viewed through IPCS, format the trace data by specifying the IPCS GTFTRACE subcommand or using the IPCS Trace Processing selection panel.

To format and print GTF trace data in a GTFOUTxx or IEFRDER data set, specify the IPCS GTFTRACE subcommand or use the IPCS Trace Processing selection panel.

If the GTF data was created for VTAM diagnosis, you can use the ACF/TAP program to format the VTAM data.

<table>
<thead>
<tr>
<th>Dump</th>
<th>How to obtain trace data</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABEND dump to SYSABEND</td>
<td>Default</td>
</tr>
<tr>
<td>ABEND dump to SYSMDUMP</td>
<td>Not available</td>
</tr>
<tr>
<td>ABEND dump to SYSUDUMP</td>
<td>Request SDATA=TRT</td>
</tr>
<tr>
<td>SNAP dump</td>
<td>Request SDATA=TRT</td>
</tr>
<tr>
<td>Stand-alone dump</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for SDUMP or SDUMPX macro</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for DUMP operator command</td>
<td>Default</td>
</tr>
<tr>
<td>SVC dump for SLIP operator command with ACTION=SVCD, ACTION=STDUMP, ACTION=SYNCSVCD, or ACTION=TRDUMP</td>
<td>Default</td>
</tr>
<tr>
<td>Any dump customized to exclude trace data</td>
<td>Request SDATA=TRT</td>
</tr>
</tbody>
</table>

For more information, see the following references:

- See z/OS MVS IPCS Commands for the GTFTRACE subcommand.
- See z/OS MVS IPCS User’s Guide for the panel interface.

Combining, extracting, and merging GTF trace output

GTF trace data can be combined with other data or extracted from dumps and data sets using two IPCS subcommands: COPYTRC and MERGE.

Use consolidated or merged trace output to show the chronology of events around the time of an error. Specify start and stop times for the merge to see events beginning a little before the error occurred and ending a little after. On the CTRACE and GTFTRACE subcommands, specify the jobs and address space identifiers (ASID) involved, so that the merged output contains only pertinent trace records.

Merging is most useful when several components are running traces; the system can also be running a GTF trace. Each component puts its trace records into its own buffers independently. GTF is independent from all of the component traces. You can merge these separate records into one chronological sequence to make diagnosis easier.

See z/OS MVS IPCS Commands for more information about COPYTRC and MERGE.

Combining and extracting GTF output

Use the IPCS COPYTRC subcommand to do one or more of the following:

- Consolidate GTF trace data into one data set from:
  - Multiple GTF data sets
  - Multiple GTF data sets, dumps, or both
More than one system

- Extract GTF trace data from SVC dumps and stand-alone dumps
- Extract from merged data the GTF trace data for a specified list of systems

If you have GTF set up to write data for one system to multiple data sets, you can use the IPCS COPYTRC subcommand to consolidate the data into one data set. You should do this before you consolidate GTF data from multiple systems with the MERGE or COPYTRC subcommands.

Figure 93 on page 242 shows an example of a GTF cataloged procedure with 3 data sets defined for GTF data from system SYS01.

```plaintext
//GTFABC    PROC   MEMBER=GTFPARM
//IEFPROC    EXEC   PGM=AHLGTF,REGION=2880K,TIME=1440,
//             PARM=('MODE=EXT,DEBUG=NO')
//IEFRDER    DD     DSNAME=SYS1.GTFTRC,UNIT=SYSDA,
//             SPACE=(4096,20),DISP=(NEW,KEEP)
//SYSLIB     DD     DSN=SYS1.PARMLIB(&MEMBER),DISP=SHR
//GTFOUT1    DD     DSNAME=SYS01.DSN1,UNIT=&DEVICE,DISP=&DSPS;
//GTFOUT2    DD     DSNAME=SYS01.DSN2,UNIT=&DEVICE,DISP=&DSPS;
//GTFOUT3    DD     DSNAME=SYS01.DSN3,UNIT=&DEVICE,DISP=&DSPS;
```

**Figure 93. Example: Consolidating GTF output from multiple data sets**

From IPCS, issue the following command to consolidate the data from the data sets defined in the cataloged procedure into one data set, GTF.SYS01:

```
COPYTRC TYPE(GTF)
  INDATASET(SYS01.DSN1,SYS01.DSN2,SYS01.DSN3)
  OUTDATASET(GTF.SYS01)
```

In Figure 94 on page 242, the COPYTRC subcommand is used to consolidate data from 3 systems, in data sets GTF.SYS01, GTF.SYS02, and GTF.SYS03, into one output data set, GTF.ALLSYS.

```
COPYTRC TYPE(GTF)
  INDATASET(GTF.SYS01,GTF.SYS02,GTF.SYS03)
  OUTDATASET(GTF.ALLSYS)
```

**Figure 94. Example: Consolidating GTF output from multiple systems**

Note that just one data set per system was used on the COPYTRC command. For best results, if you have more than one data set for a system, you should first consolidate those using a separate instance of the COPYTRC command.

To format the output data set for GTF data, issue the following IPCS subcommand:

```
GTFTRACE DSNAME(ALLSYS)
```

**Merging trace output**

Use the IPCS MERGE subcommand to merge multiple traces into one chronological sequence. The traces can be all of the following:

- Component traces from the same dump on direct access storage (DASD)
- Component traces from different dumps on DASD
- GTF trace records from a dump or data set and on tape or DASD
In Figure 95 on page 243, the MERGE subcommand is used to consolidate and format data from 3 systems, in data sets GTF.SYS04, GTF.SYS05, and GTF.SYS06, into one chronological sequence in output data set, GTF.SYSALL.

```mergetrace
MERGE
GTFTRACE DSNAME(GTF.SYS04)
GTFTRACE DSNAME(GTF.SYS05)
GTFTRACE DSNAME(GTF.SYS06)
MERGEEND
```

Figure 95. Example: Merging GTF output from multiple systems

---

**Reading GTF output**

This topic shows the format of the trace records that GTF creates. When you select your tracing options carefully, GTF provides detailed information about the system and user events where your problem lies, making it easier to diagnose.

This section contains the following topics:

- “Formatted GTF trace output” on page 245 which has information about trace records formatted by the IPCS GTFTRACE subcommand.
- “Unformatted GTF trace output” on page 300 which has information about unformatted trace records.

“Trace options” on page 243 lists the GTF trace options and the trace records they generate in GTF trace output. Use this list to correlate the options you selected with their associated trace records. Some trace options in the table do not have trace records associated with them:

- **ASIDP** - Specifies that GTF trace only events from the select address spaces.
- **JOBNAMEP** - Specifies that GTF trace only events in selected jobs.
- **END** - Specifies the end of prompting keyword values specified.
- **TRC** - Specifies that GTF tracing includes the GTF address space.

### Trace options

<table>
<thead>
<tr>
<th>Trace Options</th>
<th>Trace Record Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASIDP</td>
<td>N/A</td>
</tr>
<tr>
<td>CCW</td>
<td>CCW, TCW, Synch I/O</td>
</tr>
<tr>
<td>CCWP</td>
<td>CCW, TCW</td>
</tr>
<tr>
<td>CSCH</td>
<td>CSCH</td>
</tr>
<tr>
<td>DSP</td>
<td>DSP, LSR, SDSP, SRB</td>
</tr>
<tr>
<td>END</td>
<td>N/A</td>
</tr>
<tr>
<td>EXT</td>
<td>EXT</td>
</tr>
<tr>
<td>HSCH</td>
<td>HSCH</td>
</tr>
</tbody>
</table>

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The Generalized Trace Facility (GTF) 243
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IO</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EOS, INTG, IO, IOCS, SYNE</td>
</tr>
<tr>
<td><strong>IOP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EOS, INTG, IO, IOCS, SYNE</td>
</tr>
<tr>
<td><strong>IOX</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IOX</td>
</tr>
<tr>
<td><strong>IOXP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IOXP</td>
</tr>
<tr>
<td><strong>JOBNAMEP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>MSCH</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSCH</td>
</tr>
<tr>
<td><strong>PCI</strong></td>
<td></td>
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<tr>
<td></td>
<td>PCI</td>
</tr>
<tr>
<td><strong>PCIE</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PCILG, PCISTG, ADINT, PCIDMX</td>
</tr>
<tr>
<td><strong>PFIDP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>PI</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGM, PI</td>
</tr>
<tr>
<td><strong>PIP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGM, PI</td>
</tr>
<tr>
<td><strong>RNIO</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RNIO</td>
</tr>
<tr>
<td><strong>RR</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FRR, STAE</td>
</tr>
<tr>
<td><strong>SIO</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSCH, SSCH</td>
</tr>
<tr>
<td><strong>SIOP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSCH, SSCH</td>
</tr>
<tr>
<td><strong>SLIP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLIP</td>
</tr>
<tr>
<td><strong>SRM</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRM</td>
</tr>
<tr>
<td><strong>SSCH</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSCH, SSCH, SYNS</td>
</tr>
<tr>
<td><strong>SSCHP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSCH, SSCH, SYNS</td>
</tr>
<tr>
<td><strong>SVC</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SVC</td>
</tr>
<tr>
<td><strong>SVCP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SVC</td>
</tr>
<tr>
<td><strong>SYS</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCH, EOS, EXT, FRR, HSCH, INTG, IO, IOCS, MSCH, PGM, PI, SSCH, STAE, SVC, SYNE, SYNS</td>
</tr>
<tr>
<td><strong>SYSM</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCH, EOS, EXT, FRR, HSCH, INTG, IO, IOCS, MSCH, PGM, PI, SSCH, STAE, SVC, SYNE, SYNS</td>
</tr>
<tr>
<td><strong>SYSP</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CSCH, EOS, EXT, FRR, HSCH, INTG, IO, IOCS, MSCH, PGM, PI, SSCH, STAE, SVC, SYNE, SYNS</td>
</tr>
<tr>
<td><strong>TRC</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>
Formatted GTF trace output

This topic describes GTF trace output records formatted by the IPCS GTFTRACE subcommand. In each formatted record, the length of each field is indicated by the number of characters. The characters indicate the type of data in the field, as follows:

- c  Character
- d  Decimal
- h  Hexadecimal
- x  Variable information
- y  Variable information

The CCW trace record format uses additional letters to distinguish parts of fields.

A trace record can contain indicators to denote unusual conditions that occurred while GTF was tracing the event for the record. The indicators are:

- N/A  Not applicable. The field does not apply in this record. In a 2-byte field, not applicable appears as N/.
- U/A  Unavailable. GTF could not gather the information. In a 2-byte field, unavailable appears as U/.
- PPPPPP  Unavailable because of a page fault encountered while GTF was gathering the data (SVC only).
- SSSSSSS  Unavailable because of security considerations (SVC only).
- ******  Unavailable because of an error that occurred while GTF was gathering the data or due to the data being paged out.
- X'EEEE'  Unavailable because of a severe error that occurred while GTF was gathering the data. This value appears in the first 2 data bytes of the trace record. The contents of the trace record are unpredictable.

Trace record identifiers

Each trace record has an identifier to indicate the type of record. Table 40 on page 245 lists the identifiers alphabetically and gives the page that shows the format for the record.

<table>
<thead>
<tr>
<th>Trace Record Identifier</th>
<th>GTF Trace Record</th>
<th>Parameter in SYS1.PARMLIB Member or Operator Reply</th>
<th>For format, see:</th>
</tr>
</thead>
<tbody>
<tr>
<td>****</td>
<td>Time stamp</td>
<td></td>
<td>“Time stamp records” on page 249</td>
</tr>
<tr>
<td>Trace Record Identifier</td>
<td>GTF Trace Record</td>
<td>Parameter in SYS1.PARMLIB Member or Operator Reply</td>
<td>For format, see:</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------</td>
<td>----------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>****</td>
<td>Lost event</td>
<td></td>
<td>“Lost event records” on page 250</td>
</tr>
<tr>
<td>ADINT</td>
<td>Adapter interruption</td>
<td>PCIE</td>
<td></td>
</tr>
<tr>
<td>CCW</td>
<td>Non-zHPF channel program</td>
<td>CCW</td>
<td></td>
</tr>
<tr>
<td>CSCH</td>
<td>Clear subchannel operation</td>
<td>CSCH, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>DSP</td>
<td>Task dispatch</td>
<td>DSP</td>
<td>“DSP and SDSP trace records” on page 254</td>
</tr>
<tr>
<td>EOS</td>
<td>End-of-sense interruption</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>EXT</td>
<td>General external interruption</td>
<td>EXT, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>FRR</td>
<td>Functional recovery routine return</td>
<td>RR, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>HEXFORMAT</td>
<td>Unformatted trace event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSCH</td>
<td>Halt subchannel operation</td>
<td>HSCH, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>INTG</td>
<td>Interrogate input/output interruption</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>IO</td>
<td>Input/output interruption</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>IOCS</td>
<td>Input/output interruption with concurrent sense</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>IOX</td>
<td>Input/output interruption summary record format</td>
<td>IOX, IOXP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>LSR</td>
<td>Local supervisor routine dispatch</td>
<td>DSP</td>
<td></td>
</tr>
<tr>
<td>MSCH</td>
<td>Modify subchannel operation</td>
<td>MSCH, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>PCI</td>
<td>Program-controlled input/output interruption</td>
<td>PCI</td>
<td></td>
</tr>
<tr>
<td>PCIDMX</td>
<td>PCIE de-multiplexing event</td>
<td>PCIE</td>
<td></td>
</tr>
<tr>
<td>PCILG</td>
<td>PCI load instruction</td>
<td>PCIE</td>
<td></td>
</tr>
<tr>
<td>PCISTG</td>
<td>PCI store instruction</td>
<td>PCIE</td>
<td></td>
</tr>
<tr>
<td>PGM</td>
<td>Program interruption</td>
<td>PI, PIP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>Program interruption</td>
<td>PI, PIP, SYS, SYSM, SYSP</td>
<td></td>
</tr>
<tr>
<td>RNIO</td>
<td>VTAM remote network input/output event</td>
<td>RNIO</td>
<td></td>
</tr>
<tr>
<td>RSCH</td>
<td>Resume subchannel</td>
<td>SSCH, SSCHP</td>
<td></td>
</tr>
<tr>
<td>SDSP</td>
<td>Task re-dispatch</td>
<td>DSP</td>
<td></td>
</tr>
</tbody>
</table>
Table 40. Summary of trace record identifiers (continued)

<table>
<thead>
<tr>
<th>Trace Record Identifier</th>
<th>GTF Trace Record</th>
<th>Parameter in SYS1.PARMLIB Member or Operator Reply</th>
<th>For format, see:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLIP</td>
<td>SLIP program event interruption</td>
<td>SLIP</td>
<td>“SLIP trace records” on page 273</td>
</tr>
<tr>
<td>SRB</td>
<td>Service request block routine dispatch or re-dispatch</td>
<td>DSP</td>
<td>“SRB trace records” on page 279</td>
</tr>
<tr>
<td>SRM</td>
<td>System resources manager return</td>
<td>SRM</td>
<td>“SRM trace records” on page 280</td>
</tr>
<tr>
<td>SSCH</td>
<td>Start subchannel operation</td>
<td>SSCH, SSCHP, SYS, SYSM, SYSP</td>
<td>“SSCH trace records” on page 281</td>
</tr>
<tr>
<td>STAE</td>
<td>STAE or ESTAE recovery routine return</td>
<td>RR, SYS, SYSM, SYSP</td>
<td>“STAE trace records” on page 282</td>
</tr>
<tr>
<td>SUBSYS</td>
<td>Unformatted trace event</td>
<td></td>
<td>“HEXFORMAT, SUBSYS, and SYSTEM trace records” on page 263</td>
</tr>
<tr>
<td>SVC</td>
<td>Supervisor call interruption</td>
<td>SVC, SVCP, SYS, SYSM, SYSP</td>
<td>“SVC and SVCR trace records” on page 284</td>
</tr>
<tr>
<td>SVCR</td>
<td>Supervisor call exit</td>
<td>SVC, SVCP, SYS, SYSM, SYSP</td>
<td>“SVC and SVCR trace records” on page 284</td>
</tr>
<tr>
<td>SYNE</td>
<td>Synchronous I/O end</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td>“SYNS and SYNE trace records” on page 286</td>
</tr>
<tr>
<td>SYNS</td>
<td>Synchronous I/O start</td>
<td>SSCH, SSCHP, SYS, SYSM, SYSP</td>
<td>“SYNS and SYNE trace records” on page 286</td>
</tr>
<tr>
<td>SYNCH I/O</td>
<td>Synchronous I/O request information</td>
<td>CCW</td>
<td>“SYNCH I/O trace records” on page 287</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>Unformatted trace event</td>
<td></td>
<td>“HEXFORMAT, SUBSYS, and SYSTEM trace records” on page 263</td>
</tr>
<tr>
<td>TCW</td>
<td>zHPF channel program</td>
<td>CCW</td>
<td>“TCW trace records” on page 290</td>
</tr>
<tr>
<td>USR</td>
<td>User event</td>
<td>USR, USRP</td>
<td>“USR trace records” on page 292</td>
</tr>
<tr>
<td>XSCH</td>
<td>Cancel subchannel operation</td>
<td>XSCH, SYS, SYSM, SYSP</td>
<td>“XSCH trace record” on page 297</td>
</tr>
</tbody>
</table>

Example of formatted GTF trace output

This section contains screen images that show GTF records. IPCS produced the screens from an example dump. These records are in comprehensive format and are time stamped.

The GTFTRACE subcommand was issued on the IPCS Subcommand Entry panel shown in Figure 96 on page 248.
**** GTFTRACE DISPLAY OPTIONS IN EFFECT ****
SSCH=ALL IO=ALL CCw=SI
EXT RNIO SRM RR DSP SLIP

**** GTF DATA COLLECTION OPTIONS IN EFFECT: ****
Minimum tracing for IO, SSCH, SVC, PI, EXT, and FRR events
All GTRACE events requested
All events associated with the execution should be traced
All DISPATCHER events traced
PCI events are to be traced
System resource manager events traced

**** GTF TRACING ENVIRONMENT ****
Release: SP7.8.0 FMID: HBB7780 System name: FIRST
CPU Model: 2097 Version: FF Serial no. 170067

SRB   ASCB.... 00FC1500 CPU..... 0000
PSW..... 07040000 80000000 0000022 0217E050
R15..... 8217E050 SRB..... I
TYPE.... INITIAL DISPATCH OF SRB
GMT-01/09/2011 00:39:44.155668 LOC-01/08/2011 19:39:44.155668
DSP   ASCB.... 00FC1500 CPU..... 0000
PSW..... 07040000 80000000 0000022 013AB828
TCB..... 066F148 R15..... 813AB828 R0...... 006E1BC0
R1...... 0217E050
GMT-01/09/2011 00:39:44.155742 LOC-01/08/2011 19:39:44.155742
SSCH.... 00982 ASCB.... 00FB8880 CPUID... 0000     JOBN.... JES2
RST..... 0FC27620 VST..... 02626620 DSID.... 006DCFEC
CC...... 00       SEEKA... 00000000 15000D07
GPMSK... 00       OPT..... 00       FMSK.... 00
DVRID... 02       IOSLVL.. 01       UCBLVL.. 01
UCBWGT.. 00       BASE.... 00982
ORB..... 00F13AE8 13C2D881 01FDC6B8 0000FE00 00000000
00000000 00000000 00000000

Figure 96. Example: IPCS subcommand entry panel for GTFTRACE

Figure 97 on page 248 shows records for the start subchannel operation (SSCH) event.

Figure 97. Example: GTF record for SSCH events

The screen images in Figure 98 on page 249 and Figure 98 on page 249 show records for two input/output (IO) interruption events. The last two rows in the I/O statistics section will only appear for zHPF I/O events.
### Formatted trace records for events

The following sections describe different types of formatted trace records.

#### Time stamp records

Time stamp records mark the time an event occurred.

**Record Format After Each Trace Record**

```
GMT-mm/dd/yy hh:mm:ss:dddddd LOC-mm/dd/yy hh:mm:ss:dddddd
```

---

**Figure 98. Example: GTF records for IO interruption events**

**Figure 99. Example: More GTF records for IO interruption events**

---

The Generalized Trace Facility (GTF) 249
Source index records

Source index records are added when GTF trace records are consolidated using the IPCS COPYTRC subcommand. The records identify the system that produced the GTF trace record.

Record Format After Each Trace Record, if the GTF trace records are consolidated with the IPCS COPYTRC subcommand:

```
SOURCE INDEX: 01
```

The source index record indicates that the GTF trace record was produced by the system with identifier 01. Identifiers include the system name and the trace options in effect for that system. The identifiers are listed at the top of the IPCS report.

Lost event records

A lost event record indicates that GTF lost the trace records for one or more events because of an error or overflow of the trace buffer.

Record Format When GTF Trace Buffer is Lost due to Error

```
**** ONE TRACE BUFFER LOST TIME hh.mm.ss.dddddd
```

- **hh.mm.ss.dddddd**
  - The time of day (hour.minute.second.microsecond) when GTF placed the first trace record in the buffer.

The size of the GTF trace buffer is:

- Equal to the blocksize used by GTF when writing the trace data, if GTF is writing the trace records to a data set on a direct access storage device (DASD). The system displays the blocksize in message AHL906I. If the records are to be written to a data set, the system issues message AHL906I after starting GTF.
- 32,760 bytes, if GTF is writing the trace records to a data set on tape.
- 32,768 bytes, if GTF is writing the trace records only into internal trace buffers.

Record Format for Number of Trace Events Lost due to Errors or Trace Buffer Overflow

```
****** LOST EVENTS NUM ddddddddddd LOCAL TIME mm/dd/yyyy hh.mm.ss.nnnnnn ***
```

- **dddddddddd**
  - The number of lost events
- **mm/dd/yyyy**
  - The date (in month/day/year format) when GTF placed the first trace record in the current trace buffer.
- **hh.mm.ss.dddddd**
  - The time of day (hour.minute.second.microsecond) when GTF placed the first trace record in the current trace buffer.
ADINT trace records

ADINT trace records represent adapter interruptions.

<table>
<thead>
<tr>
<th>ADINT...</th>
<th>ASCB...</th>
<th>hhhhhhh</th>
<th>CPUID...</th>
<th>hhh</th>
<th>JOBN...</th>
<th>ccccccc</th>
<th>PSW.....</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISC.....</td>
<td>hh</td>
<td>AISM...</td>
<td>hh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASCB hhhhhhh
Address of the ASCB for the address space that was active when the adapter interruption occurred on this CPU.

CPUID hhhh
Address of the processor on which the adapter interruption occurred.

JOBN cccccccc
Name of the job associated with the address space that was active when the adapter interruption occurred on this CPU.

PSW hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
Program status word (PSW) stored when the interruption occurred.

ISC hh
Interruption subclass.

AISM hh
Adapter source identification mask.

CCW trace records

A CCW record represents the processing of a non-zHPF channel program. CCW trace records appear following EOS, IO, IOCS PCI, RSCH, or SSCH trace records; they do not appear alone. Any of the formats can appear in any combination in one CCW trace record.

<table>
<thead>
<tr>
<th>CCW CHAIN</th>
<th>FORMAT d</th>
<th>ccc</th>
<th>DEVE....</th>
<th>hhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCB.....</td>
<td>hhhhhhh</td>
<td>CPU...</td>
<td>hhh</td>
<td>JOBN....</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>Fhhhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
<tr>
<td>IDAW</td>
<td>hhhhhhhh</td>
<td>hhhhhhh</td>
<td>hhh</td>
<td>ccccccc</td>
</tr>
<tr>
<td>MIDAW</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhh</td>
<td>ccccccc</td>
</tr>
<tr>
<td>IOSB</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhh</td>
<td>ccccccc</td>
</tr>
<tr>
<td>EWAX</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhh</td>
<td>ccccccc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FORMAT d</th>
<th>ccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOS, IO, IOCS PCI, RSCH, or SSCH. Format is either zero or 1.</td>
<td></td>
</tr>
</tbody>
</table>

DEV shhhh

Device number from the UCBCHAN field of the UCB. This number is qualified with the subchannel identifier (UCBSID).
**ASCB hhhhhhhh**
Same as the ASCB field in the IO, IOCS, SSCH, RSCH, PCI, or EOS base record.

**CPU hhhh**
Same as the CPU ID field in the IO, IOCS, SSCH, RSCH, PCI, or EOS base record.

**JOBN cccccccc**
Same as the job named (JOBN) field in the IO, IOCS, SSCH, RSCH, PCI, or EOS base record.

**Fhhhhhhh**
Fullword address of the CCW. If the high order bit of the address is on, this is the real address of the CCW, otherwise this is the virtual address of the address of the CCW.

--- CCW --
Is the CCW command. The command is either a format 0 or format 1 CCW.

- Format 0 CCW is in the format ooaaaaaa ffuubbbb
- Format 1 CCW is in the format ooffbbbb aaaaaaaa

  oo
  op code.

  aaaaaa
  Real address of data associated with the CCW. If indirect address words (IDAWs) are present, this is the address of the IDAW list.

  aaaaaaaa
  Fullword real address of data associated with the CCW. If IDAWs are present, this is the address of the IDAW list.

  ff
  CCW flags; if this flag is .... 1.. , then this indicates that an IDAW list is present. If this flag is .... ..1., then a suspend of the channel program was requested. If this flag is .... ...1 , then a modified indirect addressing word list is present.

  uu
  Not used by hardware; could contain a nonzero character.

  bbbb
  Byte count.

**ddddddd dddddd | cccccccc |**
Information transferred by the CCW. If there is not a series of dashes in this field, then all transferred data is displayed in four byte sections.

-- Back half of split data --
Indicates there were more bytes of information transferred than were specified on the START command. The default value is 20 bytes, but you can specify the number of bytes to be shown. The specified value is halved; for an odd number, the larger section is shown first. The first section of data displayed comes from the beginning of the buffer from which the data was transferred. The last section comes from the end of the buffer.

**IDAW hhhhhhhh or hhhhhhhh_hhhhhhh hhhh**
Contents of the IDAW, a fullword real address for 31–bit IDAWs or a doubleword real address for 64–bit IDAWs, followed by a halfword specifying the length of the data at that address. The data at the address follows the halfword length. The **hhhhhhhh_hhhhhhh** version of this parameter specifies 64–bit.

**MIDAW hhhhhhhh hhhhhhhh hhhh hhhhhhhh_hhhhhhh**
The modified indirect addressing word (MIDAW), which is 16 bytes, formatted in the GTF trace with the first 8 bytes on the first line containing the flags and data length and the second line containing the 64 bit data address. The length of the data is replicated after the first 8 bytes of MIDAW data to make it easier to read and maintain consistency with the IDAW format. The data at the address follows the halfword length. The data for a MIDAW is not formatted if the skip indicator is on.
IOSB hhhhhhhh
Fullword virtual address of the IOSB followed by the contents of the IOSB. The fullword at offset X'34' of the IOSB points to an error recover procedure work area (EWA), or is zero. The EWA is traced and documented directly below the IOSB and is formatted in the same manner as the IOSB.

EWAx hhhhhhhh
Fullword virtual address of the error recovery procedure work area, followed by the contents of EWA.

CSCH and HSCH trace records
CSCH and HSCH records represent a clear subchannel operation and a halt subchannel operation.

Record Formats

<table>
<thead>
<tr>
<th>CSCH.... shhhh</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPUID... hhhh</th>
<th>JOBN.... cccccccc</th>
<th>DEV.... hh</th>
<th>SFLS.... hhhh</th>
<th>SID.... hhhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCH.... shhhh</td>
<td>ASCB.... hhhhhhhh</td>
<td>CPUID... hhhh</td>
<td>JOBN.... cccccccc</td>
<td>DEV.... hh</td>
<td>SFLS.... hhhh</td>
<td>SID.... hhhhhhhh</td>
</tr>
</tbody>
</table>

CSCH shhhh
Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.

ASCB hhhhhhhh
Address of the ASCB for the address space that started the I/O operation.

CPUID hhhh
Address of the processor on which the I/O operation started

JOBN cccccccc
One of the following:

ccccc
Name of the job associated with the task that requested the I/O operation

N/A
No job is associated with the requested I/O

DEV hhhh
Device number from the UCBCHAN field of the UCB.

SFLS hhhh
Start flags from the UCBSFLS field of the UCB.

SID hhhhhhhh
Subchannel ID from the UCBSID field of the UCB.

CC hh
CSCH or HSCH condition code in bits 2 - 3.

DVRID hh
Driver ID value from the IOSDVRID field of the IOSB.

ARDID hh
One of the following:

hh
Associated request driver ID from the IOSDVRID field of the IOSB

U/
Unavailable because the IOQ was unavailable
Generalized Trace Facility

**IOSLVL hh**
Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

**UCBLVL hh**
UCB level value from the UCIBLEVEL field of the UCB.

**UCBWGT hh**
Flags from the UCBWGT field of the UCB.

**BASE shhhh**
Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.

**DSP and SDSP trace records**
A DSP record represents dispatching of a task. An SDSP record represents re-dispatching of a task after an SVC interruption. SDSP interruptions also build SVC exit records with label SDSP. When both DSP and SVC options are in effect, the SVCR format of trace record is produced by IPCS.

If the trace data contains an SVC exit record, the label that appears in the formatted output will depend on the options selected during IPCS.

1. If the SVC option is selected in the IPCS dialog, the SVC exit record and the SVC number will appear with the label SVCR.
2. If only the DSP option is chosen in the IPCS dialog, the formatted output record will remain unchanged; DSP and SDSP labels will appear in the formatted output and no SVC number is present.
3. If both DSP and SVC options are active in IPCS, the SVCR along with SVC number will appear.

It can be concluded, if SVC is one of the options selected during IPCS formatting, all SVC exit records will appear with label SVCALong with SVC number.

**Minimal Trace Record Formats**

<table>
<thead>
<tr>
<th>Minimal Trace Record Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSP</td>
</tr>
<tr>
<td>SDSP</td>
</tr>
</tbody>
</table>

**Comprehensive Trace Record Formats**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>DSP</td>
</tr>
<tr>
<td>SDSP</td>
</tr>
</tbody>
</table>

**ASCB hhhhhhhh**
Address of address space control block.
CPU hhhh  
Address of processor on which the task is dispatched.

PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
Program status word under which the task is dispatched.

JOBN cccccccc  
One of the following:

cccccccc  
Name of the job associated with the task being dispatched

N/A  
The record is for a system or started task

PPPPPPPPP  
A page fault occurred

********  
An internal error occurred

TCB hhhhhhhh  
Address of the task control block.

R15 hhhhhhhh
R0 hhhhhhhh
R1 hhhhhhhh  
Data that will appear in general registers 15, 0, and 1 when the task is dispatched.

MODN cccccccc  
ccccccccc is one of the following:

mod_name  
The name of a module that will receive control when the task is dispatched.

WAITTCB  
Indicates that the system wait task is about to be dispatched.

SVC–T2  
Indicates that a type 2 SVC routine that resides in the nucleus is about to be dispatched.

SVC–RES  
Indicates that a type 3 SVC routine or the first load module of a type 4 SVC routine is about to be dispatched. The routine is located in the pageable link pack area (PLPA).

SVC–cccc  
Indicates that the second or subsequent load module of a type 4 SVC routine is about to be dispatched. The module is located in the fixed or pageable link pack area (LPA). The last four characters of the module name are cccc.

**IRB***  
Indicates that an asynchronous routine with an associated interruption request block (IRB) is about to be dispatched. No module name is available.

*cccccccc  
Indicates that error fetch is in the process of loading an error recovery module. The last seven characters of the module name are cccccccc.

PPPPPPPPP  
A page fault occurred

********  
An internal error occurred
EOS, INTG, IO, IOCS, and PCI trace records

EOS records represent an end of sense interruption.

EOS records: shhh ASCB.... hhhhhhh CPUID... hh JOBN.... cccccccc
PSW.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
IRB.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
TCB.... hhhhhhh SENSE... hhh FLA..... hh
OPT..... hh DVRID... hh IOSLVL.. hh
UCBLVL.. hh UCBWGT.. hh BASE.... shhh

I/O Statistics:
Connect. hhhhhhh Pending. hhhhhhh Discon.. hhhhhhh
CUG.... hhhhhhh DAO.... hhhhhhh Devbsy.. hhhhhhh
ICMR.... hhhhhhh StartCt. hhhhhhh SampCt. hhhhhhh
ZTotdev. hhhhhhh ZDefer.. hhhhhhh ZCUQ.... hhhhhhh
ZDevByy. hhhhhhh ZDAO.... hhhhhhh
Interrly. hhhhhhh IOSQTim: hhhhhhh

INTG records represent an input/output (I/O) interruption that is used to signal the completion of a zHPF interrogate request.

INTG records: shhh ASCB.... hhhhhhh CPUID... hh JOBN.... cccccccc
PSW.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
IRB.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
TCB.... hhhhhhh SENSE... hhh FLA..... hh
OPT..... hh DVRID... hh IOSLVL.. hh
UCBLVL.. hh UCBWGT.. hh BASE.... shhh

IO records represent an I/O interruption.

IO records: shhh ASCB.... hhhhhhh CPUID... hh JOBN.... cccccccc
PSW.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
IRB.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
TCB.... hhhhhhh SENSE... hhh FLA..... hh
OPT..... hh DVRID... hh IOSLVL.. hh
UCBLVL.. hh UCBWGT.. hh BASE.... shhh

I/O Statistics:
Connect. hhhhhhh Pending. hhhhhhh Discon.. hhhhhhh
CUG.... hhhhhhh DAO.... hhhhhhh Devbsy.. hhhhhhh
ICMR.... hhhhhhh StartCt. hhhhhhh SampCt. hhhhhhh
ZTtotdev. hhhhhhh ZDefer.. hhhhhhh ZCUQ.... hhhhhhh
ZDevByy. hhhhhhh ZDAO.... hhhhhhh
Interrly. hhhhhhh IOSQTim: hhhhhhh

IOCS records represent an I/O interruption that also contains concurrent sense information, for devices that support the concurrent sense facility.

IOCS records: shhh ASCB.... hhhhhhh CPUID... hh JOBN.... cccccccc
PSW.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
IRB.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh
TCB.... hhhhhhh SENSE... hhh FLA..... hh
OPT..... hh DVRID... hh IOSLVL.. hh
UCBLVL.. hh UCBWGT.. hh BASE.... shhh

I/O Statistics:
Connect. hhhhhhh Pending. hhhhhhh Discon.. hhhhhhh
CUG.... hhhhhhh DAO.... hhhhhhh Devbsy.. hhhhhhh
ICMR.... hhhhhhh StartCt. hhhhhhh SampCt. hhhhhhh
ZTtotdev. hhhhhhh ZDefer.. hhhhhhh ZCUQ.... hhhhhhh
ZDevByy. hhhhhhh ZDAO.... hhhhhhh
Interrly. hhhhhhh IOSQTim: hhhhhhh
PCI records represent a program-controlled interruption.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI</td>
<td>hhhh</td>
<td>APCI records represent a program-controlled interruption.</td>
</tr>
<tr>
<td>ASCB</td>
<td>hhhhhh</td>
<td>Address of the address space control block (ASCB) for the address space that started the I/O operation.</td>
</tr>
<tr>
<td>CPU</td>
<td>hhhh</td>
<td>Address of the processor on which the interruption occurred.</td>
</tr>
<tr>
<td>JOBN</td>
<td>ccccccc</td>
<td>Name of the job associated with the task that requested the I/O operation.</td>
</tr>
<tr>
<td>PSW</td>
<td>hhhhhhh</td>
<td>Program status word (PSW) stored when the interruption occurred.</td>
</tr>
<tr>
<td>IRB</td>
<td>hhhhhh</td>
<td>Interruption response block (IRB) operand of the Test Subchannel (TSCH) instruction.</td>
</tr>
<tr>
<td>TCB</td>
<td>hhhhhh</td>
<td>Address of the TCB for the task that requested the I/O operation.</td>
</tr>
</tbody>
</table>

**ASCB {hhhhhhhh|U/A}**

One of the following:

- **hhhhhhhh**
  Address of the address space control block (ASCB) for the address space that started the I/O operation.
- **U/A**
  Unavailable because the I/O supervisor block (IOSB) control block is unavailable.

**CPU hhhh**

Address of the processor on which the interruption occurred.

**JOBN {cccccccc|N/A|U/A}**

One of the following:

- **cccccccc**
  Name of the job associated with the task that requested the I/O operation.
- **N/A**
  Not applicable.
- **U/A**
  Unavailable because the IOSB control block is unavailable.

**PSW hhhhhhh hhhhhhh hhhhhhh hhhhhhh**

Program status word (PSW) stored when the interruption occurred.

**IRB (see explanation)**

For the EOS, IO, and PCI trace records, this field contains the first five words, in hexadecimal, of the interruption response block (IRB) operand of the Test Subchannel (TSCH) instruction.

For the IOCS trace record, this field contains the first 16 words, in hexadecimal, of the interruption response block operand of the TSCH instruction. (Note that this IRB is not the interruption request block indicated as **IRB*** in a DSP trace record.)

**TCB {hhhhhhhh|N/A|U/A}**

One of the following:

- **hhhhhhhh**
  Address of the TCB for the task that requested the I/O operation.
- **N/A**
  Not applicable.
Generalized Trace Facility

**U/A**
Unavailable because the IOSB control block is unavailable.

**SENSE {hhhh|N/A|U/A}**
One of the following:

- **hhhh**
  First 2 sense bytes from the IOSSNS field of the IOSB.

- **N/A**
  Not applicable.

- **U/A**
  Unavailable because the IOSB control block is unavailable.

**FLA {hh|U/A}**
One of the following:

- **hh**
  Flag byte from the IOSFLA field of the IOSB.

- **U/A**
  Unavailable because the IOSB control block is unavailable.

**OPT {hh|U/A}**
One of the following:

- **hh**
  IOSB options byte from the IOSOPT field of the IOSB.

- **U/A**
  Unavailable because the IOSB control block is unavailable.

**DVRID {hh|U/A}**
One of the following:

- **hh**
  Driver identifier from the IOSDVRID field of the IOSB.

- **U/A**
  Unavailable because the IOSB control block is unavailable.

**IOSLVL {hh|U/A}**
One of the following:

- **hh**
  Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

- **U/A**
  Unavailable because the IOSB control block is unavailable.

**UCBLVL hh**
UCB level value from the UCBLEVEL field of the UCB.

**UCBWGT hh**
Flags from the UCBWGT field of the UCB.

**BASE shhhh**
Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.

**Connect hhhhhhhh**
The device connect time for this I/O request, in units of 0.5 microseconds.

**Pending hhhhhhhh**
The function pending time for this I/O request, in units of 0.5 microseconds.

**Discon hhhhhhhh**
The device disconnect time for this I/O request, in units of 0.5 microseconds.
CUQ hh
The control unit queueing time for this I/O request, in units of 0.5 microseconds.

DAO hh
The device active only time for this I/O request, in units of 0.5 microseconds.

Devbsy hh
The device busy time for this I/O request, in units of 0.5 microseconds.

ICMR hh
The initial command response time for this I/O request, in units of 0.5 microseconds.

StartCt hh
The number of SSCH/RSCH instructions that were issued for the device while GTF trace was active.

SamplCt hh
The number of SSCH/RSCH instructions for which data was collected for the device.

ZTotdev hh
The total device time for this I/O request, in units of 1 microseconds. This information is reported only for zHPF I/O requests when it is provided by the device.

ZDefer hh
The control unit defer time for this I/O request, in units of 1 microseconds. This information is reported only for zHPF I/O requests when it is provided by the device.

ZCUQ hh
The control unit queue time for this I/O request, in units of 1 microseconds. This information is reported only for zHPF I/O requests when it is provided by the device.

ZDevBsy hh
The device busy time for this I/O request, in units of 1 microseconds. This information is reported only for zHPF I/O requests when it is provided by the device.

ZDAO hh
The device active only time for this I/O request, in units of 1 microseconds. This information is reported only for zHPF I/O requests when it is provided by the device.

IntrDly hh
The total interrupt delay time for all I/O requests, in units of 128 microseconds.

IOSQTim hh
The measured I/O queuing time for this I/O request, in units of 1 microseconds.

**EXT trace records**

An EXT record represents a general external interruption.

**Minimal Trace Record Format**

```
EXT   CODE.... hhhh   ASCB.... hhhhhhhh CPU.... hhhh
PSW....  hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
TCB....  hhhhhhhh ccc-TCB. hhhhhhhh
```

**Comprehensive Trace Record Format**

```
EXT.... hhhh   ASCB.... hhhhhhhh CPU.... hhhh  JOBN.... cccccc
OLD-PSW.  hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
TCB....  hhhhhhhh TQE FIELDS: FLGS.... hhhh
EXTADDR. hhhhhhhh TCB....  hhhhhhhh
EXT.... hhhh   ASCB.... hhhhhhhh CPU.... hhhh  JOBN.... cccccc
OLD-PSW.  hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
TCB....  hhhhhhhh TQE FIELDS: FLGS.... hhhh
EXTADDR. hhhhhhhh ASCB....  hhhhhhhh TCB....  hhhhhhhh
EXT.... hhhh   ASCB.... hhhhhhhh CPU.... hhhh  JOBN.... cccccc
OLD-PSW.  hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
TCB....  hhhhhhhh PARM.... hhhhhhhh SIG-CPU. hhhh
```
EXT CODE hhhh
EXT hhhh
External interruption code.

ASCB hhhhhhh
Address of ASCB for the address space that was current when the interruption occurred.

CPU hhhh
Address of the processor on which the interruption occurred.

JOBN cccccccc
One of the following:

cccccccc
Name of the job associated with the interrupted task

N/A
The record is for a system or started task

PPPPPPPP
A page fault occurred

********
An internal error occurred

PSW hhhhhhhhh hhhhhhh hhhhhhh hhhhhhh
OLD-PSW hhhhhhh hh hh hh hh hh hh hh hh
Program status word stored when the interruption occurred.

TCB hhhhhhhh
One of the following:

hhhhhhhh
Address of the TCB for the interrupted task

N/A
Not applicable, as in the case of an interrupted SRB routine

INT-TCB hhhhhhhh
TQE-TCB hhhhhhhh
Address of the TCB. This interruption is indicated by interruption codes 12hh.

TQE FIELDS
Indicates a clock comparator or CPU timer interruption. These interruptions are indicated by interruption codes X’1004’ or X’1005’. The following fields contain information from the timer queue element (TQE):

FLAGS hhhh
The flags from the TQEFLGS field.

EXTADDR hhhhhhh
The first four hexadecimal digits are the contents of the TQEFLGS field; the last four hexadecimal digits are the contents of the TQEEXIT field.

ASCB hhhhhhhh
One of the following:

hhhhhhhh
Contents of the TQEASCB field.

PPPPPPPPPP
A page fault occurred

********
An internal error occurred

The TQEASCB field is present only for a clock comparator interruption. TQEASCB contains the address of the ASCB for the address space in which the timer exit routine will be run.

TCB hhhhhhhh
One of the following:
**TQETCB field.**

**N/A**

The record is for a system or started task

**PPPPPPPP**

A page fault occurred

************

An internal error occurred

TQETCB contains the address of the TCB for the task under which the timer exit routine will run.

**PARM hhhhhhhh**

Signal passed on a signal processor interruption, which is indicated by interruption codes 12hh.

**SIG-CPU hhhh**

Address of the processor on which a signal processor interruption occurred.

**FRR trace records**

An FRR record represents the return to the recovery termination manager (RTM) from a functional recovery routine (FRR). All fields, except the processor address, are gathered from the system diagnostic word area (SDWA) that was passed to the FRR.

**Minimal Trace Record Format**

<table>
<thead>
<tr>
<th>FRR</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPU..... hhhh</th>
<th>PSW.... hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comprehensive Trace Record Format**

<table>
<thead>
<tr>
<th>FRR</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPU..... hhhh</th>
<th>JOBN.... cccccccc</th>
<th>NAME.... cccccccc</th>
<th>PSW.... hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>ERRT.... hhhhhhhh</th>
<th>FLG..... hhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ASCB hhhhhhhh**

One of the following:

**hhhhhhhhh**

Address of the ASCB for the address space in which the error occurred.

**PPPPPPPP**

A page fault occurred

************

An internal error occurred

**CPU hhhh**

Address of the processor associated with the error.

**JOBN cccccccc**

One of the following:

**cccccccc**

Name of the job associated with the error

**N/A**

The record is for a system or started task

**PPPPPPPP**

A page fault occurred
Generalized Trace Facility

********
An internal error occurred

NAME cccccccc
Name of the FRR routine.

PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
One of the following:

hhhhhhhh hhhhhhhh hhhhhhh hhhhhhhh
Program status word at the time of the error

PPPPPPPP
A page fault occurred

********
An internal error occurred

CC hhhhhhhh
ABCC hhhhhhhh
One of the following:

hhhhhhhh
The first three digits are the system completion code and the last three digits are the user completion code

U/A
Unavailable because the system diagnostic work area (SDWA) was unavailable

********
An internal error occurred

FLG1 hhhhhhhh
FLG hhhhhh
ERRT hhhhhhhh
Error-type flags from the SDWAFLGS field of SDWA.

FLG2 hhhhhh
Additional flags from the SDWAMCHD and SDWAACF2 fields of SDWA. The flags are contained in the two low-order bytes of this printed field; the high order byte is meaningless.

RC hh
Return code

RETRY hhhhhhhh
RTRY hhhhhhhh
One of the following:

hhhhhhhh
Retry address supplied by the FRR

N/A
Not applicable, indicating an FRR return code other than 4

PPPPPPPP
A page fault occurred

********
An internal error occurred

RTCA hhhhhhhh
Indicates if the recovery routine was a STAE or ESTAE.
HEXFORMAT, SUBSYS, and SYSTEM trace records

HEXFORMAT, SUBSYS, and SYSTEM records represent events for which GTF could not format the records.

| HEXFORMAT | AID hh FID hh EID hh hhhhhhh hhhhhhh ...
| SUBSYS     | AID hh FID hh EID hh hhhhhhh hhhhhhh ...
| SYSTEM     | AID hh FID hh EID hh hhhhhhh hhhhhhh ...

**HEXFORMAT**
Indicates an event signalled by a GTRACE macro. The macro specified no formatting routine (FID=00).

**SUBSYS**
Indicates an event signalled by a GTRACE macro. The macro specified a formatting routine (FID=hh) that could not be found.

**SYSTEM**
Indicates a system event. The trace record could not be formatted for one of the following reasons:

- If EEEE hex appears in bytes 0-1 or 8-9 of the recorded data, an unrecoverable error occurred in a GTF data-gathering routine. Message AHL118I is written on the console, identifying the module that caused the error and the action taken. (The message indicates that GTF will no longer trace this type of event. No more records for this type of event will appear in the trace output.)

- If EEEE hex does not appear in bytes 0-1 or 8-9 of the recorded data, the record could not be formatted because the GTF formatting routine could not be found.

**AID hh**
Application identifier, which should always be AID FF.

**FID hh**
Format identifier of the routine (AMDUSRhh or AMDSYShh) that was to format this record.

**EID hh**
Event identifier, which uniquely identifies the event that produced the record.

**hhhhhhhh hhhhhhh ...**
Recorded data (256 bytes maximum).

**IOX trace records**

IOX records represent an input/output (I/O) interruption for a completed channel program and a summary of a complete channel program for the I/O operation.

| IOX....shhhh ASCB.... hhhhhhhh CPU...... hhhh 30BN.... cccccc
| DEVN.... hhhh SID..... hhhh DRID.... hh
| TVSN.... hh ECNO.... hhhh DVCLS... hh
| DSTAT... hh AERRC... hh FLAG0... hh
| VOLSER... ccccc UCBTPN... hhhhhhh
| DNSNAME... cccc.cccccc.cccccc.cccccc
| NSSCH... hhhhhhh DSSCH... hhhhhhh SDCON... hhhhhhh
| SRPEN... hhhhhhh SDCON... hhhhhhh SCUQU... hhhhhhh
| IOOTS... hhhhhhh hhhhhhh
| AONLY... hhhhhhh DVBSY... hhhhhhh ICMP.... hhhhhhh
| CCW SECTION SQNO.... hh FGSI.... hh FGSI2.... hh
| RCNT.... hh BLKR.... hhhh BLKW.... hhhh
| BTRD.... hhhhhhhh BTWR.... hhhhhhhh BCHN.... hhhhh
| CCHN.... hhhh DEGA.... hh DEGE.... hh
| DEEE.... hhhh SEEKLOC... hh CCHR... hh
| LROP.... hh LRSECTION... hh LRESP... hh
| LRESPWM... hhhh

**IOX shhhh**
IOX identifies the beginning of an IOX record where hhhh is the device number and s is the subchannel set identifier.
ASCB {hhhhhhhh|U/A}
One of the following:

hhhhhhhh
Address of the address space control block (ACSB) for the address space that started the I/O operation.

U/A
Unavailable because the I/O supervisor block (IOSB) control block is unavailable.

CPU hhhh
Address of the processor on which the interruption occurred.

JOBN {cccccccc|N/A|U/A}
One of the following:

cccccccc
Name of the job associated with the task that requested the I/O operation.

N/A
Not applicable.

U/A
Unavailable because the IOSB control block is unavailable.

DEVN shhhh
Device number with the subchannel set identifier when appropriate.

SID hhhh
System ID

DRID hh
Driver ID from IOSB

TVSN hh
Trace version

ECNO hhhh
Record count

DVCLS hh
Device class

DSTAT hh
Device status

AERRC hh
Error codes found during CCW analysis. See "CCW error codes" on page 309 for a description.

FLAG0 hh
Flag byte

VOLSER cccccccc
Volume Serial

UCBTPY hhhhhhhh
UCB type

DSNAME cccc.ccccc.ccccc.ccccc.ccccc
44-byte data set name

NSSCH hhhhhhhh
Number of SSCH instructions.

DSSCH hhhhhhhh
Number of SSCH instructions for which data was collected.

SDCON hhhhhhhh
Summation of device connect times.

SRPEN hhhhhhhh
Summation of function pending times.
Generalized Trace Facility

**SDISC**
Summation of device disconnect times.

**SCUQU**
Summation of control unit queuing times

**IODTS**
Time stamp from IOD

**AONLY**
Summation of device active only times

**DVBSY**
Summation of device busy times

**ICMR**
Summation of initial command response times

**SQNO**
Orientation Sequence Number

**FGS1**
Flag byte 1

**FGS2**
Flag byte 2

**RCNT**
Count of erase

**BLKR**
Number of blocks read

**BLKW**
Number of block written

**BTRD**
Number of bytes read

**BTWR**
Number of bytes written

**DCHN**
Number of data chain CCWs

**CCHN**
Number of COM chain CCWs

**DEGA**
Definition of exterior global attribute

**DEGE**
Definition of exterior global attribute extended

**DEEE**
Definition of exterior end of extend CCH

**SEEKLOCC**
The command code that performed the seek or locate record operation.

**CCHHR**
CCHHR seek or search address

**LROP**
The locate record operation code.

**LRSECT**
The locate record sector number.

**LREXOP**
The locate record extended operation code.

**LREXPM**
The locate record extended parameters.
LSR trace records

An LSR record represents dispatching of a local supervisor routine in an address space.

**Minimal Trace Record Format**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSR</td>
<td>Address of the address space control block.</td>
</tr>
<tr>
<td>ASCB</td>
<td>Address of the processor on which the routine will be dispatched.</td>
</tr>
<tr>
<td>CPU</td>
<td>Program status word under which the routine receives control.</td>
</tr>
<tr>
<td>PSW</td>
<td>Program status word under which the routine receives control.</td>
</tr>
<tr>
<td>TCB</td>
<td>Address of the task control block associated with this routine (if the routine is run as part of a task)</td>
</tr>
</tbody>
</table>

**Comprehensive Trace Record Format**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSR</td>
<td>Address of the address space control block.</td>
</tr>
<tr>
<td>ASCB</td>
<td>Address of the processor on which the routine will be dispatched.</td>
</tr>
<tr>
<td>CPU</td>
<td>Program status word under which the routine receives control.</td>
</tr>
<tr>
<td>PSW</td>
<td>Program status word under which the routine receives control.</td>
</tr>
<tr>
<td>LSR-PSW</td>
<td>Program status word under which the routine receives control.</td>
</tr>
<tr>
<td>TCB</td>
<td>Address of the task control block associated with this routine (if the routine is run as part of a task)</td>
</tr>
<tr>
<td>JOBN</td>
<td>One of the following:</td>
</tr>
<tr>
<td></td>
<td>cccccccc</td>
</tr>
<tr>
<td></td>
<td>Name of the job associated with the routine being dispatched</td>
</tr>
<tr>
<td>N/A</td>
<td>Not applicable</td>
</tr>
<tr>
<td>PPPPPPPP</td>
<td>A page fault occurred</td>
</tr>
<tr>
<td>********</td>
<td>An internal error occurred</td>
</tr>
<tr>
<td>TCB</td>
<td>One of the following:</td>
</tr>
<tr>
<td>hhhhhhh</td>
<td>Address of the task control block associated with this routine (if the routine is run as part of a task)</td>
</tr>
<tr>
<td>N/A</td>
<td>Not applicable</td>
</tr>
<tr>
<td>R15</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>R0</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>R1</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>One of the following:</td>
<td></td>
</tr>
<tr>
<td>hhhhhhh</td>
<td>Data that will appear in general registers 15, 0, and 1 when the local supervisor routine is dispatched</td>
</tr>
<tr>
<td>PPPPPPPP</td>
<td>A page fault occurred</td>
</tr>
<tr>
<td>********</td>
<td>An internal error occurred</td>
</tr>
</tbody>
</table>
MSCH trace records

An MSCH record represents a modify subchannel operation.

<table>
<thead>
<tr>
<th>MSCH.... shhhh</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPUID.... hhhh</th>
<th>JOBN.... cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>SID.... hhhhhhhh</td>
<td>CC.... hh</td>
<td>OPT.... hh</td>
<td>OPT2.... hh</td>
</tr>
<tr>
<td>OPT2.... hh</td>
<td>IOSLVL.... hh</td>
<td>SCHIB1.... hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>hhhhhhh</td>
<td>UCSLVL.... hh</td>
<td>SCHIB2.... hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
</tbody>
</table>

**MSCH shhhh**
- Device number from the UCBCHAN field of the UCB with subchannel set identifier when appropriate.

**ASCB hhhhhhhh**
- Address of the ASCB for the address space that started the modify subchannel operation.

**CPU hhhh**
- Address of the processor on which the modify subchannel started.

**JOBN cccccccc**
- One of the following:
  - cccccccc
    - Name of the job associated with the task that requested the modify subchannel operation
  - N/A
    - Not applicable

**SID hhhhhhhh**
- Subchannel ID from the UCBSID field of the UCB.

**CC hh**
- MSCH condition code in bits 2 and 3.

**OPT hh**
- IOSB option bytes from the IOSOPT field of the IOSB.

**OPT2 hh**
- IOSB option bytes from the IOSOPT field of the IOSB.

**IOSLVL hh**
- Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

**SCHIB1 hhhhhhhh ... hhhhhhh**
- First 7 words of the subchannel information block. Input from the caller of modify subchannel instruction. SCHIB address from the IOSSCHIB field of the IOSB.

**UCBLVL hh**
- UCB level value from the UCLEVEL field of the UCB.

**SCHIB2 hhhhhhhh ... hhhhhhh**
- First 7 words of the subchannel information block resulting from the modify subchannel instruction.

**UCBWGT hh**
- Flags from the UCBWGT field of the UCB.

**BASE shhhh**
- Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.
PCIDMX trace records

PCIDMX trace records represent a PCIE de-multiplexing request.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIDMX</td>
<td>PCIE function identifier (PFID) for PCIE device/function.</td>
</tr>
<tr>
<td>ASCB</td>
<td>Address of the ASCB for the address space that was active when the de-multiplexing event occurred.</td>
</tr>
<tr>
<td>CPUID</td>
<td>Address of the processor on which the de-multiplexing operation occurred.</td>
</tr>
<tr>
<td>JOBN</td>
<td>Name of the job associated with the address space that was active when the de-multiplexing event occurred.</td>
</tr>
<tr>
<td>DEVTYPE</td>
<td>PCIE device type.</td>
</tr>
<tr>
<td>DMXAD</td>
<td>Address of the program that is performing the de-multiplexing.</td>
</tr>
<tr>
<td>CALLBK@</td>
<td>Address of the callback routine.</td>
</tr>
<tr>
<td>PARMS</td>
<td>First 8 bytes of the callback parameters.</td>
</tr>
</tbody>
</table>

PCILG trace records

A PCILG record represents a PCI load instruction.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCILG</td>
<td>PCIE function identifier (PFID) for PCIE device/function.</td>
</tr>
<tr>
<td>ASCB</td>
<td>Address of the ASCB for the address space that issued the PCI load instruction.</td>
</tr>
<tr>
<td>CPUID</td>
<td>Address of the processor on which the PCI load instruction was issued.</td>
</tr>
<tr>
<td>JOBN</td>
<td>Name of the job associated with the address space that issued the PCI load operation.</td>
</tr>
<tr>
<td>TCB</td>
<td>Address of task control block or zero if not running under a task.</td>
</tr>
<tr>
<td>CC</td>
<td>Condition code from the PCI load instruction.</td>
</tr>
<tr>
<td>REQAD</td>
<td>Address of the program that requested the PCI load instruction to be issued.</td>
</tr>
</tbody>
</table>
TRCID hhhhhhhhh
   Program defined trace identifier that can be used to determine why the PCI load instruction is being issued.

DATA hhhhhhhhh hhhhhhh
   The data that was loaded.

HANDLE hhhhhhhhh
   PCIE function hardware handle.

STATUS hh
   Error status information.

PCIAS hh
   PCIE address space associated with the request.

LENGTH hh
   Length of the data that was loaded.

OFFSET hhhhhhhhh hhhhhhh
   Offset of the data within the PCIE address space that was loaded.

PCISTG trace records

A PCISTG record represents a PCI store instruction.

```
PCISTG... hhhhhhhhh  ASCB.... hhhhhhhhh  CPUID... hhhhhhhhh  JOBN... ccccccccc
TCB...... hhhhhhhhh  CC...... hh...... hh  REQAD... hhhhhhhhh
TRCID... hhhhhhhhh  DATA.... hhhhhhhhh hhhhhhhhh
STATUS.. hh  PCIAS... hh  HANDLE.. hhhhhhhhh
OFFSET.. hhhhhhhhh hhhhhhhhh
```

PCILG hhhhhhhhh
   PCIE function identifier (PFID) for PCIE device/function.

ASCB hhhhhhhhh
   Address of the ASCB for the address space that issued the PCI store instruction.

CPUID hhhhh
   Address of the processor on which the PCI store instruction was issued.

JOBN ccccccccc
   Name of the job associated with the address space that issued the PCI store operation.

TCB hhhhhhhhh
   Address of task control block or zero if not running under a task.

CC hh
   Condition code from the PCI store instruction.

REQAD hhhhhhhhh
   Address of the program that requested the PCI store instruction to be issued.

TRCID hhhhhhhhh
   Program defined trace identifier that can be used to determine why the PCI store instruction is being issued.

DATA hhhhhhhhh hhhhhhhhh
   The data that was stored.

HANDLE hhhhhhhhh
   PCIE function hardware handle.

STATUS hh
   Error status information.

PCIAS hh
   PCIE address space associated with the request.
LENGTH hh
Length of the data that was stored.

OFFSET hhhhhhh hhhhhhh
Offset of the data within the PCIE address space that was stored.

PGM and PI trace records
PGM and PI records represent program interruptions.

Minimal Trace Record Format

<table>
<thead>
<tr>
<th>PI</th>
<th>CODE.... hhh</th>
<th>ASCB.... hhhhhhh</th>
<th>CPU.... hhh</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PSW.... hhhhhhh</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
<th>hhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCB.... hhhhhhh</td>
<td>VPH..... hhhhhhh</td>
<td>VPA..... hhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R15..... hhhhhhh</td>
<td>R1....... hhhhhhh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comprehensive Trace Record Format

<table>
<thead>
<tr>
<th>PGM.... hhh</th>
<th>ASCB.... hhhhhhh</th>
<th>CPU.... hhh</th>
<th>JOBN.... cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD-PSW.... hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>TCB.... hhhhhhh</td>
<td>VPH.... hhhhhhh</td>
<td>VPA..... hhhhhhh</td>
<td></td>
</tr>
<tr>
<td>MOLDN.... cccccccc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R0..... hhhhhhh</td>
<td>R1.... hhhhhhh</td>
<td>R2..... hhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R3..... hhhhhhh</td>
<td>R4.... hhhhhhh</td>
<td>R5..... hhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R6..... hhhhhhh</td>
<td>R7.... hhhhhhh</td>
<td>R8..... hhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R9..... hhhhhhh</td>
<td>R10..... hhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R11..... hhhhhhh</td>
<td>R12..... hhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R13..... hhhhhhh</td>
<td>R14..... hhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R15..... hhhhhhh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PI CODE hhh
Program interruption code, in decimal.

PGM hhh
Address of ASCB for the address space in which the interruption occurred.

ASCB hhhhhhh
Address of the processor on which the interruption occurred.

CPU hhh
Address of the processor on which the interruption occurred.

JOBN cccccccc
One of the following:

ccccc
Name of the job associated with the interruption

N/A
Not applicable

PPPPPPPPP
A page fault occurred

********
An internal error occurred

PSW hhhhhhh hhhhhhh hhhhhhh hhhhhhh
OLD-PSW hhhhhhh hhhhhhh hhhhhhh hhhhhhh
Program status word stored when the interruption occurred.

TCB hhhhhhh
One of the following:

hhhhhh
Address of the TCB for the interrupted task

N/A
Not applicable as in the case of an interrupted SRB routine
**VPH hhhhhhhh**

Bytes 0-3 of the translation exception ID (TEID), displayed only when these bytes are not all zero.

**VPA hhhhhhhh**

Bytes 4-7 of the translation exception ID. In cases defined by principles of operation, bits 0-51 of the TEID with 12 zero bits appended on the right are the translation exception address which is the virtual address of the page, the reference to which resulted in the program exception.

**MODN cccccccc**

cccccccc is one of the following:

**mod_name**

The name of a module that will receive control when the task is dispatched.

**WAITTCB**

Indicates that the system wait task was interrupted.

**SVC-T2**

Indicates that a type 2 SVC routine resident in the nucleus was interrupted.

**SVC-RES**

Indicates that a type 2 SVC routine or the first load module of a type 4 SVC routine was interrupted. The routine is located in the pageable link pack area (PLPA).

**SVC-ccc**

Indicates that the second or subsequent load module of a type 4 SVC routine was interrupted. The module is located in the fixed or pageable link pack area (LPA). The last four characters of the load module name are cccc.

**IRC***

Indicates that an asynchronous routine with an associated interrupt request block was interrupted. No module name is available.

**ccccccc**

Indicates that an error recovery module was in control. The last seven characters of the module name are cccccccc.

************

An internal error occurred

**Rdd hhhhhhhh**

Contents of general registers when the interruption occurred.

**RNIO trace records**


**Minimal Trace Record Format**

<table>
<thead>
<tr>
<th>RNIO</th>
<th>ASCB....</th>
<th>hhhhhhhh</th>
<th>CPU.....</th>
<th>hhhh</th>
<th>R0.....</th>
<th>hhhhhhhh</th>
</tr>
</thead>
</table>

**Comprehensive Trace Record Format**

<table>
<thead>
<tr>
<th>RNIO</th>
<th>ASCB....</th>
<th>hhhhhhhh</th>
<th>CPU.....</th>
<th>hhhh</th>
<th>JOB.....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN....</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>R0.....</td>
<td>hhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RNIO</th>
<th>ASCB....</th>
<th>hhhhhhhh</th>
<th>CPU.....</th>
<th>hhhh</th>
<th>JOB.....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>R0.....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
</tbody>
</table>
**ASCB hhhhhhhh**
Address of the ASCB for the address space of the application associated with the event.

**CPU hhhh**
Address of the processor that ran the I/O instruction.

**JOBN cccccccc**
One of the following:

- **cccccccc**
  - Name of the job associated with the I/O event
- **N/A**
  - Not applicable
- **PPPPPPPPP**
  - A page fault occurred
- *********
  - An internal error occurred

**IN hhhhhhhh ... hhhhhhhh**
**OUT hhhhhhhh ... hhhhhhhh**
IN indicates that the I/O is from NCP to VTAM; OUT indicates that the direction of the I/O is from VTAM to NCP. The hexadecimal data is:

- For IN events: the transmission header, the response header, and the response unit.
- For OUT events: the transmission header, the request header, and the request unit.

**R0 hhhhhhhh**
Contents of general register 1 when the event occurred.

**RSCH trace records**
An RSCH record represents a resume subchannel operation.

<table>
<thead>
<tr>
<th>RSCH.... shhhh</th>
<th>ASCB... hhhhhhhh</th>
<th>CPUID... hhhh</th>
<th>JOBN.... cccccccc</th>
<th>RST.... hhhhhhhh</th>
<th>VST...... hhhhhhhh</th>
<th>DSID.... hhhhhhhh</th>
<th>SEEKA... hhhhhhhh</th>
<th>GPMSK... hh</th>
<th>OPT..... hh</th>
<th>FMSK.... hh</th>
<th>DVRID... hh</th>
<th>IOSLVL... hh</th>
<th>UCBLVL... hh</th>
<th>DVBWGT... hh</th>
<th>BASE.... shhhh</th>
</tr>
</thead>
</table>

**RSCH shhhh**
Device number from the UCBCHAN field of the UCB with subchannel set identifier when appropriate.

**ASCB hhhhhhhh**
Address of the ASCB for the address space that started the I/O operation.

**CPU hhhh**
Address of the processor on which the I/O operation resumed.

**JOBN cccccccc**
One of the following:

- **cccccccc**
  - Name of the job associated with the I/O operation
- **N/A**
  - Not applicable
- **RST hhhhhhhh**
  - Address of the channel program. This value comes from the contents of the IOSRST field of the IOSB.
- **VST hhhhhhhh**
  - Virtual address of the channel program. This value comes from the contents of the IOSVST field of the IOSB.
DSID hhhhhhhh
Request identifier used by purge. Contents of the IOSID field of the IOSB (address of the DEB or another control block used by purge).

CC hh
RSCH condition code in bits 2 and 3.

SEEKA hhhhhhhh hhhhhhhh
Dynamic seek address from the IOSEEKA field of the IOSB.

GPMSK hh
Guaranteed device path mask for GDP requests from the IOSEEKA field of the IOSB.

OPT hh
IOSB options byte from the IOSOPT field of the IOSB.

FMSK hh
Mode set/file mask from the IOSFMSK field of the IOSB.

DVRID hh
Driver ID from the IOSDVRID field of the IOSB.

IOSLVL hh
Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

UCBLVL hh
UCB level value from the UCBLEVEL field of the UCB.

UCBWGT hh
Flags from the UCBWGT field of the UCB.

BASE shhh
Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.

SLIP trace records
A SLIP record represents a SLIP program event interruption. GTF writes four types of SLIP records:
- SLIP standard trace record
- SLIP stand/user trace record
- SLIP user trace record
- SLIP debug trace record

SLIP standard trace record
A SLIP standard (STD) trace record represents a slip trap match when the SLIP command specifies ACTION=TRACE or ACTION=TRDUMP.

<table>
<thead>
<tr>
<th>SLIP STD</th>
<th>ASCB....</th>
<th>hhhhhhhh</th>
<th>CPU.....</th>
<th>hhhh</th>
<th>JOBN....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>TID....</td>
<td>cccc</td>
<td>ASID....</td>
<td>hhhh</td>
<td>JSP....</td>
<td>cccccccc</td>
<td></td>
</tr>
<tr>
<td>TCB....</td>
<td>hhhhhh</td>
<td>MFLG....</td>
<td>hhhh</td>
<td>EFLG....</td>
<td>hhh</td>
<td></td>
</tr>
<tr>
<td>SFLG....</td>
<td>hh</td>
<td>DAUN....</td>
<td>hhhh</td>
<td>MODN....</td>
<td>cccccccc</td>
<td></td>
</tr>
<tr>
<td>OFFS....</td>
<td>hhhhhh</td>
<td>IADR....</td>
<td>hhhhhh</td>
<td>hhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INS....</td>
<td>hhhhhhhh</td>
<td>hhhhhh</td>
<td>EXSIAD..</td>
<td>hhhhhh</td>
<td>hhhhhh</td>
<td>hhh</td>
</tr>
<tr>
<td>BRNGH...</td>
<td>hhhhhhhh</td>
<td>BRNGA...</td>
<td>hhhhhhhh</td>
<td>BRNGD...</td>
<td>hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>OPSW...</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>ILC/PIC:</td>
<td>hhhhhhhh</td>
<td>PERC....</td>
<td>hh</td>
<td>TYP.....</td>
<td>hh</td>
<td></td>
</tr>
<tr>
<td>PNM....</td>
<td>hhhh</td>
<td>SASID....</td>
<td>hhhh</td>
<td>AX......</td>
<td>hhh</td>
<td></td>
</tr>
<tr>
<td>PASID....</td>
<td>hhhh</td>
<td>ASC.....</td>
<td>c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA-SPACE</td>
<td>cccccccc</td>
<td>cccc</td>
<td>DATX....</td>
<td>h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASCB hhhhhhhh
The address of the ASCB for the current address space.
CPU hhhh
The processor identifier (ID).

JOBN cccccccc
One of the following:

cccccccc
Name of the job associated with the SLIP trap

N/A
Not applicable

TID cccc
The trap ID.

ASID hhhh
The identifier of the current address space.

JSP cccccccc
One of the following:

cccccccc
Job step program name

N/A
Not applicable

U/A
Unavailable

TCB hhhhhhhh
One of the following:

hhhhhhhh
TCB address

N/A
Not applicable

MFLG hhhh
System mode indicators that indicate the status of the system. The indicators correspond to the SLWACW field in the SLWA. For a description of the SLWA, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

EFLG hhhh
Error bytes that indicate the error status of the system. These bytes correspond to SDWAERRA in the SDWA. For a description of the SDWA, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

SFLD hh
SLIP status flags.

DAUN hhhhhhhh
A counter representing the number of times data was unavailable for the DATA keyword test.

The following fields apply to PER interruptions only. For other than PER interruptions, these fields are not applicable and contain: N/A, N/, or N.

MODN cccccccc
One of the following:

cccccccc
Load module name in which the interruption occurred

N/A
Not applicable

U/A
Unavailable
OFFS hhhhhhhh
One of the following:

hhhhhhhh
Offset into the load module containing the instruction that caused the interruption

N/A
Not applicable

U/A
Unavailable

IADR hhhhhhh  hhhhhhh
Address of the instruction that caused the interruption.

INS hhhhhhhh  hhhh
Instruction content: the instruction that caused the PER interruption.

EXSIAD hhhhhhh  hhhhhhh
One of the following:

hhhhhhhh  hhhhhhh
Target instruction address if the INS field is an Execute instruction

N/A
Not applicable

U/A
Unavailable

EXSINS hhhhhhhhhh  hhh
One of the following:

hhhhhhhh  hhhh
Target instruction content if an INS field is an Execute instruction: 6 bytes of data beginning at the target instruction address

N/A
Not applicable

U/A
Unavailable

BRNGH hhhhhhh
BRNGA hhhhhhh
One of the following:

hhhhhhhh
The beginning range virtual address if the SLIP command specified SA. BRNGH identifies the high 4 bytes. BRNGA identifies the low 4 bytes.

N/A
Not applicable

OPSW hhhhhhh  hhhhhhh  hhhhhhh  hhhhhhh
The program old PSW.

ILC/PIC hhhhhhh
The instruction length code and program interruption code.
PERC hh
The PER interruption code.

TYP hh
The PER trap mode.

PKM hhhh
The PSW key mask.

SASID hhhh
The identifier of the secondary address space.

AX hhhh
The authorization index.

PASID hhhh
The identifier of the primary address space.

ASC c
The PSW ASC mode indicator:

  c
  Meaning
  0  Primary addressing mode
  1  Access register addressing mode
  2  Secondary addressing mode
  3  Home addressing mode

SA-SPACE ccccccccccc
Storage alteration space identifier, as follows:

- The ASID, for an address space
- The owning ASID and the data space name, for a data space

DATX hh
The DATA filter mismatch count due to an event that occurred in transactional execution mode.
SLIP standard/user trace record

The SLIP standard/user trace record represents a slip trap match when the SLIP command specifies ACTION=TRACE or ACTION=TRDUMP and TRDATA=parameters.

| SLIP | ASCB ... | CPU .... | hhhh | JOBN ... | ccccccccc | TID .... | cccc | ASID ... | hhhh | JSP ... | ccccccccc | TCB .... | hhhhhhhh | MFLG ... | hhhh | EFLG ... | hhhh | SFLAG ... | hhhh | DAUN ... | hhhh | MODN ... | cccccccc | OFFS ... | hhhhhhhh | IADR ... | hhhhhhhh | EFLG ... | hhhh | INS ... | hhhhhhhh | EXSIAD ... | hhhhhhhh | BRNGH ... | hhhhhhhh | BRNGA ... | hhhhhhhh | BRNGD ... | hhhhhhhh | OPSW ... | hhhhhhhh | ASCT ... | hhhhhh | CPU ... | hhhhhhhh | EXT ... | hhhhhhhh | CNTLN ... | hh | DATX ... | hh | GENERAL PURPOSE REGISTER VALUES | 0-3 ..... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 4-7 ..... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 8-11 .... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 12-15 ... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | GPR HIGH HALF VALUES | 0-3 ..... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 4-7 ..... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 8-11 .... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 12-15 ... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | ACCESS REGISTER VALUES | 0-3 ..... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 4-7 ..... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 8-11 .... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh | 12-15 ... | hhhhhhhh | hhhhhhhh | hhhhhhhh | hhhhhhhh |

ASCB hhhhhhhh . . . DATX hh
These fields are the same as the fields in the SLIP standard trace record.

GENERAL PURPOSE REGISTER VALUES
GPR HIGH HALF VALUES
ACCESS REGISTER VALUES
Contents of the general purpose registers and access registers at the time of the error or interruption, if REGS is specified in TRDATA on the SLIP command. The GPR high half values will only be traced in z/Architecture mode.

SLIP user trace record

The SLIP user record represents a SLIP trap match when the SLIP command specifies ACTION=TRACE or ACTION=TRDUMP and TRDATA=parameters.

| SLIP | ASCB ... | CPU .... | hhhh | EXT ... | hhhhhhhh | CNTLN ... | hh |

CPU hhhh
Processor ID.

EXT hhhh
Extension number.

CNTLN hh
Continuation length.

hhhh
Length for the single range in the SLIP command. If hhh is zero, either the range was not available or the range was not valid, so that GTF did not collect data for the range. GTF would consider the range not valid if, for example, the ending range address precedes the beginning range address.

hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh | cccccccccccccccc |
User-defined data fields that are specified by TRDATA on the SLIP command. The length and data fields may be repeated.
For a SLIP command, the trace contains as many user records and user continuation records as needed to trace the data ranges specified in the TRDATA parameter on the SLIP command. The header in each record contains the processor ID and the extension number. When a record is filled enough so that the next data range cannot fit, GTF writes the partially filled record to the GTF trace table. GTF builds another record; its extension number is increased by one and the continuation length is set to zero.

When the length of data from a range is greater than 249 bytes, the excess data is put in user continuation records. After writing the SLIP USR record, GTF builds a user continuation record. GTF increases the extension number by one and sets the continuation length to the number of bytes of data to be put in the continuation record. If more than 251 bytes of data are left, GTF copies 248 bytes into the record and places it in the GTF trace table. GTF builds user continuation records until all the data from a range is traced.

**SLIP debug trace record**

The SLIP debug record represents a SLIP trap match when the SLIP command specifies DEBUG.

| SLIP S+U | ASCB... | hhhhhhhh | CPU..... | hhh | JOBN.... | cccccccc | TID..... | cccc | ASID.... | hhhh | JSP..... | cccccccc | TCB..... | hhhhhhhh | MFLG.... | hhhh | EFLG.... | hhhh | SFLG.... | hh | DAUN.... | hhhh | MODN.... | cccccccc | OFFS.... | hhhhhhhh | IADR.... | hhhhhhhhh | EFLG.... | hhhh | SFLG.... | hh | BRNGH... | hhhhhhhh | BRNGA... | hhhhhhhh | BRNGD... | hhhhhhhh | INS..... | hhhhhhhh | hhh | EXSIAD.. | hhhhhhhh | hhhhhhhh | EXSINS.. | hhhhhhhh | ILC/PIC. | hhhhhhhh | PERC.... | hh | TYP..... | hh | PKM.... | hhh | SASID... | hhhh | AX...... | hhhh | PASID... | hhhh | ASC..... | h | SA-SPACE | hhh | hh00 | DATX.... | hh |

**ASCB hhhhhhhh . . . DATX hh**

These fields are the same as the fields in the SLIP standard trace record. The high order bit in the SFLG field is set to 1 to indicate a debug record.

**hh00**

Two bytes of debug-produced data. The first byte indicates which keyword failed, the second byte contains zeros.

**Byte 1 (decimal)**

**Keyword That Failed**

...1

DATA test failed

3

ASID

4

JOBNAME

5

JSPGM

6

PVTMOD

7

LPAMOD

8

ADDRESS

9

MODE

..10 ....

ERRTYP

<table>
<thead>
<tr>
<th><strong>Keyword That Failed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>...1</td>
</tr>
<tr>
<td>DATA test failed</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>ASID</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>JOBNAME</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>JSPGM</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>PVTMOD</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>LPAMOD</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>ADDRESS</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>MODE</td>
</tr>
<tr>
<td>..10 ....</td>
</tr>
<tr>
<td>ERTYP</td>
</tr>
</tbody>
</table>

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SRB trace records

An SRB record represents dispatching of an asynchronous routine represented by a service request block (SRB).

Minimal Trace Record Format

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRB</td>
<td>Address of the ASCB for the address space in which the SRB routine is dispatched. This may or may not be the address space in which the SRB was created.</td>
</tr>
<tr>
<td>ASCB.</td>
<td>Address of the processor on which the SRB routine is dispatched.</td>
</tr>
<tr>
<td>CPU.</td>
<td>Program status word under which the SRB routine receives control.</td>
</tr>
<tr>
<td>JOBN.</td>
<td>One of the following:</td>
</tr>
<tr>
<td>TYPE.</td>
<td>One of the following:</td>
</tr>
<tr>
<td>N/A</td>
<td>Not applicable, as in the case of a global SRB, which is indicated in the TYPE field</td>
</tr>
<tr>
<td>SRB</td>
<td>One of the following:</td>
</tr>
</tbody>
</table>

Comprehensive Trace Record Format

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRB</td>
<td>Address of the ASCB for the address space in which the SRB routine is dispatched. This may or may not be the address space in which the SRB was created.</td>
</tr>
<tr>
<td>ASCB.</td>
<td>Address of the processor on which the SRB routine is dispatched.</td>
</tr>
<tr>
<td>CPU.</td>
<td>Program status word under which the SRB routine receives control.</td>
</tr>
<tr>
<td>JOBN.</td>
<td>One of the following:</td>
</tr>
<tr>
<td>TYPE.</td>
<td>One of the following:</td>
</tr>
<tr>
<td>N/A</td>
<td>Not applicable, as in the case of a global SRB, which is indicated in the TYPE field</td>
</tr>
<tr>
<td>SRB</td>
<td>One of the following:</td>
</tr>
</tbody>
</table>
Generalized Trace Facility

**SRM trace records**

An SRM record represents an entry to the system resources manager (SRM).

**Minimal Trace Record Format**

```
SRM   ASCB.... hhhhhhhh CPU..... hhhh   R15..... hhhhhhhh R0...... hhhhhhhh
     R1...... hhhhhhhh
```

**Comprehensive Trace Record Format**

```
SRM       ASCB.... hhhhhhhh CPU..... hhhh   JOBN.... cccccccc
         R15..... hhhhhhhh R0...... hhhhhhhh R1...... hhhhhhhh
```

**ASCB hhhhhhhh**

One of the following:

**hhhhhhhh**

Address of the ASCB for the address space that was current when SRM was entered

*********

An internal error occurred

**CPU hhhh**

Address of the processor used by the system resources manager.

---

R15 hhhhhhhh
R1hhhhhhhhh

One of the following:

**hhhhhhhh**

Data that will appear in general registers 15 and 1 when the SRB routine is dispatched

*********

An internal error occurred

**PARM hhhhhhhh**

One of the following:

**hhhhhhhh**

Four-byte parameter or the address of a parameter field to be passed to the SRB routine

**N/A**

Not applicable, as in the case of a suspended SRB, which is indicated in the TYPE field

**TYPE cccccc**

Indicates the type of SRB routine, as follows:

**SUSPENDED**

Denotes an SRB routine that was dispatched earlier and was subsequently interrupted (for example, by I/O operations or by a request for a lock). The routine is about to be re-dispatched.

**INITIAL DISPATCH OF SRB**

Denotes an SRB routine selected from the service priority list that is about to be dispatched for the first time.

**REDISPATCH OF SUSPENDED SRB**

Denotes an SRB routine that was dispatched earlier and was subsequently interrupted (for example, by I/O operations or by a request for a lock). The routine is about to be re-dispatched.
**SSCH trace records**

An SSCH record represents a start subchannel operation.

<table>
<thead>
<tr>
<th>SSCH</th>
<th>ASCB</th>
<th>CPUID</th>
<th>JOBN</th>
<th>RST</th>
<th>VST</th>
<th>DSID</th>
<th>CC</th>
<th>SEEKA</th>
<th>GPMSK</th>
<th>OPT</th>
<th>FMSK</th>
<th>DVRID</th>
<th>IOSLVL</th>
<th>UCBLVL</th>
<th>UCBLVL</th>
<th>ORB</th>
<th>BASE</th>
<th>VIO</th>
<th>UCBWGT</th>
<th>GPMSK</th>
<th>IOSRST</th>
<th>IOSVST</th>
<th>IOSDID</th>
<th>IOSGPMSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>shhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>cccccccc</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SSCH shhhh**

Device number from the UCBCHAN field of the UCB with subchannel set identifier when appropriate.

**ASCB hhhhhhhh**

Address of the ASCB for the address space that started the I/O operation.

**CPU hhhh**

Address of the processor on which the I/O operation started.

**JOBN cccccccc**

One of the following:

- cccccccc
  
  Name of the job associated with I/O operation

- **N/A**
  
  Not applicable

**RST hhhhhhhh**

Address of the channel program. This value comes from the contents of the IOSRST field of the IOSB.

**VST hhhhhhhh**

Virtual address of the channel program. This value comes from the contents of the IOSVST field of the IOSB.

**DSID hhhhhhhh**

Request identifier used by purge. This identifier is in the IOSDID field of the IOSB and is the address of the DEB or another control block used by PURGE.

**CC hh**

SSCH condition code in bits 2 and 3.

**SEEKA hhhhhhhh hhhhhhhh**

Dynamic seek address from the IOSEEKA field of the IOSB.

**GPMSK hh**

Guaranteed device path mask for GDP requests from the IOSGPMSK field of the IOSB.
OPT hh
IOS options byte from the IOSOPT field of the IOSB.

FMSK hh
Mode Set/File mask from the IOSFMSK field of the IOSB.

DVRID hh
Driver ID from the IOSDV RID field of the IOSB.

IOSLVL hh
Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

UCBLVL hh
UCB level value from the UCBLEVEL field of the UCB.

UCBWGT hh
Flags from the UCBWGT field of the UCB.

BASE shhhh
Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.

ORB hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
Contents of the operation request block (ORB).

**STAE trace records**

A STAE record represents return to the recovery termination manager (RTM) from a STAE or ESTAE routine.

**Minimal Trace Record Format**

<table>
<thead>
<tr>
<th>STAE</th>
<th>PSW.....</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>CC......</th>
<th>hhhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF......</td>
<td>hhhhhhhh</td>
<td>TYCA....</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comprehensive Trace Record Format**

<table>
<thead>
<tr>
<th>STAE</th>
<th>ASCB....</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>CPU.....</th>
<th>hhhhhhhh</th>
<th>JOBN....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESTN...</td>
<td>cccccccc</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>ERR-PSw.</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
<td>hhhhhhhh</td>
</tr>
<tr>
<td>ABCC....</td>
<td>hhhhhhhh</td>
<td>ERRT....</td>
<td>hhhhhhhh</td>
<td>FLG....</td>
<td>hhhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC......</td>
<td>hhhhhhhh</td>
<td>RTRY....</td>
<td>hhhhhhhh</td>
<td>RTCA....</td>
<td>hhhhhhhh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AS CB hhhhhhhh
Address of the ASCB for the address space involved in the recovery.

CPU hhhh
Address of the processor.

JO BN ccc ccccc
One of the following:

cc ccccc
Name of the job involved in the recovery

N/A
Not applicable

********
An internal error occurred

EST N ccccc ccccc
One of the following:
cccccccc
  ESTAE routine name

U/A
  Unavailable because the routine did not supply a name
  
  An internal error occurred

PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
ERR-PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
  One of the following:
    hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
      Program status word at the time of the error

U/A
  Unavailable because the system diagnostic work area (SDWA) was unavailable
  
  An internal error occurred

CC hhhhhhhh
ABCC hhhhhhhh
  One of the following:
    hhhhhhhh
      The first four digits are the system completion code and the last four digits are the user completion code

U/A
  Unavailable because the system diagnostic work area (SDWA) was unavailable
  
  An internal error occurred

TYCA hhhhhhhh hhhhhhhh
  Retry address (see RTRY hhhhhhhh following) and an indication of whether the routine was a STAE or ESTAE (see RTCA hhhhhhhh following).

RF hhhhhhhh
FLG hhhhhh
ERRT hhhhhhhh
  Error flags from the SDWAFLGS field of the SDWA.

RC hh
  Return code

RTRY hhhhhhhh
  One of the following:
    hhhhhhhh
      The address supplied by the FRR

N/A
  Not applicable, indicating an FRR return code other than 4

PPPPPPPPP
  A page fault occurred
  
  An internal error occurred

RTCA hhhhhhhh
  Indicates if the recovery routine was a STAE or ESTAE.
SVC and SVCR trace records

An SVC record represents a supervisor call (SVC) interruption. An SVCR record represents an exit from a supervisor call. SDSP interruptions also build SVC exit records with label SDSP. When both DSP and SVC options are in effect, the SVCR format of trace record is produced by IPCS.

If the trace data contains an SVC exit record, the label that appears in the formatted output will depend on the options selected during IPCS.

1. If the SVC option is selected in the IPCS dialog, the SVC exit record and the SVC number will appear with the label SVCR.
2. If only the DSP option is chosen in the IPCS dialog, the formatted output record will remain unchanged; DSP and SDSP labels will appear in the formatted output and no SVC number will be present.
3. If both DSP and SVC options are active in IPCS, the SVCR along with SVC number will appear.

It can be concluded, if SVC is one of the options selected during IPCS formatting, all SVC exit records will appear with label SVCR along with SVC number.

The format of an SVC and SVCR trace record depends on the SVC interruption being traced. For a breakdown of the information that GTF collects for each SVC, see the SVC Summary chapter of z/OS MVS Diagnosis: Reference. The formats shown are typical.

Minimal Trace Record Format

<table>
<thead>
<tr>
<th>SVC</th>
<th>CODE.... hhh</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPU..... hhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSW</td>
<td>hhhhhhhh hhhhhhh hhhhhhh hhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCB</td>
<td>hhhhhhhh R15.... hhhhhhh R0...... hhhhhhh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R1</td>
<td>hhhhhhhh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SVCR CODE.... hhh | ASCB.... hhhhhhhh | CPU..... hhhh |

SVC CODE hhh

SVC hhh

- For SVC, and for SVCR when not X'FFxx': SVC interruption code, which is also called the SVC number.
- For SVCR when X'FF00': completion of the system-initiated processing involved with ATTACH, LINK, XCTL or SYNCH processing prior to the target routine getting control.
- For SVCR when X'FF01': initial system-initiated processing involved with XCTL processing prior to the target routine getting control.

ASCB hhhhhhhh

Address of the ASCB for the address space in which the interruption occurred.

CPU hhhh

Address of the processor on which the interruption occurred.

JOBNAME cccccccc

One of the following:

cccccccc

Name of the job associated with SVC interruption.
Unavailable; GTF cannot provide data for the SVC due to security considerations.

An internal error occurred

Program status word stored when the interruption occurred.

- For SVC, and for SVCR when SVC Code is not X'FFxx': Program status word stored when the interruption occurred.
- For SVCR when SVC Code is X'FF00': PSW of the target routine that will get control as a result of ATTACH, LINK, XCTL or SYNCH processing.
- For SVCR when SVC Code is X'FF01': PSW of a system routine that will get control as a result of initial processing involved with XCTL.

Address of the TCB for the interrupted task, that is, the task that issued the SVC instruction.

Data in general registers 15, 0, and 1 when the SVC instruction ran.

mod_name
- The name of a module that will receive control when the task is dispatched.

SVC–T2
- Indicates a type 2 SVC routine resident in the nucleus.

SVC–RES
- Indicates a type 3 SVC routine or the first load module of a type 4 SVC routine. The routine is located in the pageable link pack area (PLPA).

SVC cccc
- Indicates the second or subsequent load module of a type 4 SVC routine. The routine is located in the fixed or pageable link pack area (LPA). The last four characters of the load module name are cccc.

**IRB****
- Indicates an asynchronous routine with an associated interruption request block. No module name is available.

*cccccc
- Indicates an error recovery module. The last seven characters of the load module name are ccccc.

A page fault occurred

An internal error occurred

Name of the DD statement associated with the SVC, if applicable.

Vary with the SVC number. These fields are described for the SVC in the z/OS MVS Diagnosis: Reference.
SYNS and SYNE trace records

A SYNS trace entry represents the start of a synchronous I/O (zHyperLink) operation. A SYNE trace entry represents the end of a synchronous I/O (zHyperLink) operation.

<table>
<thead>
<tr>
<th>SYNS</th>
<th>shhhh</th>
<th>ASCB</th>
<th>hhhhhhh</th>
<th>CPUID</th>
<th>hhh</th>
<th>JOBN....</th>
<th>cccccccc</th>
<th>RST......</th>
<th>hhhhhhh</th>
<th>VST......</th>
<th>hhhhhhh</th>
<th>DSID....</th>
<th>hhhhhhh</th>
<th>DVRID...</th>
<th>hh</th>
<th>SEEKA...</th>
<th>hhhhhhh</th>
<th>hh</th>
<th>PFID....</th>
<th>hhhhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYNE</td>
<td>shhhh</td>
<td>ASCB</td>
<td>hhhhhhh</td>
<td>CPUID</td>
<td>hhh</td>
<td>JOBN....</td>
<td>cccccccc</td>
<td>TCB......</td>
<td>hhhhhhh</td>
<td>DVRID...</td>
<td>hh</td>
<td>UCBVLVL..</td>
<td>hh</td>
<td>PFID....</td>
<td>hh</td>
<td>HANDLE..</td>
<td>hhhhhhh</td>
<td>SYNTYPE.</td>
<td>cccccccc</td>
<td>OPCODE..</td>
</tr>
</tbody>
</table>

SYNS shhhhh or SYNE shhhhh

Device number from the UCBCHAN field of the UCB with subchannel set identifier, when appropriate.

ASCB hhhhhhhh

Address of the ASCB for the address space that performed the I/O operation.

CPUID hhhh

Address of the processor on which the I/O operation was performed.

JOBNAME {cccccccc | NA}

One of the following:

cccccccc

Name of the job associated with task that requested the I/O operation

N/A

Not applicable

TCB {hhhhhhhh | N/A}

One of the following:

hhhhhhhh

Address of the TCB for the task that requested the I/O operation

N/A

Not applicable

RST hhhhhhhh

Real address of the channel program. This value comes from the contents of the IOSRST field of the IOSB.

VST hhhhhhhh

Virtual address of the channel program. This value comes from the contents of the IOSVST field of the IOSB.

DSID hhhhhhhh

Request identifier used by purge. This identifier is in the IOSDSID field of the IOSB and is the address of the DEB or another control block used by PURGE.

DVRID hh

Driver identifier from the IOSDVRID field of the IOSB

SEEKA hhhhhhhh hhhhhhhh

Dynamic seek address from the IOSEEKA field of the IOSB

UCBSFLS hhhh

Contents of the UCB startability flags (UCBSFLS) from the UCB
UCBLVL hh
UCB level value from the UCLEVEL field of the UCB

PFID hhhhhhh
PCIE function identifier (PFID) for PCIE device/function

HANDLE hhhhhhh
PCIE function hardware handle

SYNTYPE cccccc
The type of synchronous I/O request:

- Initiate - This is an initiate type request. An initiate request is used when multiple synchronous I/O requests need to be performed in parallel. There is one initiate request issued for each synchronous I/O to be started in parallel. Normally, the system traces only the start of an initiate request (SYNS event). However, if the initiate request fails, the end of the initiate request is also traced (SYNE event).

- Complete – This is a complete type request. A complete request is used to wait for previously initiated requests to complete. There is one complete request issued for each synchronous I/O that was initiated successfully. The system traces only the end of the complete request (SYNE event).

- Only – This is a standalone (only) request. The system traces the start (SYNS event) and end (SYNE event) of a standalone request.

OPCODE hh
Operation code for the operation to be performed

LEN1 hhh
First data length field

LEN2 hhh
Second data length field

RECCNT hh
Record count for this I/O operation

RESP hhh
Response code

RCQ hhh
Response code qualifier

ELAPSED hhhhhhh hhhhhhh
Elapsed time in 0.5 microsecond units

DEVSTAT hhhhhhh hhhhhhh hhhhhhh...
Device specific status (optional)

SYNCH I/O trace records
A SYNCH I/O record represents the processing of a synchronous I/O (zHyperLink) request. SYNCH I/O trace records appear following a SYNE trace record; they do not appear alone.
FORMAT d cccc
Format (d) and type of trace event (cccc): SYNE. Format is zero.

DEV hhhhh
The device number qualified with the subchannel set identifier.

ASCB hhhhhhhh
Same as the ASCB field in the SYNE base record.

CPU hhhh
Same as the CPU ID field in the SYNE base record.

JOBN cccccc
Same as the job named (JOBN) field in the SYNE base record.

CLP Request Block at vvvvvvvv_vvvvvvvv
The request block at virtual address vvvvvvvv_vvvvvvvv. The formatted request block follows.

Len hhhhh
Request block length

CmdCode hhhh
Command code

Fmt hh
Request block format

OpCode hh
Operation code for the operation to be performed

Flag hh
Request block flags

Key hh
Channel program key in the first four bits

Func Handle hhhhhhhh
PCIE function hardware handle

SID hhhhhhhh
Subsystem id for the associated subchannel/device

WWNN hhhhhhhh hhhhhhhh
World-wide node name for the control unit

Device Spec hhhhhhhh...
Device specific parameters

CLP Response Block at vvvvvvvv_vvvvvvvv
The response block at virtual address vvvvvvvv_vvvvvvvv. The formatted response block follows.

Len hhhhh
Request block length

RespCode hhhh
Response code
**RCQ hhhh**
- Response code qualifier

**Flag hh**
- Response flags

**RecNo hh**
- Record number to which the status pertains or zero

**TimeStamp hhhhhhhh hhhhhhh**
- Control unit time stamp at the time the status condition was detected

**DiagId hhhhhhhh hhhhhhh**
- Diagnostic information identifier

**Device Status hhhhhhhh...**
- Device specific status (optional)

**Data at rrrrrrrr_rrrrrrrr**
- Data buffer at real address rrrrrrrr_rrrrrrrr

**dddddddd dddddddd dddddddd dddddddd**
- Data transferred to or from the data buffer. If there is not a series of dashes in this field, then all transferred data are displayed in four byte sections.

*** Back half of split data ***
- Indicates there were more bytes of information transferred than were specified on the START command. The default value is 20 bytes, but you can specify the number of bytes to be shown. The specified value is halved; for an odd number, the larger section is shown first. The first section of data displayed comes from the beginning of the buffer from which the data was transferred. The last section comes from the end of the buffer.

**IOSB vvvvvvvv**
- Fullword virtual address of the IOSB followed by the formatted contents of the IOSB

**IOBE vvvvvvvv**
- Fullword virtual address of the IOBE followed by the formatted contents of the IOBE.
TCW trace records

A TCW record represents the processing of a zHPF channel program. TCW trace records appear following INTG, IOCS, IO, SSCH, and XSCH trace records; they do not appear alone.

<table>
<thead>
<tr>
<th>FORMAT d cccc</th>
<th>TCW CHAIN</th>
<th>DEV hhhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASCB hhhhh</td>
<td>CPU hhhhh</td>
</tr>
</tbody>
</table>

TCW at vvvvvvvvv (vvvvvvvvvv)

Format........... hh
Flag1............ hh
Flag2............ hh
Flag3............ hh
TCBBL/R/W........ hh
Output Address... rrrrrrrr
Input Address.... rrrrrrrr
TSB Address..... rrrrrrrr
DevAddress...... rrrrrrrr
Output Count..... hhhhhhh
Input Count...... hhhhhhh
Interrogate TCW... rrrrrrrr

tsbtype TSB at vvvvvvvvv

Length........... hh
Flags---------- hh
Dw Offset...... hhhh
Count........... hhhhhhh
TotalDevTime.... hhhhhhh
DeferTime...... hhhhhhh
CuQueueTime.... hhhhhhh
DevBusyTime..... hhhhhhh
Sense Data...... hhhhhhh

TCB TIDAW at vvvvvvvvv

Flags... hh
Count... hhhhhhh
Addr... rrrrrrrr

TCA Header at vvvvvvvvv

Format........... hh
Serv Act Code... hhhh
Priority........ hh

DCW at vvvvvvvvv

Command.. hh
Flags.. hh
CD Count.. hh
Priority.... hh

DCW Control Data at vvvvvvvvv

dddddd dddddd dddddd dddddd | ............... |
dddddd dddddd dddddd dddddd | ............... |

Data TIDAW at vvvvvvvvv

Flags... hh
Count... hhhhhhh
Addr... rrrrrrrr

Data at vvvvvvvvv

dddddd dddddd dddddd dddddd | ............... |
dddddd dddddd dddddd dddddd | ............... |

TCA Trailer at vvvvvvvvv

Transport Count... hhhhhhh
* or *
TCA Trailer at vvvvvvvvv

Write Count... hhhhhhh
Read Count... hhhhhhh

TCAX TIDAW at vvvvvvvvv

Flags... hh
Count... hhhhhhh
Addr... rrrrrrrr

DCW (TCAX) at vvvvvvvvv

Command.. hh
Flags.. hh
CD Count.. hh
Count.. hhhhhhh

DCW Control Data (TCAX) at vvvvvvvvv

dddddd dddddd dddddd dddddd | ............... |
dddddd dddddd dddddd dddddd | ............... |

IOSB at vvvvvvv

formatted iosb data

IODE at vvvvvvv

formatted iode data

EMA at vvvvvvv

formatted ema data

**FORMAT d cccc**

Format (d) and type of trace event (cccc): INTG, IO, IOCS, SSCH, or XSCH. Format is zero.

**DEV hhhhh**

The device number qualified with the subchannel set identifier.
ASCB hhhhhhhh
Same as the ASCB field in the INTG, IO, IOCS, SSCH, or XSCH base record.

CPU hhhh
Same as the CPU ID field in the INTG, IO, IOCS, SSCH, or XSCH base record.

JOBN cccccccc
Same as the job named (JOBN) field in the INTG, IO, IOCS, SSCH, or XSCH base record.

TCW at rrrrrrr (vvvvvvv)
The Transport Control Word (TCW) at real address rrrrrrr and virtual address vvvvvvvv. The formatted TCW follows. Fields designated as "rrrrrrrr" or "rrrrrrrr_rrrrrrrr" are real addresses.

tsbtype TSB at rrrrrrrr_rrrrrrrr
The Transport Status Block (TSB) at real address rrrrrrrr_rrrrrrrr. The formatted TSB follows. The TSB is only formatted for I/O interruptions (trace events INTG, IO, and IOCS).

tsbtype
Describes the type of TSB. It can be one of the following:

- I/O status - This is a TSB for an I/O completion.
- Interrogate - This is a TSB for the completion of an interrogate operation.
- Program Check - This is a TSB for an I/O completion with status indicating a device detected program check.
- Unknown - The TSB type is not recognized. In this case, the TSB is formatted as hexadecimal data.

TCCB TIDAW at rrrrrrrr_rrrrrrrr
A Transport Indirect Address Word (TIDAW) for the Transport Command Control Block (TCCB) at real address rrrrrrrr_rrrrrrrr. The formatted TIDAW follows.

TCA Header at rrrrrrrr_rrrrrrrr
The Transport Control Area Header (TCAH) at real address rrrrrrrr_rrrrrrrr. The formatted TCAH follows.

DCW at rrrrrrrr_rrrrrrrr
A Device Command Word (DCW) at real address rrrrrrrr_rrrrrrrr. The formatted DCW follows.

DCW Control Data at rrrrrrrr_rrrrrrrr
The control data (command parameters) for the preceding DCW at rrrrrrrr_rrrrrrrr. The control data is formatted as hexadecimal data.

Data TIDAW at rrrrrrrr_rrrrrrrr
A Transport Indirect Address Word (TIDAW) for the input or output data buffers at real address rrrrrrrr_rrrrrrrr. The formatted TIDAW follows.

Data at rrrrrrrr_rrrrrrrr
Data transferred by the preceding DCW at real address rrrrrrrr_rrrrrrrr.

dddddddd dddddddd dddddddd dddddddd
Data transferred by the DCW. If there is not a series of dashes in this field, then all transferred data are displayed in four byte sections.

*** Back half of split data ***
Indicates there were more bytes of information transferred than were specified on the START command. The default value is 20 bytes, but you can specify the number of bytes to be shown. The specified value is halved; for an odd number, the larger section is shown first. The first section of data displayed comes from the beginning of the buffer from which the data was transferred. The last section comes from the end of the buffer.

TCA Trailer at rrrrrrrr_rrrrrrrr
The Transport Control Area Trailer (TCAT) at real address rrrrrrrr_rrrrrrrr. The formatted TCAT follows.

Transport Count hhhhhhhh
Fullword count of total data transferred.
Write Count hhhhhhhh
  Fullword count of total write data transferred.

Read Count hhhhhhhh
  Fullword count of total read data transferred.

TCAX TIDAW at rrrrrrrrrrrrrrr
  A Transport Indirect Address Word (TIDAW) for the Transport Control Area Extension (TCAX) at real
  address rrrrrrrrrrrrrrr. The formatted TIDAW follows.

DCW (TCAX) at rrrrrrrrrrrrrrr
  A Device Command Word (DCW) in the Transport Control Area Extension (TCAX) at real address
  rrrrrrrrrrrrrrr. The formatted DCW follows.

DCW Control Data (TCAX) at rrrrrrrrrrrrrrr
  The control data (command parameters) for the preceding DCW in the TCAX at rrrrrrrrrrrrrrr. The
  control data is formatted as hexadecimal data.

IOSB vvvvvvvv
  Fullword virtual address of the IOSB followed by the formatted contents of the IOSB.

IOBE vvvvvvvv
  Fullword virtual address of the IOBE followed by the formatted contents of the IOBE.

EWA vvvvvvvv
  Fullword virtual address of the error recovery procedure work area (EWA), followed by the formatted
  contents of EWA.

USR trace records

The USR record represents processing of a GTRACE macro. A user-supplied formatting routine
(AMDUUSRrh) formats the record. If a routine is not supplied, GTF prints the record without formatting.

This topic shows the unformatted and formatted records, then shows the following examples of USR
records created by GTRACE macros in IBM-components:

- USRF9 trace records for VSAM
- USRFE trace records for BSAM, QSAM, BPAM, and BDAM
- USRFF trace records for open, close, and end-of-volume (EOV)

The USRFD trace records for VTAM are described in z/OS Communications Server: SNA Diagnosis Vol 1,
Techniques and Procedures.

USR records contain the following information useful for identifying the user program, MVS component, or
IBM product producing the record and the routine you can use to format the record:

- Event identifiers (EIDs) identify the event that produced the record. See “Event Identifiers (EIDs) for
  USR trace records” on page 297 for a list of the EIDs and associated products for USR trace records.
  Because each EID for USR records start with an E, unformatted USR records show just the last three
  numbers of the EID after the E.
- Format identifiers (FIDs) identify the routine that the system used to format the USR trace record. See
  “Format Identifiers (FIDs) for USR trace records” on page 299 for a list of the FIDs and associated
  routines.

Unformatted USR trace record

An unformatted user trace record represents processing of a GTRACE macro when a formatting routine is
not supplied.

USR AID hh FID hhhh EID hhhh hhhhhhhh hhhhhhhh ....

AID hh
  Application identifier, which should always be AID FF.
**FID hhhh**
Format identifier of the routine (AMDUSRhh) that was to format this record. See “Format Identifiers (FIDs) for USR trace records” on page 299 for a list of the FIDs and associated formatting routines for user trace records.

**EID hhhh**
Event identifier, which identifies the event that produced the record. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for USR trace records.

**hhhhhhhh hhhhhhh ....**
Recorded data (268 bytes maximum). The data are as follows:
- Bytes 0-3: ASCB address
- Bytes 4-11: jobname
- Bytes 12-256: user data

**Formatted USR trace record**
A formatted user trace record represents processing of a GTRACE macro when an AMDUSRhh formatting routine is supplied.

```
USRhh hhh ASCB hhhhhhhhh JOBN cccccccc
 xxxx ...
```

**USRhh**
Identifies the user-supplied formatting routine (AMDUSRhh). The following USR records are generated and formatted by system components, and are described in the following topics:
- USRF9 Trace Records for VSAM
- USRFD Trace Records for VTAM
- USRFE Trace Records for BSAM, QSAM, BPAM, and BDAM
- USRFF Trace Records for Open/Close/EOV

**hhh**
Last three numbers of the event identifier (EID) specified in the GTRACE macro. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for USR trace records.

**ASCB hhhhhhhhh**
Address of the ASCB for the address space that created the record.

**JOBN cccccc**
Name of the job associated with the address space.

**xxxx ...**
User-formatted trace data.
The USRF9 trace record represents opening or closing of a VSAM data set.

```
USRF9 FF5 ASCB hhhhhhhh JOBN cccccc
JOB NAME cccccc STEP NAME cccccc
TIOT ENT hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
ACB hhhhhhhh hhhhhhhh hhhhhhhh…
            hhhhhhhh hhhhhhhh hhhhhhhh…
AMBL hhhhhhhh hhhhhhhh hhhhhhhh…
            hhhhhhhh hhhhhhhh hhhhhhhh…
AMB  hhhhhhhh hhhhhhhh hhhhhhhh…
            hhhhhhhh hhhhhhhh hhhhhhhh…
AMDSB  hhhhhhhh hhhhhhhh hhhhhhhh…
            hhhhhhhh hhhhhhhh hhhhhhhh…
AMB  hhhhhhhh hhhhhhhh hhhhhhhh…
            hhhhhhhh hhhhhhhh hhhhhhhh…
AMDSB  hhhhhhhh hhhhhhhh hhhhhhhh…
            hhhhhhhh hhhhhhhh hhhhhhhh…
```

USRF9
Identifies VSAM's trace-record formatting routine (AMDUSRF9).

FF5
Last three numbers of the event identifier (EID) specified in the GTRACE macro. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for USR trace records.

ASCB hhhhhhhh
Address of the ASCB for the address space in which the event occurred.

JOBN cccccc
Name of the job.

STEP NAME cccccc
Name of the job step during which the event occurred.

TIOT ENT hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
Data set entry from the task I/O table (TIOT).

ACB hhhhhhhh…
Contents of the data set's access method control block (ACB).

AMBL hhhhhhhh…
Contents of the AMB list (AMBL).

AMB hhhhhhhh…
Contents of the access method block (AMB). The first AMB is for data, the second for the index.

AMDSB hhhhhhhh…
Contents of the access method statistics block (AMDSB). The first AMDSB is for data, the second for the index.

USRFD trace record for VTAM
See z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures for samples of the USRFD trace records.
USRFE trace record for BSAM, QSAM, BPAM, and BDAM

The USRFE trace record represents abnormal termination of an access method routine for basic sequential access method (BSAM), queued sequential access method (QSAM), basic partitioned access method (BPAM), or basic direct access method (BDAM).

```
USRFE hhh ASCB hhhhhhhh JOBN cccccc
BSAM/QSAM/BPAM/BDAM TRACE RECORD DDNAME cccccc ABEND CODE hh
cccc...[AT LOCATION hhhhhhhh]

hiiiiiiii hiiiiiiii hiiiiiiii hiiiiiiii ...
```

USRFE

Identifies the trace-record formatting routine (AMDUSRFE).

hhh

Last three numbers of the event identifier (EID) specified in the GTRACE macro. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for USR trace records. The event identifier (EID) corresponds to the system completion code as follows:

<table>
<thead>
<tr>
<th>EID</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF3</td>
<td>002</td>
</tr>
<tr>
<td>FF4</td>
<td>008</td>
</tr>
<tr>
<td>FF6</td>
<td>112</td>
</tr>
<tr>
<td>FF7</td>
<td>215</td>
</tr>
<tr>
<td>FF8</td>
<td>119</td>
</tr>
<tr>
<td>FF9</td>
<td>235</td>
</tr>
<tr>
<td>FFA</td>
<td>239</td>
</tr>
<tr>
<td>FFB</td>
<td>145</td>
</tr>
<tr>
<td>FFC</td>
<td>251</td>
</tr>
<tr>
<td>FFD</td>
<td>451</td>
</tr>
<tr>
<td>FFE</td>
<td>169</td>
</tr>
</tbody>
</table>

ASCB hhhhhhhh

Address of the ASCB for the address space in which the abnormal termination occurred.

JOBN cccccc

Name of the job associated with the address space.

BSAM/QSAM/BPAM/BDAM TRACE RECORD

Record identification provided by the AMDUSRFE formatting routine.

DDNAME cccccc

Name of the DD statement for the data set being processed.

ABEND CODE hh

System completion code for the abnormal termination of the task.

RETURN CODE hh

Return code from the module that detected the error condition.

TIME=dd.dd.dd

Time (hour.minute.second) when the GTRACE macro was processed or blank, if the time is not available.
Data area name, or name and address, followed by the data area contents.

**USRFF trace record for open/close/EOV abnormal end**

This USRFF trace record represents an abnormal end during open, close, or end-of-volume (EOV).

```
USRFF   FFF    ASCB hhhhhhhh JOBN cccccc
xxxx ...          
```

**USRFF**

Identifies the Open/Close/EOV trace record formatting routine (IMDUSRFF).

**FFF**

Last three numbers of the event identifier (EID) specified in the GTRACE macro. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for USR trace records.

**xxxx ...**

Unformatted RRCBSA's (recovery routine control block save areas).

**USRFF trace record for user requested work area**

This USRFF trace record represents a user request for a work area trace.

```
USRFF     FFF     ASCB hhhhhhhh JOBN cccccc
DCB       xxxx ...  
WKAREA1   xxxx ...  
WKAREA2   xxxx ...  
WKAREA3   xxxx ...  
WKAREA4   xxxx ...  
WKAREA5   xxxx ...  
WTG TBL   xxxx ...  
```

**USRFF**

Identifies the Open/Close/EOV trace record formatting routine (IMDUSRFF).

**FFF**

Last three numbers of the event identifier (EID) specified in the GTRACE macro. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for user trace records.

**DCB**

Data control block.

**WKAREA1**

Volume labels, file labels, DSCBs or message area. See *z/OS DFSMS Using Magnetic Tapes*.

**WKAREA2**

Job file control block.

**WKAREA3**

Internal control blocks for Open/Close/EOV. These blocks are the data control block (DCB), data extent block (DEB), and the input/output block (JOB).

**WKAREA4**

**WKAREA5**

Where-to-go-table used in transferring control among CSECTs of Open/Close/EOV.
XSCH trace record

An XSCH record represents a cancel subchannel operation. For zHPF I/O operations, a cancel subchannel can be used to initiate an interrogate operation to query the status of the I/O operation at the device.

<table>
<thead>
<tr>
<th>XSCH... ddddd</th>
<th>ASCB... aaaaaaaa</th>
<th>CPUID... cccc</th>
<th>JOBN... jijjijjj</th>
<th>SID... sssssss</th>
<th>CC... cc</th>
<th>DVRID... dd</th>
<th>IOSLVL... ll</th>
<th>UCBlvl... ll</th>
<th>UCBWGT... ww</th>
<th>BASE... sbbbb</th>
<th>INTTCW... aaaaaaa</th>
</tr>
</thead>
</table>

**XSCH ddddd**
Device number with the subchannel set identifier that the XSCH was issued for.

**ASCB aaaaaaaa**
Address of the ASCB.

**CPU cccc**
Address of the processor.

**JOBN jijjijjj**
Name of the job associated with I/O operation.

**SID sssssss**
Subchannel ID from the UCBSID field of the UCB.

**CC cc**
The condition code of the XSCH request.

**DVRID dd**
The IOSB driver ID (IOSDVRID) of the request that is attempting to be cancelled.

**IOSLVL ll**
Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

**UCBLVL ll**
UCB level value from the UCBLEVEL field of the UCB.

**UCBWGT ww**
Flags from the UCBWGT field of the UCB.

**BASE sbbbb**
The base device number and subchannel set id if the device is a PAV.

**INTTCW**
The virtual address of the interrogate TCW, if the XSCH was used to initiate an interrogate operation, or zero.

**Event Identifiers (EIDs) for USR trace records**

The event identifier (EID) in GTF trace records is a 2-byte hexadecimal number that identifies the event producing the record. You can use it to identify the product that produced the record. Table 41 on page 297 shows the full 2-byte EID, but because EIDs for USR records start with an E, often unformatted USR records show just the last three numbers of the EID after the E. If you have a three number EID, such as FF5, look for EFF5 in the table.

<table>
<thead>
<tr>
<th>EID (hex)</th>
<th>Symbolic Name</th>
<th>Issued by</th>
</tr>
</thead>
<tbody>
<tr>
<td>E000-E3FF</td>
<td>GTF user program</td>
<td></td>
</tr>
<tr>
<td>E400-E5F0</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>E5F1</td>
<td>PVM</td>
<td></td>
</tr>
</tbody>
</table>

Table 41. Event identifiers for USR trace records
### Table 41. Event identifiers for USR trace records (continued)

<table>
<thead>
<tr>
<th>EID (hex)</th>
<th>Symbolic Name</th>
<th>Issued by</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5F2-E5F3</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>E5F4-E5F5</td>
<td></td>
<td>NetView® Session Monitor</td>
</tr>
<tr>
<td>E5F6</td>
<td></td>
<td>NetView</td>
</tr>
<tr>
<td>E5F7</td>
<td>IMDOMGM</td>
<td>Omegamon for DB2</td>
</tr>
<tr>
<td>E5F8-E5F9</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>E5FA-E5FB</td>
<td></td>
<td>ALCS</td>
</tr>
<tr>
<td>E5FC-EF0F</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF10-EF1C</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF1D-EF1F</td>
<td></td>
<td>MVS Job Management - Dynamic Allocation (SVC 99)</td>
</tr>
<tr>
<td>EF20-EF3F</td>
<td></td>
<td>LANRES</td>
</tr>
<tr>
<td>EF40-EF41</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF42</td>
<td>IMDEF42</td>
<td>IBM Client I/O Sockets</td>
</tr>
<tr>
<td>EF43</td>
<td>IMDEF43</td>
<td>MVS System logger</td>
</tr>
<tr>
<td>EF44-EF45</td>
<td></td>
<td>RACF</td>
</tr>
<tr>
<td>EF46</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF47</td>
<td>IMDEF47</td>
<td>OSI</td>
</tr>
<tr>
<td>EF48</td>
<td></td>
<td>IOS</td>
</tr>
<tr>
<td>EF49</td>
<td></td>
<td>BDT</td>
</tr>
<tr>
<td>EF4A-EF51</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF52</td>
<td></td>
<td>Netview</td>
</tr>
<tr>
<td>EF53</td>
<td></td>
<td>OSI</td>
</tr>
<tr>
<td>EF54-EF5D</td>
<td></td>
<td>FSI</td>
</tr>
<tr>
<td>EF5E</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF5F</td>
<td></td>
<td>DB2</td>
</tr>
<tr>
<td>EF60</td>
<td></td>
<td>JES3</td>
</tr>
<tr>
<td>EF61</td>
<td></td>
<td>VSAM Buffer Manager</td>
</tr>
<tr>
<td>EF62</td>
<td></td>
<td>Dynamic output SVC installation exit</td>
</tr>
<tr>
<td>EF63</td>
<td></td>
<td>Converter/Interpreter installation exit</td>
</tr>
<tr>
<td>EF64</td>
<td></td>
<td>APPC/VM VTAM Support (AVS)</td>
</tr>
<tr>
<td>EF65</td>
<td></td>
<td>GETMAIN FREEMAIN STORAGE trace (MVS)</td>
</tr>
<tr>
<td>EF66-EF6B</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF6C</td>
<td></td>
<td>CICS</td>
</tr>
<tr>
<td>EF6D-EF8C</td>
<td></td>
<td>Netware</td>
</tr>
<tr>
<td>EFBD-EF8F</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EF90</td>
<td>IMDVTMDS</td>
<td>VTAM</td>
</tr>
<tr>
<td>EF91-EF9F</td>
<td></td>
<td>Reserved for IBM use</td>
</tr>
<tr>
<td>EFA0-EFA9</td>
<td></td>
<td>TCAM</td>
</tr>
</tbody>
</table>
Table 41. Event identifiers for USR trace records (continued)

<table>
<thead>
<tr>
<th>EID (hex)</th>
<th>Symbolic Name</th>
<th>Issued by</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFAA</td>
<td>VTAM VM/SNA Console Services (VSCS)</td>
<td></td>
</tr>
<tr>
<td>EFAB</td>
<td>DFSMS Media Manger</td>
<td></td>
</tr>
<tr>
<td>EFAC</td>
<td>NetSpool</td>
<td></td>
</tr>
<tr>
<td>EFAD-EFAE</td>
<td>VM</td>
<td></td>
</tr>
<tr>
<td>EFAF-EFCF</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EFD0-EFD4</td>
<td>Print Service Facility</td>
<td></td>
</tr>
<tr>
<td>EFD5-EFE0</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EFE1</td>
<td>ISTVIEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFE2</td>
<td>ISTTHEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFE3</td>
<td>ISTTREID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFE4</td>
<td>ISTTDEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFE5-EFEE</td>
<td>JES2</td>
<td></td>
</tr>
<tr>
<td>EFEF</td>
<td>ISTTPEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFF0</td>
<td>ISTRPEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFF1</td>
<td>ISTCLEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFF2</td>
<td>ISTLNEID</td>
<td>VTAM</td>
</tr>
<tr>
<td>EFF3</td>
<td>IGGSP002</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFF4</td>
<td>IGGSP008</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFF5</td>
<td>IDAAM01</td>
<td>VSAM</td>
</tr>
<tr>
<td>EFF6</td>
<td>IGGSP112</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFF7</td>
<td>IGGSP215</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFF8</td>
<td>IGGSP119</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFF9</td>
<td>IGGSP235</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFFA</td>
<td>IGGSP239</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFFB</td>
<td>IGGSP145</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFFC</td>
<td>IGGSP251</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFFD</td>
<td>IGGSP451</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFFE</td>
<td>IGGSP169</td>
<td>SAM/PAM/DAM</td>
</tr>
<tr>
<td>EFFF</td>
<td>IHLMDMA1</td>
<td>OPEN/CLOSE/EOV</td>
</tr>
</tbody>
</table>

Format Identifiers (FIDs) for USR trace records

As Table 42 on page 300 shows, the format identifier (FID) in GTF trace records is a one-byte hexadecimal number that is used to determine the name of the GTFTRACE module you can use to format USR records. See z/OS MVS IPCS Customization for information about the GTFTRACE formatting appendage for formatting USR trace records.
### Table 42. Format identifiers for USR trace records

<table>
<thead>
<tr>
<th>FID (hex)</th>
<th>EID</th>
<th>Issued by</th>
<th>Optional format module</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>E000-EFE4</td>
<td>User/component</td>
<td>CSECT AHLFFILT in AHLFINIT</td>
</tr>
<tr>
<td>01-50</td>
<td>E000-E3FF</td>
<td>User</td>
<td>IMDUSR or AMDUSR (01-50)</td>
</tr>
<tr>
<td>57</td>
<td>EF44-EF45</td>
<td>RACF</td>
<td>AMDUSR57</td>
</tr>
<tr>
<td>81</td>
<td>VMSI</td>
<td></td>
<td>IMDUSR81 or AMDUSR81</td>
</tr>
<tr>
<td>84</td>
<td>VMSI/VTAM</td>
<td></td>
<td>IMDUSR84 or AMDUSR84</td>
</tr>
<tr>
<td>DC</td>
<td>PVM</td>
<td></td>
<td>IMDUSRDC or AMDUSRDC</td>
</tr>
<tr>
<td>E2-E3</td>
<td>PSF/MVS</td>
<td></td>
<td>IMDUSRE2-IMDUSER3 or AMDUSRE2-AMDUSER3</td>
</tr>
<tr>
<td>E6</td>
<td>OSI</td>
<td></td>
<td>IMDUSRE6 or AMDUSRE6</td>
</tr>
<tr>
<td>E8</td>
<td>FSI</td>
<td></td>
<td>IMDUSRE8 or AMDUSRE8</td>
</tr>
<tr>
<td>E9</td>
<td>DB2/VSAM</td>
<td></td>
<td>IMDUSRE9 or AMDUSRE9</td>
</tr>
<tr>
<td>EB</td>
<td>APPC/VM VTAM Support (AVS)</td>
<td></td>
<td>IMDUSREB or AMDUSREB</td>
</tr>
<tr>
<td>EC</td>
<td>VTAM</td>
<td></td>
<td>IMDUSREC or AMDUSREC</td>
</tr>
<tr>
<td>F5</td>
<td>VTAM/VSCS</td>
<td></td>
<td>IMDUSRF5 or AMDUSRF5</td>
</tr>
<tr>
<td>F9</td>
<td>EFF5</td>
<td>VSAM</td>
<td>IMDUSRF9 or AMDUSRF9</td>
</tr>
<tr>
<td>FA</td>
<td>EFAB</td>
<td>DFSMS Media Manager</td>
<td>IMDUSRFA or AMDUSRFA</td>
</tr>
<tr>
<td>FD</td>
<td>EFEF-EF2</td>
<td>VTAM</td>
<td>IMDUSRFD or AMDUSRFD</td>
</tr>
<tr>
<td>FE</td>
<td>EFF3-EFF4, EFF6-EFFE</td>
<td>SAM/PAM/DAM</td>
<td>IMDUSRFE or AMDUSRFE</td>
</tr>
</tbody>
</table>

### Unformatted GTF trace output

This topic describes GTF output records that are not formatted by IPCS or other routines. You can use this information to write your own formatting or analysis routines.

**Note:** When GTF cannot obtain the data normally placed in fields of the following records, it signals this by placing one of the following values in the field:

- C'U/A'. Blanks are added on the right to fill out the field.
- C'*'. Asterisks are replicated to fill out the field.

There are several types of output records:

- Control records, see “Control records” on page 301.
- Lost data records, see “Unformatted lost event records” on page 302.
- User data record, see “User data records” on page 302.
- System data records, see “System data records” on page 304.

The lost data, user data and system data records all contain optional fields, which are fields that only appear under certain conditions. The conditions are covered in the explanation for the fields. Make sure that your formatting or analysis routine takes these variable fields into account.

This section also describes the GTF system data records for individual events. See “CCW trace record” on page 305 through “SVC minimal trace record” on page 320.
Control records

GTF creates a control record at the start of each block of trace output. The control record can be followed by lost data, user data, and system data records. If this trace output was merged from multiple systems using the IPCS COPYTRC subcommand, then the control record reflects the combined GTF options in effect from all the systems. See z/OS MVS IPCS Commands for more information about the COPYTRC subcommand. Figure 100 on page 301 shows the format of a control record.

```
┌──────┬─────┬─────┬─────┬─────────┬──────────┬───────┐
│      │     │     │     │         │          │       │
│ length │ res │ AID │ FID │ time zone │ time stamp │ options │ ... source descriptors ... │
└───┴───┴───┴───┴───────┴───────┴───────┴─────────────────┘
     2   2    1    1       4         8         8
bytes  bytes  byte  byte   bytes     bytes     bytes
```

*Figure 100. Unformatted control record*

The fields in the control record contain the following information:

**length**
Total length of the record, in bytes.

**res**
Two bytes of zeroes. Reserved for IBM use.

**AID**
Application identifier, which is always zero for control records.

**FID**
Format identifier of the routine that will format the record, which is always X'01' for a control record.

**time zone**
Value showing the difference between local time and Greenwich mean time (GMT) in binary units of 1.048576 seconds when tracing began.

**time stamp**
Time stamp showing the eight-byte Greenwich mean time (GMT) when the control record was created.

**options**
An eight-byte field containing the following: The first five bytes identify the GTF options in effect for a block of trace output. See mapping macro AHLZGTO in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

The remaining 3 bytes contain the following important flags, in bit ranges 0-7:

**GTWCFSID - Byte 6, Bit 6**
1, if the individual trace records have SIDs (system identifiers) indicating that the GTF trace data from multiple systems was merged using the IPCS COPYTRC command. In this case, there is multiple source descriptors, one for each system. The source descriptors are ranged in order by system identifier (SID). Use the value in the SID field as an array index to locate the source descriptor for a particular system.

The source descriptor information is identical in all control records within a single trace data set.

0, if the trace records have no SIDs.

**GTWCFNEW - Byte 6, Bit 7**
1.

**Source descriptors**
One or more arrays of information about the origins of the records in this block of trace data, such as the release level of the system issuing the trace data and the GTF options in effect. If GTF trace data was merged from multiple systems, there are multiple source descriptors, one for each system. Use the value in the SID field as an array index to locate the source descriptor for a particular system.

See mapping macro AHLZGTS in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary), and check the format of the source descriptor information.
Unformatted lost event records

A lost event record indicates that GTF lost the trace records for one or more events because of an error or overflow of the trace buffer. Figure 101 on page 302 shows the format of a lost event record.

```
<table>
<thead>
<tr>
<th>length</th>
<th>res</th>
<th>AID</th>
<th>FID</th>
<th>time zone</th>
<th>time stamp</th>
<th>count</th>
<th>SID</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 bytes</td>
<td>2 bytes</td>
<td>1 byte</td>
<td>1 byte</td>
<td>4 bytes</td>
<td>8 bytes</td>
<td>4 bytes</td>
<td>2 bytes</td>
</tr>
</tbody>
</table>
```

Figure 101. Unformatted Lost Event Record

The fields in the lost event record contain the following information:

**length**
Total length of the record, in bytes.

**res**
Two bytes of zeroes. Reserved for IBM use.

**AID**
Application identifier, which is always zero for lost event records.

**FID**
Format identifier. The value of FID is one of the following:
- X'02', if some trace records are missing because of an error or an overflow of the trace buffer.
- X'03', if an entire block of trace records is missing because of an error or an overflow of the trace buffer.

**time zone**
Value showing the difference between local time and Greenwich mean time (GMT) in binary units of 1.048576 seconds when tracing began.

**time stamp**
Time stamp showing the eight-byte Greenwich mean time (GMT) when the control record was created.

**count**
If the FID is X'02', indicating that some trace records are missing, this field contains the number of trace events that are lost.

If the FID is X'03', indicating that an entire block of trace data is missing, this field contains zeros.

**SID**
The system identifier of the system where this trace record was created. This 2-byte field only exists when GTF trace data from multiple systems was merged using the IPCS COPYTRC command. When present, the SID is an array index you can use to locate the source descriptor information for a particular system. For example, if the SID value for a record is 3, the source descriptor information for the system issuing the record is the third source descriptor in the control record.

To check to see whether trace data for a block of output comes from multiple systems, look in the control record for the **options** field and see if the GTWCFSID bit is set on. See “Control records” on page 301 for the **options** field.

User data records

This topic describes the format of user trace records requested using the GTRACE macro.

If the application using GTRACE specifies more than 256 bytes of data, the user records may be split. If a user trace record is a split record, the AID will contain a value of X'F0', X'F1', or X'F2'. Split records contain the optional **sequence** and **total length** fields.

The records have the general format shown in Figure 102 on page 303.
The fields in the record contain the following information:

**length**
Total length of the record, in bytes.

**res**
Two bytes of zeros. Reserved for IBM use.

**AID**
Application identifier, which is one of the following:
- X'FF'-- Non-split record
- X'F0'-- The first record of a series of split records
- X'F1'-- A middle record in a series of split records
- X'F3'-- The last record in a series of split records

**FID**
Format identifier of the routine that will format the trace record. See “Format Identifiers (FIDs) for USR trace records” on page 299 for a list of FIDs and associated formatting routines.

**time stamp**
Time stamp showing the eight-byte Greenwich mean time (GMT) when the record was created.

**EID**
Event identifier, which identifies the event that produced the trace record. See “Event Identifiers (EIDs) for USR trace records” on page 297 for a list of the EIDs and associated products for user trace records.

**SID**
System identifier, which identifies the system where the record was produced. This 2-byte field only exists in the following cases:
- GTF trace data from multiple systems was merged using the IPCS COPYTRC command.
- The record is a split one. If the trace data containing this split record was not merged from multiple systems, the SID field for the split record contains zeros.

You can use the SID from merged trace data as an array index to locate the source descriptor information for a particular system. For example, if the SID value for a record is 3, the source descriptor information for the system issuing the record is the third source descriptor in the control record.

To check to see whether trace data for a block of output comes from multiple systems, look in the control record for the **options** field and see if the GTWCFSID bit is set on. See “Control records” on page 301 for the **options** field.

**sequence**
Sequence number, in hexadecimal, of this split record. This field only exists for split records.

**total length**
Total length of the split trace data. This field only exists for split records.

**ASCB**
The address of the address space control block (ASCB) for the address space where the GTRACE macro was issued.

**jobname**
The name of the job associated with the task where the GTRACE macro was issued.
**data**
Contains the trace data gathered for the requested event. The length of this field varies according to the event being traced. The number of bytes of data in the data field for user records is equal to the number of bytes specified on the GTRACE macro.

**System data records**
GTF creates trace records for each system event you select when requesting GTF tracing. The header portion of system data records for events is shown in Figure 103 on page 304. Individual event record formats The format of individual system data records are shown in “Unformatted trace records for events” on page 304 in alphabetical order. Note that this section does not include all system events.

```
+---------------+---------+-------+-------+----------+---------+-----------------+----------+----------+----------+---------------+---------+-------------------+--------+
<table>
<thead>
<tr>
<th>length</th>
<th>res</th>
<th>AID</th>
<th>FID</th>
<th>time stamp</th>
<th>EID</th>
<th>SID</th>
<th>data</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 bytes</td>
<td>2 bytes</td>
<td>byte</td>
<td>byte</td>
<td>8 bytes</td>
<td>2 bytes</td>
<td>2 bytes (optional)</td>
<td>... data ...</td>
</tr>
</tbody>
</table>
```

*Figure 103. Header for Unformatted System trace record Format*

The fields in the record contain the following information:

- **length**
  Total length of the record, in bytes.

- **res**
  Two bytes of zeros. Reserved for IBM use.

- **AID**
  Application identifier, which is always X'FF' for system data records.

- **FID**
  Format identifier of the routine that will format the trace record.

- **time stamp**
  Time stamp showing the eight-byte Greenwich mean time (GMT) when the record was created.

- **EID**
  Event identifier, which identifies the event that produced the trace record.

- **SID**
  System identifier, which identifies the system where the record was produced. The SID field contains zeros when the record is a split record. This 2-byte field is only created when GTF trace data from multiple systems was merged using the IPCS COPYTRC command. When present, the SID is an array index you can use to locate the source descriptor information for a particular system. For example, if the SID value for a record is 3, the source descriptor information for the system issuing the record is the third source descriptor in the control record.

  To check to see whether trace data for a block of output comes from multiple systems, look in the control record for the options field and see if the GTWCFSID bit is set on. See “Control records” on page 301 for the options field.

- **data**
  Trace data gathered for the requested event. The length of this field varies according to the event being traced. The data portions for individual system trace records are shown starting on “Unformatted trace records for events” on page 304.

**Unformatted trace records for events**
This topic presents the records for a selection of system events in alphabetical order. It shows the unformatted layout of the data for individual event records. See “System data records” on page 304 to see the header section for the records. Note that not all system events are included in this topic. Fields in a trace record may contain the following special indicators:
N/A
Not applicable. The field does not apply in this record. In a 2-byte field, not applicable appears as N/A.

U/A
Unavailable. GTF could not gather the information. In a 2-byte field, unavailable appears as U/A.

The offsets for all the data records are relative and do not reflect the actual number of bytes into the record for each field. The offsets begin at the start of the data portion of the each record because the header section varies in length, depending on whether the optional SID field is present.

**ADINT trace record**

For a complete mapping of the adapter interruption trace record, see the AHLPCIE (PCIE trace record formats) data area in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

**CCW trace record**

For a complete mapping of the AHLMCWRC data area, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

**DSP comprehensive trace record**

GTF builds a DSP record when an entry is made to the dispatcher to dispatch a unit of work and TRACE=DSP is the GTF option in effect.

The FID for the DSP comprehensive trace record is X'00'. The EID is one of the following:

- X'0001' - indicates SRB dispatching.
- X'0002' - indicates LSR dispatching.
- X'0003' - indicates TCB dispatching.
- X'0004' - indicates exit prolog dispatching.

<p>| Table 43. DSP trace record offset, size, and description. |
|---------------------------------|-----|---------------------------------|</p>
<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>8</td>
<td>Jobname.</td>
</tr>
<tr>
<td>14 (E)</td>
<td>16</td>
<td>Resume PSW for new task.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>4</td>
<td>New TCB (for LSR and TCB, SRB for SRB).</td>
</tr>
<tr>
<td>For TCB only:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 (22)</td>
<td>8</td>
<td>CDE name.</td>
</tr>
<tr>
<td>For SRB only:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>Parm address.</td>
</tr>
<tr>
<td>38 (26)</td>
<td>1</td>
<td>For SRB only, SRB routine type indicator. S for a suspended SRB that is about to be re-dispatched. I for an SRB that is about to be dispatched for the first (initial) time.</td>
</tr>
</tbody>
</table>

**DSP minimal trace record**

GTF builds a DSP minimal record when an entry is made to the dispatcher to dispatch a unit of work and both TRACE=SYSM, DSP are the GTF options in effect.

The FID for the DSP minimal trace record is X'03'. The EID is one of the following values:

- X'0001' - indicates SRB dispatching.
• X'0002' - indicates LSR dispatching.
• X'0003' - indicates TCB dispatching.
• X'0004' - indicates exit prolog dispatching.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>16</td>
<td>Resume PSW for work unit that is being dispatched.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>Current TCB or N/A (for TCB and LSR only).</td>
</tr>
<tr>
<td>26 (1A)</td>
<td>4</td>
<td>Register 15.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>4</td>
<td>Register 0 or SRB.</td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>Register 1.</td>
</tr>
<tr>
<td>38 (26)</td>
<td>1</td>
<td>For SRB only. The SRB routine type indicator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S for a suspended SRB that is about to be redispatched.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I for an SRB that is about to be dispatched for the first (initial) time.</td>
</tr>
</tbody>
</table>

**EXT comprehensive trace record**

GTF builds an EXT comprehensive record when an external interruption occurs and either TRACE=SYS or TRACE=EXT are the GTF options in effect.

The FID for the EXT comprehensive trace record is X'02'. The EID is X'6201'. interruption.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>8</td>
<td>Jobname.</td>
</tr>
<tr>
<td>14 (E)</td>
<td>16</td>
<td>External old PSW.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>4</td>
<td>Old TCB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For SIGP interrupt:</td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>PARMFIELD.</td>
</tr>
<tr>
<td>38 (26)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For clock comparator interrupt:</td>
</tr>
<tr>
<td>34 (22)</td>
<td>2</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>36 (24)</td>
<td>4</td>
<td>TQE exit.</td>
</tr>
<tr>
<td>40 (28)</td>
<td>4</td>
<td>TQE ASCB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For CPU timer interrupt:</td>
</tr>
<tr>
<td>34 (22)</td>
<td>2</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>36 (24)</td>
<td>4</td>
<td>TQE exit.</td>
</tr>
</tbody>
</table>

**EXT minimal trace record**

GTF builds an EXT minimal record when an external interruption occurs and TRACE=SYSM is the GTF option in effect.
The FID for the EXT minimal trace record is X'03'. An EID of X'6201' indicates an external interruption.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>16</td>
<td>External old PSW.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>TCB of interrupted task or N/A.</td>
</tr>
<tr>
<td>26 (1A)</td>
<td>4</td>
<td>NTQE TCB or INT CPU or N/A.</td>
</tr>
</tbody>
</table>

**I/O summary trace record**

GTF builds an I/O summary record when an I/O interruption occurs and TRACE=IOX or TRACE=IOXP is a GTF option in effect. To trace PCI I/O interruptions, TRACE=PCI must also be in effect.

The FID for the I/O summary record is X'08'. The EID is one of the following:

- X'2100' - indicates a PCI I/O interruption
- X'5107' - indicates an EOS I/O interruption
- X'5202' - indicates an I/O interruption with a valid UCB
- X'5203' - indicates a I0CS I/O interruption. It indicates an I/O interruption that also contains concurrent sense information, for devices that support the concurrent sense facility.

The I/O summary record will always contain a header section, followed by a section header and a common section. The section header describes the type and length of the following section and an indicator if this is the last section of the record.

A typical I/O summary record for a dasd device would have a header section, a common section, a data set section, a CMB section and, probably, one or more CCW sections. If an I/O summary record has to be extended the following extension records would consist of a header section with the header record number greater than 1, a common section and one or more CCW sections.

**Header section**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>8</td>
<td>Jobname.</td>
</tr>
<tr>
<td>14 (E)</td>
<td>2</td>
<td>Device number.</td>
</tr>
<tr>
<td>16 (10)</td>
<td>4</td>
<td>System ID.</td>
</tr>
<tr>
<td>20 (14)</td>
<td>1</td>
<td>Driver ID.</td>
</tr>
<tr>
<td>21 (15)</td>
<td>1</td>
<td>Trace version.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>2</td>
<td>Record count.</td>
</tr>
</tbody>
</table>

**Section header**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>1</td>
<td>Section type:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FL1'0': Common section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FL1'1': CMB section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FL1'3': CCW Orientation section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FL1'4': Data set section</td>
</tr>
</tbody>
</table>
## Generalized Trace Facility

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1)</td>
<td>1</td>
<td>Flag identifiers.</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Last section of this record.</td>
</tr>
<tr>
<td>2 (2)</td>
<td>2</td>
<td>Section length.</td>
</tr>
</tbody>
</table>

### Common section

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>1</td>
<td>Device class.</td>
</tr>
<tr>
<td>1 (1)</td>
<td>1</td>
<td>Device status.</td>
</tr>
<tr>
<td>2 (2)</td>
<td>1</td>
<td>Error codes: indicate errors found during CCW analysis. See “CCW error codes” on page 309 for a description.</td>
</tr>
<tr>
<td>3 (3)</td>
<td>1</td>
<td>Flag byte.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>6</td>
<td>Volume serial.</td>
</tr>
</tbody>
</table>

### Data set section

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>1</td>
<td>Data set type.</td>
</tr>
<tr>
<td>1 (1)</td>
<td>1</td>
<td>Name length.</td>
</tr>
<tr>
<td>2 (2)</td>
<td>44</td>
<td>Data set name.</td>
</tr>
</tbody>
</table>

### CMB Section

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>2</td>
<td>Number of SSCH instructions.</td>
</tr>
<tr>
<td>2 (2)</td>
<td>2</td>
<td>Number of SSCH instructions for which data was collected.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>4</td>
<td>Sum of device connect times.</td>
</tr>
<tr>
<td>8 (4)</td>
<td>4</td>
<td>Sum of SSCH request pending times.</td>
</tr>
<tr>
<td>12 (C)</td>
<td>4</td>
<td>Sum of subchannel disconnect times.</td>
</tr>
<tr>
<td>16 (10)</td>
<td>4</td>
<td>Sum of control unit queueing times.</td>
</tr>
<tr>
<td>20 (14)</td>
<td>8</td>
<td>Time stamp for the start of this I/O request.</td>
</tr>
<tr>
<td>28 (1C)</td>
<td>4</td>
<td>Device active only time.</td>
</tr>
<tr>
<td>32 (20)</td>
<td>4</td>
<td>Number of SSCH instructions.</td>
</tr>
<tr>
<td>36 (24)</td>
<td>4</td>
<td>Number of SSCH instructions for which data was collected</td>
</tr>
<tr>
<td>40 (28)</td>
<td>4</td>
<td>Sum of device busy times</td>
</tr>
<tr>
<td>44 (2C)</td>
<td>4</td>
<td>Sum of initial command response times.</td>
</tr>
</tbody>
</table>
**CCW orientation section**

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>1</td>
<td>Orientation sequence number.</td>
</tr>
<tr>
<td>1 (1)</td>
<td>1</td>
<td>Flag byte 1.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... .... At least one SII bit on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... .... At least one suspend bit on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... At least one PCI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...1... At least one skip bit on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... 1... Read record zero or read home address.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .1.. Reserved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... ..1. Read multiple CKD or track.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... ...1 At least one erase CCW.</td>
</tr>
<tr>
<td>2 (2)</td>
<td>1</td>
<td>Flag byte 2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... .... End of file read or written.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... .... At least one format write.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... This record is for an FCX (zHPF) channel program</td>
</tr>
<tr>
<td>3 (3)</td>
<td>1</td>
<td>Count of erase, read MCKD.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>Number of blocks read.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>2</td>
<td>Number of blocks written.</td>
</tr>
<tr>
<td>8 (8)</td>
<td>4</td>
<td>Number of bytes read.</td>
</tr>
<tr>
<td>12 (C)</td>
<td>4</td>
<td>Number of bytes written.</td>
</tr>
<tr>
<td>16 (10)</td>
<td>2</td>
<td>Number of data chain CCWs.</td>
</tr>
<tr>
<td>18 (12)</td>
<td>2</td>
<td>Number of COM chain CCWs.</td>
</tr>
<tr>
<td>20 (14)</td>
<td>1</td>
<td>External global attribute.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11... .... '11' (only allowed value).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... CKD conversion mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...1... Subsystem operation mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... ..1. Cache fast write.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... ...1 Inhibit DASD fast write.</td>
</tr>
<tr>
<td>21 (15)</td>
<td>1</td>
<td>External global attribute extended.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>External end of extent CCH.</td>
</tr>
<tr>
<td>26 (1A)</td>
<td>1</td>
<td>Seek/locate code.</td>
</tr>
<tr>
<td>27 (1B)</td>
<td>5</td>
<td>CCHHR (search ID equal).</td>
</tr>
<tr>
<td>32 (20)</td>
<td>1</td>
<td>Operation code from locate parameter.</td>
</tr>
<tr>
<td>33 (21)</td>
<td>1</td>
<td>Sector number from parameter.</td>
</tr>
<tr>
<td>34 (22)</td>
<td>1</td>
<td>Extended operation code.</td>
</tr>
<tr>
<td>35 (23)</td>
<td>2</td>
<td>Extended parameters.</td>
</tr>
</tbody>
</table>

**CCW error codes**
### Table 46. CCW error codes

<table>
<thead>
<tr>
<th>Error code (Hex)</th>
<th>Error Code Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>IONOCCW</td>
<td>Bad CCW</td>
</tr>
<tr>
<td>04</td>
<td>IOINSPAC</td>
<td>Insufficient space in table</td>
</tr>
<tr>
<td>05</td>
<td>IOX4K</td>
<td>Target crosses 4K boundary</td>
</tr>
<tr>
<td>06</td>
<td>IOLASTCC</td>
<td>Last CCW not trace</td>
</tr>
<tr>
<td>07</td>
<td>IOSRCHCD</td>
<td>Search CCW with data chain</td>
</tr>
<tr>
<td>08</td>
<td>IOINSCNT</td>
<td>Insufficient count</td>
</tr>
<tr>
<td>09</td>
<td>IOCUPUNAV</td>
<td>Channel program unavailable</td>
</tr>
<tr>
<td>0A</td>
<td>IORCKD8</td>
<td>Read CKD with count &lt;8</td>
</tr>
<tr>
<td>0B</td>
<td>IONOIIDAW</td>
<td>No IDAW where needed</td>
</tr>
<tr>
<td>0C</td>
<td>IOCSWINV</td>
<td>Invalid CSW</td>
</tr>
<tr>
<td>0D</td>
<td>IOTICBAD</td>
<td>Invalid TIC address</td>
</tr>
<tr>
<td>0E</td>
<td>IOEBIDA</td>
<td>IDAL across page bound</td>
</tr>
<tr>
<td>0F</td>
<td>IOEBIDAL</td>
<td>IDAL not aligned on correct boundary</td>
</tr>
<tr>
<td>10</td>
<td>IOMIDNOQ</td>
<td>MIDAW not aligned on correct boundary</td>
</tr>
<tr>
<td>11</td>
<td>IOMIDZCT</td>
<td>MIDAW contains a zero count</td>
</tr>
<tr>
<td>12</td>
<td>IOMIDPBD</td>
<td>MIDAW crosses a page boundary (ignored if the skip bit is on)</td>
</tr>
<tr>
<td>13</td>
<td>IOMIDIDA</td>
<td>Both the IDAW and MIDAW bits are on</td>
</tr>
<tr>
<td>14</td>
<td>IONOTCW</td>
<td>Failure accessing TCW</td>
</tr>
<tr>
<td>15</td>
<td>IONOTCAH</td>
<td>Failure accessing TCA header</td>
</tr>
<tr>
<td>16</td>
<td>IONOTSB</td>
<td>Failure accessing TSB</td>
</tr>
<tr>
<td>17</td>
<td>IONOTIDA</td>
<td>Failure accessing TIDAW</td>
</tr>
<tr>
<td>18</td>
<td>IONODCW</td>
<td>Failure accessing DCW</td>
</tr>
<tr>
<td>19</td>
<td>IOINCMDL</td>
<td>TCW command length in error</td>
</tr>
<tr>
<td>1A</td>
<td>IOCmdParmInvalid</td>
<td>Command dependent parameters contain invalid information</td>
</tr>
</tbody>
</table>

### I/O trace record

GTF builds an I/O record when an I/O interruption occurs and TRACE=SYSM, TRACE=SYS, TRACE=IO, or TRACE=IOP are the GTF options in effect. To trace PCI I/O interruptions, TRACE=PCI must also be in effect.

The FID for the I/O trace record is X'07'. The EID is one of the following:

- X'2100' - indicates a PCI I/O interruption.
- X'5101' - indicates an EOS I/O interruption.
- X'5200' - indicates an I/O interruption with a valid UCB.
- X'5201' - indicates a IOCS I/O interruption. It indicates an I/O interruption that also contains concurrent sense information, for devices that support the concurrent sense facility.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
</tbody>
</table>
### Generalized Trace Facility

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 (6)</td>
<td>8</td>
<td>Jobname.</td>
</tr>
<tr>
<td>14 (E)</td>
<td>2</td>
<td>Device number.</td>
</tr>
<tr>
<td>16 (10)</td>
<td>16</td>
<td>I/O old PSW.</td>
</tr>
<tr>
<td>32 (20)</td>
<td>20</td>
<td>IRB words 0-4.</td>
</tr>
<tr>
<td>52 (34)</td>
<td>4</td>
<td>TCB.</td>
</tr>
<tr>
<td>56 (38)</td>
<td>2</td>
<td>Sense bytes.</td>
</tr>
<tr>
<td>58 (3A)</td>
<td>1</td>
<td>IOSB Flag (IOSFLA).</td>
</tr>
<tr>
<td>59 (3B)</td>
<td>1</td>
<td>IOSB Option (IOSOPT).</td>
</tr>
<tr>
<td>60 (3C)</td>
<td>1</td>
<td>IOS Driver ID.</td>
</tr>
<tr>
<td>61 (3D)</td>
<td>1</td>
<td>IOS level.</td>
</tr>
<tr>
<td>62 (3E)</td>
<td>1</td>
<td>UCB level.</td>
</tr>
<tr>
<td>63 (3F)</td>
<td>1</td>
<td>Flags (UCBGWT).</td>
</tr>
<tr>
<td>64 (40)</td>
<td>2</td>
<td>Base device number.</td>
</tr>
<tr>
<td>66 (42)</td>
<td>44</td>
<td>IRB words 5–15 (for EID X'5201' only).</td>
</tr>
</tbody>
</table>

**PCIDMX trace record**

For a complete mapping of the PCIE de-multiplexing trace record, see the AHLPCIE (PCIE trace record formats) data area in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

**PCILG trace record**

For a complete mapping of the PCILG trace record, see the AHLPCIE (PCIE trace record formats) data area in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

**PCISTG trace record**

For a complete mapping of the PCISTG trace record, see the AHLPCIE (PCIE trace record formats) data area in z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

**PI comprehensive trace record**

GTF builds a PI comprehensive record when a program interruption occurs and either TRACE=PI or TRACE=SYS are the GTF options in effect.

The FID for the PI comprehensive trace record is X'00'. The EID is one of the following:

- X'6101' - indicates a program interruption with codes 1-17, 19, and 128.
- X'6200' - indicates a program interruption with code 18.
PI minimal trace record

GTF builds a PI minimal record when a program interruption occurs and TRACE=SYSM is the GTF option in effect.

The FID for the PI minimal trace record is X'03'. The EID is one of the following:
- X'6101' - indicates a program interruption with codes 1-17, 19, and 128.
- X'6200' - indicates a program interruption with code 18.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 (26)</td>
<td>8</td>
<td>RB or CDE name.</td>
</tr>
<tr>
<td>46 (2E)</td>
<td>64</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>110 (6E)</td>
<td>4</td>
<td>Virtual page address high half.</td>
</tr>
</tbody>
</table>

RR comprehensive trace record

GTF builds an RR comprehensive record when a recovery routine is invoked and TRACE=SYS or TRACE=RR are the GTF options in effect.

The FID for the RR comprehensive trace record is X'04'. The EID is one of the following:
- X'4002' - indicates STAE/ESTAE invocation.
- X'4003' - indicates FRR invocation.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>16</td>
<td>Program old PSW.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>Old TCB.</td>
</tr>
<tr>
<td>26 (1A)</td>
<td>4</td>
<td>Virtual page address low half.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>4</td>
<td>Register 15.</td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>Register 1.</td>
</tr>
<tr>
<td>38 (26)</td>
<td>4</td>
<td>Virtual page address high half.</td>
</tr>
</tbody>
</table>

RR minimal trace record

GTF builds an RR minimal record when a recovery routine is invoked and TRACE=SYS is the GTF option in effect.
The FID for the RR minimal trace record is X'03'. The EID is one of the following:
- X'4002' - indicates STAE/ESTAE invocation.
- X'4003' - indicates FRR invocation.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>16</td>
<td>Error PSW.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>Completion code.</td>
</tr>
<tr>
<td>26 (1A)</td>
<td>4</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>3</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>33 (21)</td>
<td>1</td>
<td>Return code from recovery routine (STAE/ESTAE only).</td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>Retry address or N/A. Note: If no return code at offset 33, begin retry address at offset 33.</td>
</tr>
<tr>
<td>38 (26)</td>
<td>4</td>
<td>Address of SDWA (STAE/ESTAE only). Note: If retry address begins at offset 33, SDWA address begins at offset 37.</td>
</tr>
</tbody>
</table>

**SLIP trace records**

GTF builds a SLIP trace record when TRACE=SLIP is the GTF option in effect and:
- A SLIP trap has matched and either TRACE or TRDUMP has been specified on the SLIP command.
- A SLIP trap is in DEBUG mode (specified on the SLIP command) and is inspected by the SLIP processor as a result of any SLIP event.

The SLIP trace records are:
- SLIP Standard Trace Record
- SLIP Standard/User Trace Record
- SLIP User Trace Record
- SLIP DEBUG Trace Record

**SLIP standard trace record**

The FID for the SLIP standard trace record is X'04'. The EID is X'4004'.

A field will contain asterisks if an error occurred when attempting to obtain data or the data is unavailable because it is paged out.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB address.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID. (Note: When SLIP is entered from RTM2, the CPUID recorded may be different from the CPUID when RTM2 was running.)</td>
</tr>
<tr>
<td>6 (6)</td>
<td>8</td>
<td>Jobname from current address space (or N/A).</td>
</tr>
<tr>
<td>14 (E)</td>
<td>4</td>
<td>SLIP trap ID.</td>
</tr>
<tr>
<td>18 (12)</td>
<td>2</td>
<td>ASID of current address space.</td>
</tr>
<tr>
<td>20 (14)</td>
<td>8</td>
<td>Job step program name (or U/A or N/A).</td>
</tr>
<tr>
<td>28 (1C)</td>
<td>4</td>
<td>TCB address (or N/A).</td>
</tr>
<tr>
<td>32 (20)</td>
<td>1</td>
<td>System mode indicators, byte 1:</td>
</tr>
<tr>
<td></td>
<td>1...</td>
<td>Supervisor control mode.</td>
</tr>
<tr>
<td>Offset</td>
<td>Size</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>.1.....</td>
<td></td>
<td>Disabled for I/O and external interrupts.</td>
</tr>
<tr>
<td>..1....</td>
<td></td>
<td>Global spin lock held.</td>
</tr>
<tr>
<td>...1...</td>
<td></td>
<td>Global suspend lock held.</td>
</tr>
<tr>
<td>....1..</td>
<td></td>
<td>Local lock held.</td>
</tr>
<tr>
<td>.... 1</td>
<td></td>
<td>Type 1 SVC in control.</td>
</tr>
<tr>
<td>.... ..1.</td>
<td></td>
<td>SRB mode.</td>
</tr>
<tr>
<td>.... ...1</td>
<td></td>
<td>TCB mode.</td>
</tr>
</tbody>
</table>

33 (21) 1 System mode indicators, byte 2:

1... .... Recovery routine in control (always zero if a PER interrupt).
.1... .... Problem program state.
..1... .... Supervisor state.
...1... .... System key.
.... 1... Problem program key.
.... 1.. Any global lock held.
.... ..1. Any lock held.

36 (24) 1 Error byte 1 (or zeros if a PER interrupt):

1... .... Program check interrupt.
.1... .... Restart interrupt.
..1... .... SVC error.
...1... .... Abend; task issued SVC 13.
.... 1... Paging I/O error.
.... 1.. Dynamic address translation error.
.... ..1. Software error caused by machine check.
.... ...1 Abnormal address space termination.

35 (23) 1 Error byte 2 (or zeros if a PER interrupt):

1... .... Memterm.

36 (24) 1 SLIP flags:

1... .... DEBUG record.
.1... .... Registers collected.

37 (25) 2 Data unavailable counter (or zeros if DATA was not specified for the trap).

The following fields apply only to PER interrupts otherwise set to N/A (or N for one-byte fields).

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>39 (27)</td>
<td>8</td>
<td>Load module name in which the interrupt occurred (or U/A or N/A).</td>
</tr>
<tr>
<td>47 (2F)</td>
<td>4</td>
<td>Offset in load module (or U/A or N/A).</td>
</tr>
<tr>
<td>51 (33)</td>
<td>8</td>
<td>Address of the instruction that caused the PER interrupt.</td>
</tr>
<tr>
<td>59 (3D)</td>
<td>6</td>
<td>Instruction content (six bytes of data beginning at the address of the instruction that caused the PER interrupt).</td>
</tr>
<tr>
<td>Offset</td>
<td>Size</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>65 (41)</td>
<td>8</td>
<td>Target instruction address if EXECUTE instruction (or N/A or U/A).</td>
</tr>
<tr>
<td>73 (49)</td>
<td>6</td>
<td>Target instruction content if EXECUTE instruction (six bytes of data beginning at the target instruction address), or (N/A or U/A).</td>
</tr>
<tr>
<td>79 (4F)</td>
<td>4</td>
<td>Beginning range virtual address if SA (storage-alteration) specified on SLIP command (or N/A).</td>
</tr>
<tr>
<td>83 (53)</td>
<td>4</td>
<td>Four bytes of storage starting at beginning range virtual address if SA specified (or N/A or U/A).</td>
</tr>
<tr>
<td>87 (57)</td>
<td>16</td>
<td>Program old PSW.</td>
</tr>
<tr>
<td>103 (67)</td>
<td>4</td>
<td>Program interrupt code (PIC) and instruction length code.</td>
</tr>
<tr>
<td>107 (6B)</td>
<td>1</td>
<td>PER interrupt code:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... ..... Successful-branch event (SB).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... ..... Instruction-fetch event (IF).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... ..... Storage-alteration event (SA).</td>
</tr>
<tr>
<td>108 (6C)</td>
<td>1</td>
<td>PER trap mode:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... ..... Successful-branch monitoring (SB).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... ..... Instruction-fetch monitoring (IF).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... ..... Storage-alteration monitoring (SA).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...x .... Reserved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... 1... PER trap.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..... 1... Recovery specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..... ..1. Message flag.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..... ...1 Message flag.</td>
</tr>
<tr>
<td>109 (6D)</td>
<td>2</td>
<td>Key mask.</td>
</tr>
<tr>
<td>111 (6F)</td>
<td>2</td>
<td>SASID.</td>
</tr>
<tr>
<td>113 (71)</td>
<td>2</td>
<td>Authorization index.</td>
</tr>
<tr>
<td>115 (73)</td>
<td>2</td>
<td>PASID.</td>
</tr>
<tr>
<td>117 (75)</td>
<td>1</td>
<td>PSW ASC mode indicator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• F0: primary addressing mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• F1: access register addressing mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• F2: secondary addressing mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• F3 home addressing mode</td>
</tr>
<tr>
<td>118 (76)</td>
<td>13</td>
<td>Storage Alteration Space Identifier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• For an address space: contains the ASID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• For a data space: contains the owning ASID and the dataspace name</td>
</tr>
<tr>
<td>131 (83)</td>
<td>4</td>
<td>High-half of begin range</td>
</tr>
<tr>
<td>135 (87)</td>
<td>1</td>
<td>Transactional execution DATA filter mismatch count</td>
</tr>
</tbody>
</table>

**SLIP standard + user trace record**

The FID for the SLIP Standard + User trace record is X'04'. The EID is X'4005'.
SLIP user trace record

The FID for the SLIP user trace record is X'04'. The EID is X'4006'.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>2</td>
<td>CPUID</td>
</tr>
<tr>
<td>2 (2)</td>
<td>2</td>
<td>Extension number.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>1</td>
<td>Continuation length.</td>
</tr>
<tr>
<td>5 (5)</td>
<td>2</td>
<td>Length of the user defined data.</td>
</tr>
<tr>
<td>7 (7)</td>
<td>variable</td>
<td>User-defined data (specified through the TRDATA parameter on the SLIP command).</td>
</tr>
</tbody>
</table>

Note:

1. If the SLIP user requests registers to be placed in the SLIP user record, they are the first field in the record.
2. A length field of zero indicates that the user-defined data was not available (for example, the data is paged out).
3. The TRDATA parameter on the SLIP command specifies one or more data ranges. The number of records needed to trace these ranges depends on the size of the ranges specified. The trace contains a standard plus (+) user record from the next range or a user record followed by as many user records and user continuation records as needed to trace the ranges specified. The header for each record contains the CPUID and extension number to help correlate the output (extension numbers apply only to user and user continuation records). When a record is partially filled and the data from the next range will not fit in the remaining space; the partially filled record is written to the trace data set. Another user record is built, the extension number is increased by one, and the continuation length is set to zero. The data length and data is then copied into this record.

When the length of the data from a range is greater than 249 bytes, the excess data is put in user continuation records in the following manner. The data length and first 248 bytes are put in a user record. After writing that record a user continuation record is built. The extension number is increased by one and the continuation length is set to the number of bytes of data to be put in this record. If more than 251 bytes of data are left, 248 bytes are copied into record, and it is written. User continuation records are built until all the data in from that range is traced.

SLIP DEBUG trace record

The FID for the SLIP DEBUG trace record is X'04'. The EID is X'4005'.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>136</td>
<td>Fields are identical to the SLIP standard record.</td>
</tr>
</tbody>
</table>
### Offset | Size | Description
--- | --- | ---
136 (88) | 1 | DEBUG byte; indication of which keyword failed:
  - Decimal 2 indicates COMP keyword
  - Decimal 3 indicates ASID keyword
  - Decimal 4 indicates JOBNAME keyword
  - Decimal 5 indicates JSPGM keyword
  - Decimal 6 indicates PVTMOD keyword
  - Decimal 7 indicates LPAMOD keyword
  - Decimal 8 indicates ADDRESS keyword
  - Decimal 9 indicates MODE keyword
  - Decimal 10 indicates ERRTYP keyword
  - Decimal 13 indicates RANGE keyword
  - Decimal 14 indicates DATA keyword
  - Decimal 20 indicates ASIDSA keyword
  - Decimal 22 indicates REASON CODE keyword
  - Decimal 23 indicates NUCMOD keyword
  - Decimal 24 indicates PSWASC keyword
  - Decimal 26 indicates DSSA keyword

137 (89) | 1 | Reserved.

**Note:** The high-order bit in the SLIP flags (SFLG) field (at offset X'34') is set on to indicate a DEBUG record.

### SRM comprehensive trace record
GTF builds an SRM comprehensive record when system resource manager is invoked and TRACE=SYS or TRACE=SRM are the trace options in effect.

The FID for the SRM trace record is X'04'. The EID is X'4001'.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>8</td>
<td>Jobname</td>
</tr>
<tr>
<td>14 (E)</td>
<td>4</td>
<td>Register 15.</td>
</tr>
<tr>
<td>18 (12)</td>
<td>4</td>
<td>Register 0.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>Register 1.</td>
</tr>
</tbody>
</table>

### SRM minimal trace record
GTF builds an SRM minimal record when system resource manager is invoked and TRACE=SYSM is the GTF option in effect.

The FID for the SRM minimal trace record is X'03'. The EID is X'4001'.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
<tr>
<td>6 (6)</td>
<td>4</td>
<td>Register 15.</td>
</tr>
<tr>
<td>10 (A)</td>
<td>4</td>
<td>Register 0.</td>
</tr>
</tbody>
</table>
SSCH trace record

GTF builds an SSCH record when an SSCH event occurs and TRACE=SYSM, TRACE=SYS, TRACE=SYSP, TRACE=SSCH or TRACE=SSCHP are the GTF options in effect.

The FID for the SSCH trace record is X'00'. The EID is X'5105'.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 (E)</td>
<td>4</td>
<td>Register 1.</td>
</tr>
</tbody>
</table>

SVC comprehensive trace records

GTF builds SVC comprehensive records when an SVC interruption occurs and either the TRACE=SYS or TRACE=SVC GTF option is in effect. All SVC records contain the basic data described below; however, many SVC numbers invoke additional data recording, described following the basic data.

The FID for the SVC comprehensive trace record is X'010'. The EID is X'1000'.
Table 47. Basic SVC comprehensive trace record (continued)

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 (32)</td>
<td>4</td>
<td>Register 1.</td>
</tr>
</tbody>
</table>

GTF builds only a basic comprehensive trace record for the following SVCs:

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXIT</td>
<td>3</td>
<td>TEST</td>
<td>97</td>
</tr>
<tr>
<td>GETMAIN/FREEMAIN</td>
<td>10</td>
<td>SUBMIT</td>
<td>100</td>
</tr>
<tr>
<td>TIME</td>
<td>11</td>
<td>QTIP</td>
<td>101</td>
</tr>
<tr>
<td>SYNCH</td>
<td>12</td>
<td>XLate</td>
<td>103</td>
</tr>
<tr>
<td>MGCR</td>
<td>34</td>
<td>TOPCTL</td>
<td>104</td>
</tr>
<tr>
<td>WTL</td>
<td>36</td>
<td>IMBLIB</td>
<td>105</td>
</tr>
<tr>
<td>TTRouter</td>
<td>38</td>
<td>REQUEST</td>
<td>106</td>
</tr>
<tr>
<td>CIRB</td>
<td>43</td>
<td>MODESET</td>
<td>107</td>
</tr>
<tr>
<td>TTtimer</td>
<td>46</td>
<td>None</td>
<td>109</td>
</tr>
<tr>
<td>TTopen</td>
<td>49</td>
<td>DSTATUS</td>
<td>110</td>
</tr>
<tr>
<td>NOP</td>
<td>50</td>
<td>JECs</td>
<td>111</td>
</tr>
<tr>
<td>OLTEP</td>
<td>59</td>
<td>RELEASE</td>
<td>112</td>
</tr>
<tr>
<td>TSAV</td>
<td>61</td>
<td>SIR</td>
<td>113</td>
</tr>
<tr>
<td>CHATR</td>
<td>72</td>
<td>BLKPAGE</td>
<td>115</td>
</tr>
<tr>
<td>(IFBSTAT)</td>
<td>76</td>
<td>None</td>
<td>116</td>
</tr>
<tr>
<td>STATUS</td>
<td>79</td>
<td>None</td>
<td>117</td>
</tr>
<tr>
<td>SMFWTM</td>
<td>83</td>
<td>DSSPATCH</td>
<td>118</td>
</tr>
<tr>
<td>(IGC084)</td>
<td>84</td>
<td>TESTAUTH</td>
<td>119</td>
</tr>
<tr>
<td>SWAP</td>
<td>85</td>
<td>GETMAIN/FREEMAIN</td>
<td>120</td>
</tr>
<tr>
<td>EMSERV</td>
<td>89</td>
<td>None</td>
<td>121</td>
</tr>
<tr>
<td>VOLSTAT</td>
<td>91</td>
<td>LINK, LOAD, XCTL</td>
<td>122</td>
</tr>
<tr>
<td>TPUT/TGET</td>
<td>93</td>
<td>PURGEDQ</td>
<td>123</td>
</tr>
<tr>
<td>TSO terminal control</td>
<td>94</td>
<td>TPIO</td>
<td>124</td>
</tr>
<tr>
<td>SYSEVENT</td>
<td>95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Basic SVC comprehensive trace record with parameter list information

For detailed information about data gathered for the following SVCs, see z/OS MVS Diagnosis: Reference.
<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINK</td>
<td>6</td>
<td>DISABLE</td>
<td>54</td>
</tr>
<tr>
<td>XCTL</td>
<td>7</td>
<td>EOV</td>
<td>55</td>
</tr>
<tr>
<td>LOAD</td>
<td>8</td>
<td>ENQ/RESERVE</td>
<td>56</td>
</tr>
<tr>
<td>DELETE</td>
<td>9</td>
<td>FREEDBUF</td>
<td>57</td>
</tr>
<tr>
<td>ABEND</td>
<td>13</td>
<td>RELBUF/REQBUF</td>
<td>58</td>
</tr>
<tr>
<td>SPIE</td>
<td>14</td>
<td>STAE</td>
<td>60</td>
</tr>
<tr>
<td>ERREXCP</td>
<td>15</td>
<td>DETACH</td>
<td>62</td>
</tr>
<tr>
<td>PURGE</td>
<td>16</td>
<td>CHKPT</td>
<td>63</td>
</tr>
<tr>
<td>RESTORE</td>
<td>17</td>
<td>RDJFCB</td>
<td>64</td>
</tr>
<tr>
<td>BLDL/FIND</td>
<td>18</td>
<td>BTAMTEST</td>
<td>66</td>
</tr>
<tr>
<td>OPEN</td>
<td>19</td>
<td>BSP</td>
<td>69</td>
</tr>
<tr>
<td>CLOSE</td>
<td>20</td>
<td>GSERV</td>
<td>70</td>
</tr>
<tr>
<td>STOW</td>
<td>21</td>
<td>ASGNBFR/BUFinq/RLSEBF</td>
<td>71</td>
</tr>
<tr>
<td>OPEN TYPE = J</td>
<td>22</td>
<td>SPAR</td>
<td>73</td>
</tr>
<tr>
<td>CLOSE TYPE = T</td>
<td>23</td>
<td>DAR</td>
<td>74</td>
</tr>
<tr>
<td>DEVTYPE</td>
<td>24</td>
<td>DQUEUE</td>
<td>75</td>
</tr>
<tr>
<td>TRKBAL</td>
<td>25</td>
<td>LSPACE</td>
<td>78</td>
</tr>
<tr>
<td>CATLG</td>
<td>26</td>
<td>GJP</td>
<td>80</td>
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<tr>
<td>OBTAIN</td>
<td>27</td>
<td>SETPRT</td>
<td>81</td>
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<tr>
<td>SCRATCH</td>
<td>29</td>
<td>ATLAS</td>
<td>86</td>
</tr>
<tr>
<td>RENAME</td>
<td>30</td>
<td>DOM</td>
<td>87</td>
</tr>
<tr>
<td>FEOB</td>
<td>31</td>
<td>MOD88</td>
<td>88</td>
</tr>
<tr>
<td>ALLOC</td>
<td>32</td>
<td>TCBEXCP</td>
<td>92</td>
</tr>
<tr>
<td>WTO/WROR</td>
<td>35</td>
<td>PROTECT</td>
<td>98</td>
</tr>
<tr>
<td>SEGLD/SEGWT</td>
<td>37</td>
<td>Dynamic allocation</td>
<td>99</td>
</tr>
<tr>
<td>LABEL</td>
<td>39</td>
<td>EXCPVR</td>
<td>114</td>
</tr>
<tr>
<td>EXTRACT</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDENTIFY</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATTACH</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHAP</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVLYBRCH</td>
<td>45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SVC minimal trace record**

GTF builds an SVC minimal record when an SVC interruption occurs and TRACE=SYSM is the GTF option in effect. The FID for the SVC minimal trace record is X'010'. The EID is X'1000'.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0)</td>
<td>4</td>
<td>ASCB.</td>
</tr>
<tr>
<td>4 (4)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
</tbody>
</table>

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TCW trace record
For a complete mapping of the AHLFCXG (FCX/zHPF channel program) data area, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).
Generalized Trace Facility
Chapter 11. The Generic Tracker (GTZ)

Overview

The intended purpose of the generic tracker is to be a migration aid and to help assess exploitation of old and new function. For example, you can assess use of interfaces you intend to make obsolete, and assess exploitation of old and new function in general. For functions that are already obsolete in a new release, you can use the generic tracker to assess their use on previous releases.

The generic tracker is a tracking facility that provides these services:

- A callable tracking service that users can instrument code with:
  - The caller passes an event address and other related information to the service.
  - The service attempts to resolve the event address to a program name and store it with the other information for later analysis.

- A callable query service that extracts previously stored track records and tracking facility information.

- Operator commands to display and maintain tracking facility information and configuration details.

- Support for parmlib members for easy reuse of tracking facility configuration statements.

- More tools to aid in the use of the tracking facility and the information it stores.

The generic tracker replaces the Console Tracking Facility, which was available in releases before z/OS V2R1. The Console Tracking Facility operator commands are available only in releases before z/OS V2R1. Macro CNZTRKR continues to be supported, but the recommendation is to use macro GTZTRACK instead. Any information CNZTRKR collects is stored in the new tracking facility. Do not continue to use service CNZTRKR. When possible, replace existing CNZTRKR invocations with GTZTRACK invocations.

The generic tracker consists of the following parts:

- A system parameter named GTZ - see z/OS MVS Initialization and Tuning Guide.

- Support for GTZPRMxx parmlib members. See z/OS MVS Initialization and Tuning Guide
  - Shipped with GTZPRM00, which includes an exclusion list.

- Operator commands. See z/OS MVS System Commands.
  - SET GTZ – add GTZPRMxx members
  - SETGTZ – control the tracking facility
  - DISPLAY GTZ – report tracking facility information.

- Callable macro services. See z/OS MVS Programming: Assembler Services Reference ABE-HSP.
  - GTZTRACK – track an event
    - Associated mapping macro GTZZTRK
  - GTZQUERY – report tracking facility information
    - Associated mapping macros for Assembler (GTZZQRY) and METAL-C (GTZHQRY)

- REXX callable functions. See “GTZLQRY REXX callable function” on page 326.
  - GTZLQRY – report tracking facility information

- Utility programs
  - GTZPRINT – report tracking facility information
    - Associated mapping macro GTZZPRT
  - GTZCNIDT – create GTZPRMxx from CNIDTRxx
The generic tracker (GTZ)

- Associated mapping macro GTZZCNI
- GTZSMFU2 and GTZSMFU3 – retrieve GTZ data from standard SMF record backend stores and format
  the data in text form

• Samples – see SYS1.SAMPLIB
  - GTZCNIDJ – start utility program GTZCNIDT
  - GTZPRNTJ – start utility program GTZPRINT
  - GTZSHCK – a sample health check to report tracked events
  - GTZSHCKJ – build health check GTZSHCK
  - GTZSMFJ – use of utility programs GTZSMFU2 and GTZSMFU3

The generic tracker is a system address space that starts automatically during the IPL of the system. A
restart is not required or recommended unless it is explicitly requested, for example to apply service. The
source of the IBM supplied started procedure GTZ can be modified to configure the MEMLIMIT, which
determines how much information the tracking facility can store.

Actual tracking (that is, recording track events) is disabled by default. When tracking is disabled,
invocations of GTZTRACK are allowed, but ignored by the system. Use the SETGTZ TRACKING=ON
operator command to enable tracking.

Besides storing track data in the dynamic storage of the GTZ address space, you can also enable the
tracking facility to persist track data using SMF records. For more information, see “Data persistence” on
page 345.

Before you enable tracking and allow the tracking facility to store data and report it back to the users,
consider protecting the DISPLAY GTZ and SETGTZ operator commands. As mentioned in z/OS MVS System
Commands, these GTZ commands can be protected by RACF resource profiles for the OPERCMDS class.
The security administrator can, for example, take the following steps to give a user profile access to the
MVS.SETGTZ.GTZ resource:

1. Ensure that the OPERCMDS class is active:

   SETROPTS CLASSACT(OPERCMDS) RACLIST(OPERCMDS)

2. Create the MVS.SETGTZ.GTZ resource profile and require explicit access to be given:

   RDEFINE OPERCMDS MVS.SETGTZ.GTZ UACC(NONE)

3. Grant individual access to the resource:

   PERMIT MVS.SETGTZ.GTZ CLASS(OPERCMDS) ID(user) ACCESS(UPDATE)

4. Refresh the OPERCMDS class to activate the changes:

   SETROPTS RACLIST(OPERCMDS) REFRESH

All SETGTZ operator commands can be used in GTZPRMxx parmlib members. For example, you can put a
TRACKING=ON statement into a GTZPRMxx parmlib member.

System parameter GTZ can be set to one or more suffixes, which identify the GTZPRMxx parmlib
members that the tracking facility must process at startup. See the description of system parameter GTZ
in z/OS MVS Initialization and Tuning Reference. It contains requirements and details on how to grant the
tracking facility permission to access the parmlib members at start-up. If you do not specify system
parameter GTZ, or specify PARM='GTZPRM=*NONE' in procedure GTZ, the tracking facility starts without
reading any parmlib members initially.

You can add more GTZPRMxx parmlib members later with the operator command SET GTZ.

You can use the SETGTZ CLEAR operator command to remove configuration data previously added by
using GTZPRMxx members and to remove previously recorded track data.

To prevent certain known track events from recording any data, you can add EXCLUDE statements. The
tracking facility ignores any future track data that matches such EXCLUDE filters and it removes any
matching previously recorded track data. Typically EXCLUDE statements are provided in GTZPRMxx parmlib members, and can be specified by using the SETGTZ EXCLUDE operator command too.

A standard list of EXCLUDE statements for known track events is shipped in parmlib member GTZPRM00. You can download it from z/OS downloads (www.ibm.com/systems/z/os/zos/downloads). It is recommended that you use the GTZPRMxx parmlib member as is and enable it by default by adding the 00 suffix to the system parameter GTZ in IEASYSxx using GTZ=(00,your_suffixes). Keeping GTZPRM00 separate allows for easier updates when z/OS releases a new GTZPRM00 version. More GTZPRMxx parmlib members would then have any additional EXCLUDEs and, for example, a TRACKING=ON, if wanted.

If you used the Console Tracking Facility and its CNIDTRxx parmlib members for exclusion lists before, you can use the GTZCNIDT utility program to create GTZPRMxx parmlib members from existing CNIDTRxx parmlib members. The sample JCL GTZCNIDJ explains how to start GTZCNIDT.

A unique tracked event is identified by the following fields, which are referenced by the EXCLUDE filters. The tracking facility increments an associated occurrence count if a GTZTRACK call results in an identical set of unique fields:

- The program name and program offset as resolved from the passed in event address.
- The name of the owner and source of the track event.
- The event description text.
- The (binary) event data.
- Job names and ASIDs associated with the track event.
- The authorization state that is associated with the track event.

For events that are difficult to track, where the program name cannot be determined by the system from the passed in event address, you can define DEBUG filters using the SETGTZ DEBUG operator command or in a GTZPRMxx parmlib member. The DEBUG statement allows, for example, to trigger a non-percolating ABEND, code E77, with custom reason codes, that you can define SLIP traps for to collect dumps.

You can use the DISPLAY GTZ operator command to display:

- General status and statistics for the tracking facility – DISPLAY GTZ[,STATUS].
- All or a subset of the track data that is currently stored in the tracking facility – DISPLAY GTZ,TRACKDATA[|filters|].
- All the EXCLUDE statements – DISPLAY GTZ,EXCLUDE.
- All the DEBUG statements – DISPLAY GTZ,DEBUG.

Using the utility program GTZPRINT, you can collect information in a data set instead of reading it on the console or in the system LOG. The sample JCL GTZPRNTJ explains how to use GTZPRINT.

Here are some typical scenarios:

- Use GTZPRINT to preserve tracking information for later analysis. This helps when you must submit the information to IBM, or an independent software vendor (ISV) product to have them analyze the output or diagnose problems.
- Use DISPLAY GTZ for quick interactive access. Certain command line and output length limits might apply.
- Use callable macro service GTZQUERY when you want to access tracking facility information from a program. For example, for a custom reporting tool or for a health check for the IBM Health Checker for z/OS. See the sample health check GTZSHCK shipped in SAMPLIB. This can be built with the sample JCL GTZSHCKJ. While local health checks run authorized, other uses of GTZQUERY require the calling user ID to have access to the GTZ.sysname.QUERY RACF profile that is used similar to how the GTZ operator commands are protected.
The generic tracker (GTZ)

GTZLQRY REXX callable function

REXX callable function GTZLQRY allows REXX programs access to data that is provided by the existing macro service GTZQUERY.

The GTZLQRY function uses corresponding request types that are provided by REXX (input) variable GTZLQRY_REQUEST to support all four published request types of the GTZQUERY macro service:

- GTZLQRY_REQUEST = "STATUS" "GTZLQRY "STATUS" interface" on page 326
- GTZLQRY_REQUEST = "TRACKDATA" "GTZLQRY "TRACKDATA" interface" on page 330
- GTZLQRY_REQUEST = "EXCLUDE" "GTZLQRY "EXCLUDE" interface" on page 337
- GTZLQRY_REQUEST = "DEBUG" "GTZLQRY "DEBUG" interface" on page 341

The requested data is provided as REXX STEM output variables.

Like the GTZQUERY macro service, the TRACKDATA request supports additional filters that allow you to limit the resulting data to only a subset of the potentially very many available track data entries.

For TRACKDATA entries, EXCLUDE statements, and DEBUG statements, which are the three request types that return lists of items, GTZLQRY supports additional OPTION input parameters to further limit the result sets.

GTZLQRY "STATUS" interface

Accepts input using a single variable. The following required statement requests to return status information:

```
GTZLQRY_REQUEST="STATUS"
```

GTZLQRY with REQUEST="STATUS" returns output with STEM variable GTZQUAAS. Diagnostic information such as the return code is provided with separate variables.

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GtzQuaaS.TrackEnabled</td>
<td>1, if tracking is currently enabled, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.Full</td>
<td>1, if the tracking facility is full, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.ExcludeNoPrm</td>
<td>1, if some EXCLUDE statements did not originate from GTZPRMxx, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.DebugNoPrm</td>
<td>1, if some DEBUG statements did not originate from GTZPRMxx, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.GtzPrmFull</td>
<td>1, if some GTZPRMxx could not be recorded centrally, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.ClearedALL</td>
<td>1, if a CLEAR=ALL has been used at some time for this tracker instance, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.ClearedTRACKDATA</td>
<td>1, if a CLEAR=TRACKDATA or a CLEAR=ALL removed trackdata at some time for this tracker instance, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.ClearedEXCLUDE</td>
<td>1, if a CLEAR=EXCLUDE or a CLEAR=ALL removed EXCLUDE statements at some time for this tracker instance, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaS.ClearedDEBUG</td>
<td>1, if a CLEAR=DEBUG or a CLEAR=ALL removed DEBUG statements at some time for this tracker instance, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>Output variable name</td>
<td>Variable description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>GtzQuaaS.PersistSMF</td>
<td>ON ('1'b), if data persistence by SMF records is enabled.</td>
</tr>
<tr>
<td>GtzQuaaS.EnabledCount</td>
<td>Number of times the tracking facility moved from disabled to enabled. An unsigned number in the single-word (32-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.TrackDataEntriesAvailable</td>
<td>Total number of unique tracked instances currently known to the tracking facility. An unsigned number in the double-word (64-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.ExcludeEntriesAvailable</td>
<td>Total number of exclusion statements currently known to the tracking facility. An unsigned number in the double-word (64-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.DebugEntriesAvailable</td>
<td>Total number of DEBUG statements currently known to the tracking facility. An unsigned number in the double-word (64-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.TrackDataEntriesEncountered</td>
<td>Total number of non-unique tracked instances currently known to the tracking facility. An unsigned number in the double-word (64-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.ExcludeRejectCount</td>
<td>Total number of GTZTRACK requests rejected due to a matching EXCLUDE statement. This counter is reset when the EXCLUDE statements are cleared. An unsigned number in the double-word (64-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.DebugActionCount</td>
<td>Total number of GTZTRACK requests which triggered a DEBUG action as specified by a matching DEBUG statement (with its LIMIT not exceeded yet). This counter is reset when the DEBUG statements are cleared. An unsigned number in the double-word (64-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.GtzPrmSuffixes.0</td>
<td>Number of GTZPRMxx members currently known to the tracking facility. An unsigned number in the half-word (16-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.GtzPrmSuffixes</td>
<td>The i=1..GtzQuaaS.GtzPrmSuffixes.0 GTZPRMxx 2-character suffixes currently known to the tracking facility.</td>
</tr>
<tr>
<td>GtzQuaaS.GtzPrmIplSuffixes.0</td>
<td>Number of GTZPRMxx members specified at IPL time from system parameter GTZ. The currently known GTZPRMxx suffix list might be different than this IPL-time list, if suffixes have been added or cleared in between. An unsigned number in the half-word (16-bit) range.</td>
</tr>
<tr>
<td>GtzQuaaS.GtzPrmIplSuffixes</td>
<td>The i=1..GtzQuaaS.GtzPrmIplSuffixes.0 GTZPRMxx 2-character suffixes specified at IPL time.</td>
</tr>
<tr>
<td>Output variable name</td>
<td>Variable description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>GtzQuaaS.MemAvailPercent</td>
<td>A number between 0 and 100, indicating the percentage of how much of the tracking facility's total dynamic memory is still available to store data for tracking entries, EXCLUDE statements, etc. When GtzQuaaS.Full is &quot;1&quot; then GtzQuaaS.MemAvailPercent is zero.</td>
</tr>
<tr>
<td>GtzQuaaS.SystemName</td>
<td>The name of the system the (unique per system) tracking facility is running on. An up to 8 character long string.</td>
</tr>
<tr>
<td>GtzQuaaS.EnabledTOD</td>
<td>The time stamp when tracking was last enabled (if GtzQuaaS.TrackEnabled=&quot;1&quot;), or when tracking was last disabled (if GtzQuaaSTrackEnabled = &quot;0&quot;), where for the latter this might be the time of when the facility started, if tracking has not been enabled since. See also GtzQuaaS.EnabledCount. This value is provided in STCK format. See, for example, BLSUXTOD to format this as human readable time stamp.</td>
</tr>
<tr>
<td>GTZLQRY_RC</td>
<td>Return code. Same as the REXX supplied output variable RESULT which REXX sets if the function result is not explicitly captured from, for example, RC = GTZLQRY(). This is a decimal text string so that, for example, RC=12 is reported as &quot;12&quot;, not &quot;0C&quot;. The possible return codes are as follows:</td>
</tr>
<tr>
<td>0</td>
<td>Meaning: The GTZLQRY request completed successfully.</td>
</tr>
</tbody>
</table>
| 4 | Meaning: The GTZLQRY request completed successfully, but issued a warning.  
Action: Refer to the action under the individual reason code returned in GTZLQRY_RSN. |
| 8 | Meaning: The GTZLQRY request encountered an error and did not complete successfully.  
Action: Refer to the action under the individual reason code returned in GTZLQRY_RSN. |
| 12 (X'C') | Meaning: The GTZLQRY request encountered a severe error, typically related to the environment in which GTZLQRY was invoked, and did not complete successfully.  
Action: Refer to the action under the individual reason code returned in GTZLQRY_RSN. |
| 16 (X'10') | Meaning: The GTZLQRY request encountered an internal, component error and did not complete successfully.  
Action: Contact IBM Service. |
Table 48. REQUEST="STATUS" output variable names and descriptions (continued)

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTZLQRY_RSN</td>
<td>(See the description following this table.)</td>
</tr>
<tr>
<td>GTZLQRY_SYSTEMDIAG</td>
<td>Additional diagnostic information for some nonzero return codes. An up to 100-character string.</td>
</tr>
</tbody>
</table>

Description for output variable GTZLQRY_RSN: Reason code. For nonzero return codes. This is a hexadecimal text string so that, for example, RSN=X'00000841' is reported as "00000841", not "2113". The reason codes are as follows:

"rrrr0401"
  **Meaning:** The underlying GTZQUERY service reported a return code of 4 and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrrr0801"
  **Meaning:** The underlying GTZQUERY service reported a return code of 8 and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrLL0802"
  **Meaning:** An unrecognized GTZLQRY_REQUEST value has been found.
  **Action:** Ensure that you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"LLLL0803"
  **Meaning:** An unrecognized GTZLQRY_REQUEST value has been found.
  **Action:** Ensure that you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "LLLL" is not zero, then it is the last two bytes of the length as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"rrrr0C01"
  **Meaning:** The underlying GTZQUERY service reported a return code of 12 (X'C') and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"xxxx0C02"
  **Meaning:** GTZLQRY was invoked with a NUL REXX ENVBLOCK address in register 0 on entry.
  **Action:** Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

"xxxx0C03"
  **Meaning:** GTZLQRY was invoked with an unrecognized ENVBLOCK, pointed to by register 0 on entry.
  **Action:** Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

In addition, GTZLQRY can issue an ABEND with system completion code E77 with the following possible ABEND reason codes:
### Table 49. REQUEST="STATUS" ABEND reason codes and descriptions

<table>
<thead>
<tr>
<th>ABEND reason code</th>
<th>Reason code description</th>
</tr>
</thead>
</table>
| X'rrrrOC27'       | **Meaning:** GTZLQRY could not write any output REXX variables.  
                    **Action:** Ensure that GTZLQRY is called within a valid REXX environment, which includes GTZLQRY being called with a valid ENVBLOCK in register 0 on entry. A nonzero "rrrr" value provides additional diagnostic information. Check the GTZLQRY_RSN variable description for possibly related values. |
| X'xxxxOC29'       | **Meaning:** An error occurred while accessing the internal GTZLQRY parameter list.  
                    **Action:** Ensure that GTZLQRY is called within a valid REXX environment, ensuring standard REXX linkage conventions. |
| X'xxxx10xx'       | **Meaning:** An unexpected error occurred.  
                    **Action:** Contact IBM Service. |

### GTZLQRY "TRACKDATA" interface

Accepts input using multiple variables. See also the description of corresponding parameters on the GTZQUERY macro service for more details on single parameters. The following required statement requests to return track data entries:

```
GTZLQRY_REQUEST="TRACKDATA"
```

The following optional statement requests to return only up to maxresults number of trackdata entries values:

```
GTZLQRY_OPTION.MAXRESULTS = { "ALL" | "maxresults" }
```

Enter special value "ALL" or an unsigned number in the double-word (64-bit) range.

Optionally enter one or more filter variables, all starting with GTZLQRY_FILTER. Note that all filter values, except for SOURCETYPE and PROGRAMTYPE, also accept values including wild card characters. For text values, an asterisk ('*') matches zero or more characters of any type, and a question mark ('?') matches a single character of any type. For numeric or binary values, such as EVENTDATA or EVENTASID, only a single asterisk ('*') is supported, as a way to explicitly specify the otherwise implied default value of "match all or match any value".

The following optional statement requests to return only such tracked instances that have a matching OWNER value.

```
GTZLQRY_FILTER.OWNER = "owner"
```

The value is a 1-16 character string.

The following optional statement identifies what type of tracked instance source values to match.

```
GTZLQRY_FILTER.SOURCETYPE = { "ALL" | "NOPATH" | "PATH" }
```

The following optional statement requests to return only those tracked instances that have a matching SOURCE value.

```
GTZLQRY_FILTER SOURCE = "source"
```
The value is a 1-8 character string that also requires the specification of GTZLQRY_FILTER.SOURCETYPE = "NOPATH".

The following optional statement requests to return only that tracked instances that have a matching SOURCEPATH value.

```plaintext
GTZLQRY_FILTER.SOURCEPATH = "sourcepath"
```

The value is a 1-1024 character string that also requires the specification of GTZLQRY_FILTER.SOURCETYPE = "PATH".

The following optional statement requests to return only those tracked instances that have a matching EVENTDESC value.

```plaintext
GTZLQRY_FILTER.EVENTDESC = "eventdesc"
```

The value is a 0-64 character string.

The following optional statement requests to return only those tracked instances that have a matching EVENTDATA value.

```plaintext
GTZLQRY_FILTER.EVENTDATA = {"eventdata" | "*"}
```

The value, if not "*", is a 16 byte string with a binary representation that is used for comparisons.

The following optional statement requests to return only those tracked instances that have a matching EVENTASID value.

```plaintext
GTZLQRY_FILTER.EVENTASID = {"eventASID" | "*"}
```

The value is a number between 0 and 65535 ("FFFF"X).

**Tip:** REXX function X2D can help specify the number in hex format in the REXX source.

The following optional statement requests to return only those tracked instances that were associated with a matching job name of the address space identified by the EVENTASID value.

```plaintext
GTZLQRY_FILTER.EVENTJOB = "eventjob"
```

The value is a 1-8 character string.

The following optional statement identifies the type of tracked instance program values to match.

```plaintext
GTZLQRY_FILTER.PROGRAMTYPE = { "ALL" | "NOPATH" | "PATH" }
```

The following optional statement requests to return only those tracked instances that have a matching PROGRAM value.

```plaintext
GTZLQRY_FILTER.PROGRAM = "program"
```

The value is a 1-8 character string that also requires the specification of GTZLQRY_FILTER.PROGRAMTYPE = "NOPATH".

The following optional statement requests to return only those tracked instances that have a matching PROGRAMPATH values.

```plaintext
GTZLQRY_FILTER.PROGRAMPATH = "progampath"
```

The value is a 1-1024 character string that also requires the specification of GTZLQRY_FILTER.PROGRAMTYPE = "PATH".

The following optional statement requests to return only those tracked instances that have a matching PROGRAMOFFSET value.

```plaintext
GTZLQRY_FILTER.PROGRAMOFFSET = { "programoffset" | "*"}
```
The value is an unsigned number in the double-word (64-bit) range.

**Tip:** REXX function X2D can help specify the number in hex format in the REXX source.

The following optional statement requests to return only those tracked instances that have a matching HOMEASID value.

```
GTZLQRY_FILTER.HOMEASID = { "homeASID" | "*"}
```

The value is a number between 0 and 65535 (FFFF'X).

**Tip:** REXX function X2D can help specify the number in hex format in the REXX source.

The following optional statement requests to return only those tracked instances that have a matching HOMEJOB value.

```
GTZLQRY_FILTER.HOMEJOB = "homejob"
```

The value is a 1-8 character string.

Specifying GTZLQRY with REQUEST="TRACKDATA" returns its output with the variables that are described in the following table.

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTZQUAAT.TrackDataEntriesAvailable</td>
<td>Number of TRACKDATA entries which are known to the tracking facility and which match the (optional) filter.</td>
</tr>
<tr>
<td>GTZQUAAT.TrackDataEntriesProvided</td>
<td>Number (n) of TRACKDATA entries provided, if n &gt; 0, from variables GTZQUAAAT.i with i=1..n. This number n is determined as MIN(GTZQUAAT.TrackDataEntriesAvailable, GTZLQRY_OPTION.MAXRESULTS).</td>
</tr>
<tr>
<td>GtzQuaaT.i.isSourcePath</td>
<td>1, if GtzQuaaT.i.Source represents a SOURCE, otherwise &quot;0&quot;, to indicate a SOURCEPATH</td>
</tr>
<tr>
<td>GtzQuaaT.i.isProgramPath</td>
<td>1, if GtzQuaaT.Program represents a PROGRAM, otherwise &quot;0&quot;, to indicate a PROGRAMPATH</td>
</tr>
<tr>
<td>GtzQuaaT.i.isAuthorized</td>
<td>1, if the tracked event ran authorized, otherwise &quot;0&quot;</td>
</tr>
<tr>
<td>GtzQuaaT.i.FirstTOD</td>
<td>The timestamp when the first instance of this (unique) tracked instance was recorded (all others just had the occurrence count Incremented). This value is provided in STCK form. See, for example, for BLSUXTOD to format this as human readable time stamp.</td>
</tr>
<tr>
<td>GtzQuaaT.i.Count</td>
<td>How often this (unique) tracked instance was recorded.</td>
</tr>
<tr>
<td>GtzQuaaT.i.Owner</td>
<td>OWNER value, an up to 16-character string</td>
</tr>
<tr>
<td>GtzQuaaT.i.Source</td>
<td>SOURCE or SOURCEPATH value, depending on GtzQuaaT.i.isSourcePath, an up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>GtzQuaaT.i.EventDesc</td>
<td>EVENTDESC value, an up to 64-character string</td>
</tr>
<tr>
<td>Output variable name</td>
<td>Variable description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>GtzQuaaT.i.EventData</td>
<td>EVENTDATA value, a 16-byte binary string</td>
</tr>
<tr>
<td>GtzQuaaT.i.EventJob</td>
<td>The derived EVENTJOB-name value, an up to 8-character string</td>
</tr>
<tr>
<td>GtzQuaaT.i.HomeJob</td>
<td>The derived HOMEJOB-name value, an up to 8-character string</td>
</tr>
<tr>
<td>GtzQuaaT.i.Program</td>
<td>The derived PROGRAM or PROGRAMPATH value, depending on GtzQuaaT.i.isProgramPath, an up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>GtzQuaaT.i.ProgramOffset</td>
<td>The derived PROGRAMOFFSET value, a decimal unsigned number in the double-word (64-bit) range</td>
</tr>
<tr>
<td>GtzQuaaT.i.EventASID</td>
<td>EVENTASID value, a decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>GtzQuaaT.i.HomeASID</td>
<td>HOMEASID value, a decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>GTZLQRY_RC</td>
<td>Return code. Same as the REXX supplied output variable RESULT which REXX sets if the function result is not explicitly captured from, for example, RC = GTZLQRY(). This is a decimal text string so that, for example, RC=12 is reported as &quot;12&quot;, not &quot;0C&quot;. The possible return codes are as follows:</td>
</tr>
</tbody>
</table>
|                      | **0**  
|                      | **Meaning:** The GTZLQRY request completed successfully. |
|                      | **4**  
|                      | **Meaning:** The GTZLQRY request completed successfully, but issued a warning.  
|                      | **Action:** Refer to the action under the individual reason code returned in GTZLQRY_RSN. |
|                      | **8**  
|                      | **Meaning:** The GTZLQRY request encountered an error and did not complete successfully.  
|                      | **Action:** Refer to the action under the individual reason code returned in GTZLQRY_RSN. |
|                      | **12 (X'C')**  
|                      | **Meaning:** The GTZLQRY request encountered a severe error, typically related to the environment in which GTZLQRY was invoked, and did not complete successfully.  
|                      | **Action:** Refer to the action under the individual reason code returned in GTZLQRY_RSN. |
|                      | **16 (X'10')**  
|                      | **Meaning:** The GTZLQRY request encountered an internal, component error and did not complete successfully.  
|                      | **Action:** Contact IBM Service. |
Table 50. REQUEST="TRACKDATA" output variable names and descriptions (continued)

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTZLQRY_RSN</td>
<td>(See the description following this table.)</td>
</tr>
<tr>
<td>GTZLQRY_SYSTEMDIAG</td>
<td>Additional diagnostic information for some nonzero return codes. An up to 100-character string.</td>
</tr>
</tbody>
</table>

Description for output variable GTZLQRY_RSN: Reason code. For nonzero return codes. This is a hexadecimal text string so that, for example, RSN=X'00000841' is reported as "00000841", not "2113". The reason codes are as follows:

"rrrr0401"
  **Meaning:** The underlying GTZQUERY service reported a return code of 4 and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrrr0801"
  **Meaning:** The underlying GTZQUERY service reported a return code of 8 and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrLL0802"
  **Meaning:** An unrecognized GTZLQRY_REQUEST value has been found.
  **Action:** Ensure you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"LLLL0803"
  **Meaning:** An unrecognized GTZLQRY_REQUEST value has been found.
  **Action:** Ensure you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "LLLL" is not zero then it is the last two bytes of the length as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"rrLL0804"
  **Meaning:** An unrecognized GTZLQRY_OPTION.MAXRESULTS value has been found.
  **Action:** Ensure you only specify valid GTZLQRY_OPTION.MAXRESULTS values ("ALL" or a valid number). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_OPTION.MAXRESULTS input variable.

"xxxx0805"
  **Meaning:** No SOURCETYPE or an invalid SOURCETYPE has been specified from input variable GTZLQRY_FILTER.SOURCETYPE.
  **Action:** When GTZLQRY_FILTER.SOURCE is specified on input, ensure that you also specify a matching GTZLQRY_FILTER.SOURCETYPE of "NOPATH".

"xxxx0806"
  **Meaning:** No PROGRAMTYPE or an invalid PROGRAMTYPE has been specified from input variable GTZLQRY_FILTER.PROGRAMTYPE.
  **Action:** When GTZLQRY_FILTER.PROGRAM is specified on input, ensure that you also specify a matching GTZLQRY_FILTER.PROGRAMTYPE of "NOPATH".

"xxxx0807"
  **Meaning:** No SOURCETYPE or an invalid SOURCETYPE has been specified from input variable GTZLQRY_FILTER.SOURCETYPE.
  **Action:** When GTZLQRY_FILTER.SOURCEPATH is specified on input, ensure that you also specify a matching GTZLQRY_FILTER.SOURCETYPE of "PATH".

"xxxx0808"
  **Meaning:** No PROGRAMTYPE or an invalid PROGRAMTYPE has been specified from input variable GTZLQRY_FILTER.PROGRAMTYPE.
**Action:** When GTZLQRY_FILTER.PROGRAMPATH is specified on input, ensure that you also specify a matching GTZLQRY_FILTER.PROGRAMTYPE of "PATH".

"rrLL0809"

**Meaning:** An unrecognized GTZLQRY_FILTER.SOURCETYPE value has been found.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.SOURCETYPE values ("ALL", "PATH", or "NOPATH"). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.SOURCETYPE input variable.

"rrLL080A"

**Meaning:** An unrecognized GTZLQRY_FILTER.PROGRAMTYPE value has been found.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.PROGRAMTYPE values ("ALL", "PATH", or "NOPATH"). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.PROGRAMTYPE input variable.

"rrLL080B"

**Meaning:** When attempting to retrieve the GTZLQRY_FILTER.SOURCE input value an error was encountered.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.SOURCE values (up to eight characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.SOURCE input variable.

"rrLL080C"

**Meaning:** When attempting to retrieve the GTZLQRY_FILTER.PROGRAM input value an error was encountered.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.PROGRAM values (up to eight characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.PROGRAM input variable.

"rrLL080D"

**Meaning:** When attempting to retrieve the GTZLQRY_FILTER.SOURCEPATH input value an error was encountered.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.SOURCEPATH values (up to 1024 characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.SOURCEPATH input variable.

"rrLL080E"

**Meaning:** When attempting to retrieve the GTZLQRY_FILTER.PROGRAMPATH input value an error was encountered.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.PROGRAMPATH values (up to 1024 characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.PROGRAMPATH input variable.

"rrLL080F"

**Meaning:** When attempting to retrieve the GTZLQRY_FILTER.EVENTDESC input value an error was encountered.

**Action:** Ensure you only specify valid GTZLQRY_FILTER.EVENTDESC values (up to 64 characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.EVENTDESC input variable.

"rrLL0810"

**Meaning:** When attempting to retrieve the GTZLQRY_FILTER.EVENTDATA input value an error was encountered.
The generic tracker (GTZ)

Action: Ensure you only specify valid GTZLQRY_FILTER.EVENTDATA values (16 bytes long, or '*'). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.EVENTDATA input variable.

"rrLL0811"
Meaning: When attempting to retrieve the GTZLQRY_FILTER.EVENTJOB input value an error was encountered.
Action: Ensure you only specify valid GTZLQRY_FILTER.EVENTJOB values (up to eight characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.EVENTJOB input variable.

"rrLL0812"
Meaning: When attempting to retrieve the GTZLQRY_FILTER.HOMEJOB input value an error was encountered.
Action: Ensure you only specify valid GTZLQRY_FILTER.HOMEJOB values (up to eight characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.HOMEJOB input variable.

"rrLL0813"
Meaning: When attempting to retrieve the GTZLQRY_FILTER.OWNER input value an error was encountered.
Action: Ensure you only specify valid GTZLQRY_FILTER.OWNER values (up to 16 characters long). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.OWNER input variable.

"rrLL0814"
Meaning: An unrecognized GTZLQRY_FILTER.PROGRAMOFFSET value has been found.
Action: Ensure you only specify valid GTZLQRY_FILTER.PROGRAMOFFSET values (double-word number). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.PROGRAMOFFSET input variable.

"rrLL0815"
Meaning: An unrecognized GTZLQRY_FILTER.EVENTASID value has been found.
Action: Ensure you only specify valid GTZLQRY_FILTER.EVENTASID values (half-word number). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.EVENTASID input variable.

"rrLL0816"
Meaning: An unrecognized GTZLQRY_FILTER.HOMEASID value has been found.
Action: Ensure you only specify valid GTZLQRY_FILTER.HOMEASID values (half-word number). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_FILTER.HOMEASID input variable.

"rrrr0C01"
Meaning: The underlying GTZQUERY service reported a return code of 12 (X'C') and reason code "rrrr".
Action: Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"xxxx0C02"
Meaning: GTZLQRY was invoked with a NUL REXX ENVBLOCK address in register 0 on entry.
Action: Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

"xxxx0C03"
Meaning: GTZLQRY was invoked with an unrecognized ENVBLOCK, pointed to by register 0 on entry.
Action: Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.
In addition, GTZLQRY can issue an ABEND with system completion code E77 with the following possible ABEND reason codes:

<table>
<thead>
<tr>
<th>ABEND reason code</th>
<th>Reason code description</th>
</tr>
</thead>
</table>
| X'rrrr0C27'       | **Meaning:** GTZLQRY could not write any output REXX variables.  
**Action:** Ensure that GTZLQRY is called within a valid REXX environment, which includes GTZLQRY being called with a valid ENVBLOCK in register 0 on entry. A nonzero "rrrr" value provides additional diagnostic information. Check the GTZLQRY_RSN variable description for possibly related values. |
| X'xxxx0C29'       | **Meaning:** An error occurred while accessing the internal GTZLQRY parameter list.  
**Action:** Ensure that GTZLQRY is called within a valid REXX environment, ensuring standard REXX linkage conventions. |
| X'xxxx10xx'       | **Meaning:** An unexpected error occurred.  
**Action:** Contact IBM Service. |

**GTZLQRY "EXCLUDE" interface**

Accepts input using multiple variables. See also the description of corresponding parameters on the GTZQUERY macro service for more details on single parameters. The following required statement requests to return EXCLUDE statements:

```
GTZLQRY_REQUEST="EXCLUDE"
```

The following optional statement requests to return only up to maxresults number of EXCLUDE statements:

```
GTZLQRY_OPTION.MAXRESULTS = { "ALL" | "maxresults" }
```

Enter special value "ALL" or an unsigned number in the double-word (64-bit) range.

**Note:** This is provided mainly for consistency among the list requests such as REQUEST="TRACKDATA". Unlike REQUEST="TRACKDATA", which potentially can return tens of thousands or more entries, REQUEST="EXCLUDE" is expected to return at most a few dozen entries in a typical configuration.

Specifying GTZLQRY with REQUEST="EXCLUDE" returns its output with the variables described in the following table.

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTZQUAAE.ExcludeEntriesAvailable</td>
<td>Number of EXCLUDE statements known to the tracking facility.</td>
</tr>
<tr>
<td>GTZQUAAE.ExcludeEntriesProvided</td>
<td>Number (n) of EXCLUDE statements provided, if n &gt; 0, from variables GTZQUAAE.i with i=1..n. This number n is determined as MIN(GTZQUAAE.ExcludeEntriesAvailable, GTZLQRY_OPTION.MAXRESULTS).</td>
</tr>
</tbody>
</table>
Table 52. REQUEST="EXCLUDE" output variable names and descriptions (continued)

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GtzQuaaE.i.OriginType</td>
<td>Indicates where this EXCLUDE originated from: PARMLIB - A GTZPRMxx parmlib member, COMMAND - A SETGTZ EXCLUDE command, PROGRAM - A program interface</td>
</tr>
<tr>
<td>GtzQuaaE.i.OriginSuffix</td>
<td>If this EXCLUDE was specified from a GTZPRMxx parmlib member, as indicated by a GtzQuaaE.i.OriginType value of &quot;PARMLIB&quot;, this field here contains the 2-character xx suffix.</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.</td>
<td>A set of variables indicating what TRACKDATA entries this EXCLUDE statement is supposed to filter out. For all but GtzQuaaE.i.Filter.SourceType and GtzQuaaE.i.Filter.ProgramType this might be a single wildcard character &quot;+&quot;, when not filtering for a specific value, indicating that all values for the respective field match this filter.</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.SourceType</td>
<td>Indicates what type of source this filter is defined to match: SOURCE, &quot;SOURCEPATH&quot;, or &quot;ALL&quot;</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.ProgramType</td>
<td>Indicates what type of program this filter is defined to match: PROGRAM, &quot;PROGRAMPATH&quot;, or &quot;ALL&quot;</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.Owner</td>
<td>OWNER filter value. An up to 16-character string.</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.Source</td>
<td>SOURCE or SOURCEPATH filter value, depending on the value of GtzQuaaE.i.Filter.SourceType: ForSourceType=&quot;SOURCE&quot; it is a source filter, for SourceType=&quot;SOURCEPATH&quot; it is a source path filter, and for SourceType=&quot;ALL&quot; it is always &quot;***&quot; (match all). An up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.EventData</td>
<td>Event data filter value. A 16-byte binary string or &quot;***&quot;</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.EventJob</td>
<td>Event job filter value. An up to 8-character string.</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.HomeJob</td>
<td>Home job filter value. An up to 8-character string.</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.Program</td>
<td>PROGRAM or PROGRAMPATH filter value, depending on the value of GtzQuaaE.i.Filter.ProgramType: For ProgramType=&quot;PROGRAM&quot; it is a source filter, for ProgramType=&quot;PROGRAMPATH&quot; it is a program path filter, and for ProgramType=&quot;ALL&quot; it is always &quot;***&quot; (match all). An up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.ProgramOffset</td>
<td>PROGRAMOFFSET filter value. A decimal unsigned number in the double-word (64-bit) range</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.EventASID</td>
<td>Event ASID filter value. A decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>Output variable name</td>
<td>Variable description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>GtzQuaaE.i.Filter.HomeASID</td>
<td>Home ASID filter value. A decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>GTZLQRY_RC</td>
<td>Return code. Same as the REXX supplied output variable RESULT which REXX sets if the function result is not explicitly captured from, for example, RC = GTZLQRY(). This is a decimal text string so that, for example, RC=12 is reported as &quot;12&quot;, not &quot;0C&quot;. The possible return codes are as follows:</td>
</tr>
<tr>
<td>0</td>
<td><strong>Meaning:</strong> The GTZLQRY request completed successfully.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Meaning:</strong> The GTZLQRY request completed successfully, but issued a warning. <strong>Action:</strong> Refer to the action under the individual reason code returned in GTZLQRY_RSN.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Meaning:</strong> The GTZLQRY request encountered an error and did not complete successfully. <strong>Action:</strong> Refer to the action under the individual reason code returned in GTZLQRY_RSN.</td>
</tr>
<tr>
<td>12 (X'C')</td>
<td><strong>Meaning:</strong> The GTZLQRY request encountered a severe error, typically related to the environment in which GTZLQRY was invoked, and did not complete successfully. <strong>Action:</strong> Refer to the action under the individual reason code returned in GTZLQRY_RSN.</td>
</tr>
<tr>
<td>16 (X'10')</td>
<td><strong>Meaning:</strong> The GTZLQRY request encountered an internal, component error and did not complete successfully. <strong>Action:</strong> Contact IBM Service.</td>
</tr>
<tr>
<td>GTZLQRY_RSN</td>
<td>(See the description following this table.)</td>
</tr>
<tr>
<td>GTZLQRY_SYSTEMDIAG</td>
<td>Additional diagnostic information for some nonzero return codes. An up to 100-character string.</td>
</tr>
</tbody>
</table>

Description for output variable GTZLQRY_RSN: Reason code. For nonzero return codes. This is a hexadecimal text string so that, for example, RSN=X'00000841' is reported as "00000841", not “2113”. The reason codes are as follows:

"rrrr0401"
  **Meaning:** The underlying GTZQUERY service reported a return code of 4 and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrrr0801"
  **Meaning:** The underlying GTZQUERY service reported a return code of 8 and reason code "rrrr".
  **Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.
"rrLL0802"
Meaning: An unrecognized GTZLQRY_REQUEST value has been found.
Action: Ensure you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"LLLL0803"
Meaning: An unrecognized GTZLQRY_REQUEST value has been found.
Action: Ensure you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "LLLL" is not zero then it is the last two bytes of the length as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"LLLL0804"
Meaning: An unrecognized GTZLQRY_OPTION.MAXRESULTS value has been found.
Action: Ensure you only specify valid GTZLQRY_OPTION.MAXRESULTS values ("ALL" or a valid number). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_OPTION.MAXRESULTS input variable.

"rrrr0C01"
Meaning: The underlying GTZQUERY service reported a return code of 12 (X'C') and reason code "rrrr".
Action: Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"xxxx0C02"
Meaning: GTZLQRY was invoked with a NUL REXX ENVBLOCK address in register 0 on entry.
Action: Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

"xxxx0C03"
Meaning: GTZLQRY was invoked with an unrecognized ENVBLOCK, pointed to by register 0 on entry.
Action: Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

In addition, GTZLQRY can issue an ABEND with system completion code of E77 with the following possible ABEND reason codes:

<table>
<thead>
<tr>
<th>ABEND reason code</th>
<th>Reason code description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'rrrr0C27'</td>
<td>Meaning: GTZLQRY could not write any output REXX variables.</td>
</tr>
<tr>
<td></td>
<td>Action: Ensure that GTZLQRY is called within a valid REXX environment, which includes GTZLQRY being called with a valid ENVBLOCK in register 0 on entry. A nonzero &quot;rrrr&quot; value provides additional diagnostic information. Check the GTZLQRY_RSN variable description for possibly related values.</td>
</tr>
<tr>
<td>X'xxxx0C29'</td>
<td>Meaning: An error occurred while accessing the internal GTZLQRY parameter list.</td>
</tr>
<tr>
<td></td>
<td>Action: Ensure that GTZLQRY is called within a valid REXX environment, ensuring standard REXX linkage conventions.</td>
</tr>
<tr>
<td>X'xxxx10xx'</td>
<td>Meaning: An unexpected error occurred.</td>
</tr>
<tr>
<td></td>
<td>Action: Contact IBM Service.</td>
</tr>
</tbody>
</table>
GTZLQRY "DEBUG" interface

Accepts input using multiple variables. See also the description of corresponding parameters on the GTZQUERY macro service for more details on single parameters. The following required statement requests to return DEBUG statements:

```
GTZLQRY_REQUEST="DEBUG"
```

The following optional statement requests to return only up to maxresults number of DEBUG statements:

```
GTZLQRY_OPTION.MAXRESULTS = { "ALL" | "maxresults" }
```

Enter special value "ALL" or an unsigned number in the double-word (64-bit) range.

**Note:** This is provided mainly for consistency among the list requests such as REQUEST="TRACKDATA". Unlike REQUEST="TRACKDATA", which potentially can return tens of thousands or more entries, REQUEST="DEBUG" is expected to return at most a few dozen entries in a typical configuration.

Specifying GTZLQRY with REQUEST="DEBUG" returns its output with the variables described in the following table.

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTZQUAAD.DebugEntriesAvailable</td>
<td>Number of DEBUG statements known to the tracking facility.</td>
</tr>
<tr>
<td>GTZQUAAD.DebugEntriesProvided</td>
<td>Number (n) of DEBUG statements provided, if n &gt; 0, from variables GTZQUAAD.i with i=1..n. This number n is determined as MIN(GTZQUAAD.DebugEntriesAvailable, GTZLQRY_OPTION.MAXRESULTS).</td>
</tr>
<tr>
<td>GTZQUAAD.i.OriginType</td>
<td>Indicates where this DEBUG originated from: PARMLIB - A GTZPRMxx parmlib member, COMMAND - A SETGTZ DEBUG command, PROGRAM - A program interface</td>
</tr>
<tr>
<td>GTZQUAAD.i.OriginSuffix</td>
<td>If this DEBUG was specified from a GTZPRMxx parmlib member, as indicated by a GtzQuaaD.i.OriginType value of &quot;PARMLIB&quot;, this field here contains the 2-character xx suffix.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Reason</td>
<td>The DEBUG REASON code. A decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>GtzQuaaD.i.Action</td>
<td>The ACTION requested when this DEBUG is matched: &quot;ABEND&quot; or &quot;DUMP&quot;.</td>
</tr>
<tr>
<td>GtzQuaaD.i.ActionLimit</td>
<td>How often the system is allowed to trigger the action for this DEBUG statement (when matched by a new tracked instance candidate). A value of &quot;NOLIMIT&quot; means &quot;no limit&quot;, otherwise a decimal number in the range 1 through 65535.</td>
</tr>
<tr>
<td>GtzQuaaD.i.ActionCount</td>
<td>How often this DEBUG statement triggered an action so far. A decimal number in the range 0 through 65535 which counts towards the ActionLimit, unless &quot;NOLIMIT&quot;.</td>
</tr>
</tbody>
</table>
Table 54. REQUEST="DEBUG" output variable names and descriptions (continued)

<table>
<thead>
<tr>
<th>Output variable name</th>
<th>Variable description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GtzQuaaD.i.Filter.</td>
<td>A set of variables indicating what TRACKDATA entries this DEBUG statement is supposed to trigger for. For all but GtzQuaaD.i.Filter.SourceType and GtzQuaaD.i.Filter.ProgramType this might be a single wildcard character &quot;*&quot;, when not filtering for a specific value, indicating that all values for the respective field match this filter.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.Owner</td>
<td>OWNER filter value. An up to 16-character string.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.Source</td>
<td>SOURCE or SOURCEPATH filter value, depending on the value of GtzQuaaD.i.Filter.SourceType: ForSourceType=&quot;SOURCE&quot; it is a source filter, forSourceType=&quot;SOURCEPATH&quot; it is a source path filter, and forSourceType=&quot;ALL&quot; it is always &quot;*&quot; (match all). An up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.EventData</td>
<td>Event data filter value. A 16-byte binary string or &quot;*&quot;.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.EventJob</td>
<td>Event job filter value. An up to 8-character string.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.HomeJob</td>
<td>Home job filter value. An up to 8-character string.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.Program</td>
<td>PROGRAM or PROGRAMPATH filter value, depending on the value of GtzQuaaD.i.Filter.ProgramType: For ProgramType=&quot;PROGRAM&quot; it is a source filter, for ProgramType=&quot;PROGRAMPATH&quot; it is a program path filter, and for ProgramType=&quot;ALL&quot; it is always &quot;*&quot; (match all). An up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.ProgramOffset</td>
<td>PROGRAMOFFSET filter value. A decimal unsigned number in the double-word (64-bit) range</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.EventASID</td>
<td>Event ASID filter value. A decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.HomeASID</td>
<td>Home ASID filter value. A decimal number in the range 0 through 65535 (X'FFFF')</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.Owner</td>
<td>OWNER filter value. An up to 16-character string.</td>
</tr>
<tr>
<td>GtzQuaaD.i.Filter.Source</td>
<td>SOURCE or SOURCEPATH filter value, depending on the value of GtzQuaaD.i.Filter.SourceType: For SourceType=&quot;SOURCE&quot; it is a source filter, for SourceType=&quot;SOURCEPATH&quot; it is a source path filter, and for SourceType=&quot;ALL&quot; it is always &quot;*&quot; (match all). An up to 8-character resp. 1024-character string</td>
</tr>
<tr>
<td>Output variable name</td>
<td>Variable description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>GTZLQRY_RC</td>
<td>Return code. Same as the REXX supplied output variable RESULT which REXX sets if the function result is not explicitly captured from, for example, RC = GTZLQRY(). This is a decimal text string so that, for example, RC=12 is reported as &quot;12&quot;, not &quot;0C&quot;. The possible return codes are as follows:</td>
</tr>
<tr>
<td>0</td>
<td><strong>Meaning:</strong> The GTZLQRY request completed successfully.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Meaning:</strong> The GTZLQRY request completed successfully, but issued a warning. <strong>Action:</strong> Refer to the action under the individual reason code returned in GTZLQRY_RSN.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Meaning:</strong> The GTZLQRY request encountered an error and did not complete successfully. <strong>Action:</strong> Refer to the action under the individual reason code returned in GTZLQRY_RSN.</td>
</tr>
<tr>
<td>12 (X'C')</td>
<td><strong>Meaning:</strong> The GTZLQRY request encountered a severe error, typically related to the environment in which GTZLQRY was invoked, and did not complete successfully. <strong>Action:</strong> Refer to the action under the individual reason code returned in GTZLQRY_RSN.</td>
</tr>
<tr>
<td>16 (X'10')</td>
<td><strong>Meaning:</strong> The GTZLQRY request encountered an internal, component error and did not complete successfully. <strong>Action:</strong> Contact IBM Service.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GTZLQRY_RSN</th>
<th>(See the description following this table.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTZLQRY_SYSTEMDIAG</td>
<td>Additional diagnostic information for some nonzero return codes. An up to 100-character string.</td>
</tr>
</tbody>
</table>

Description for output variable GTZLQRY_RSN: Reason code. For nonzero return codes. This is a hexadecimal text string so that, for example, RSN=X'00000841' is reported as "00000841", not "2113". The reason codes are as follows:

"rrrr0401"
**Meaning:** The underlying GTZQUERY service reported a return code of 4 and reason code "rrrr".
**Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrrr0801"
**Meaning:** The underlying GTZQUERY service reported a return code of 8 and reason code "rrrr".
**Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"rrLL0802"
**Meaning:** An unrecognized GTZLQRY_REQUEST value has been found.
**Action:** Ensure you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"LLLL0803"

**Meaning:** An unrecognized GTZLQRY_REQUEST value has been found.

**Action:** Ensure you only specify valid GTZLQRY request types ("STATUS", "TRACKDATA", "EXCLUDE", or "DEBUG"). If "LL" is not zero then it is the last two bytes of the length as reported by service IRXEXCOM used to retrieve the GTZLQRY_REQUEST input variable.

"LLLL0804"

**Meaning:** An unrecognized GTZLQRY_OPTION.MAXRESULTS value has been found.

**Action:** Ensure you only specify valid GTZLQRY_OPTION.MAXRESULTS values ("ALL" or a valid number). If "rrLL" is not zero then "rr" is the return code and "LL" is the last byte of the length of the variable as reported by service IRXEXCOM used to retrieve the GTZLQRY_OPTION.MAXRESULTS input variable.

"rrrr0C01"

**Meaning:** The underlying GTZQUERY service reported a return code of 12 (X'C') and reason code "rrrr".

**Action:** Refer to the action under reason code "rrrr" in the documentation for service GTZQUERY.

"xxxx0C02"

**Meaning:** GTZLQRY was invoked with a NUL REXX ENVBLOCK address in register 0 on entry.

**Action:** Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

"xxxx0C03"

**Meaning:** GTZLQRY was invoked with an unrecognized ENVBLOCK, pointed to by register 0 on entry.

**Action:** Only invoke GTZLQRY from within a REXX program/environment, ensuring standard REXX calling conventions.

In addition, GTZLQRY can issue an ABEND with system completion code of E77 with the following possible ABEND reason codes:

<table>
<thead>
<tr>
<th>ABEND reason code</th>
<th>Reason code description</th>
</tr>
</thead>
</table>
| X'rrrrOC27'       | **Meaning:** GTZLQRY could not write any output REXX variables.  
**Action:** Ensure that GTZLQRY is called within a valid REXX environment, which includes GTZLQRY being called with a valid ENVBLOCK in register 0 on entry. A nonzero "rrrr" value provides additional diagnostic information. Check the GTZLQRY_RSN variable description for possibly related values. |
| X'xxxxOC29'       | **Meaning:** An error occurred while accessing the internal GTZLQRY parameter list.  
**Action:** Ensure that GTZLQRY is called within a valid REXX environment, ensuring standard REXX linkage conventions. |
| X'xxxx10xx'       | **Meaning:** An unexpected error occurred.  
**Action:** Contact IBM Service. |
Data persistence

Use the generic tracker service GTZTRACK to provide persisted records of tracked events in SMF type 125 records. With this function, you can retrieve historical information about tracked events whenever needed.

The generic tracker keeps track of many different types of data, including the following data types:

- An "exclusion list" made up of one or more EXCLUDE statements
- A set of DEBUG statements
- A set of TRACKDATA instances
- STATUS information

Of all of these, only TRACKDATA is enabled for persistence using SMF records.

This persistence of TRACKDATA is done in parallel to the TRACKDATA that is kept in the dynamic memory of the GTZ address space. The TRACKDATA that is persisted as SMF records is meant to serve as a backup, or long-term storage for later analysis, of such data. This is because the data that is kept in dynamic memory is only available until the GTZ address space shuts down, at the latest before the next system restart. You can still achieve GTZ data persistence across those system restarts without using SMF records by instead using the existing tools GTZPRINT, GTZQUERY, or DISPLAY GTZ. These tools can explicitly extract the data from the live GTZ address space.

The external interface for the TRACKDATA persistence using SMF records consists of the following pieces:

- SETGTZ operator subcommand PERSIST. SETGTZ PERSIST enables or disables recording using SMF records.
- GTZPRMxx parmlib member statement PERSIST, which is equivalent to the SETGTZ PERSIST operator command.
- Operator command DISPLAY GTZ, STATUS reports the current enablement status of SMF recording for GTZ data.
- Macro service GTZQUERY REQUEST=STATUS reports the current enablement status of SMF recording for GTZ data.
- REXX callable function GTZLQRY with GTZLQRY_REQUEST="STATUS" reports the current enablement status of SMF recording for GTZ data among other information.
- Programs GTZSMFU2 and GTZSMFU3 allow for the retrieval of GTZ data from standard SMF record backend stores (data set or jobstream).
- Mapping macro GTZZSMF1 for the new top-level SMF record type 125, which is assigned to GTZ for its data persistence.
- Macro GTZZSMFU for return and reason codes from programs GTZSMFU2 and GTZSMFU3.
- Sample member GTZSMFJ in SYS1.PARMLIB demonstrates the use of SMF dump program exit routines GTZSMFU2 and GTZSMFU3.

SMF already provides the following dump programs to retrieve raw binary data from different SMF backend stores for SMF records:

- Program IFASMFDP for SMF records that are stored in data sets
- Program IFASMFDL for SMF data records that are stored in log streams.

However, these existing dump programs also support the use of user exit routines to filter and process individual SMF records from the overall set of SMF records that are stored in the targeted SMF record store (data set or logstream).

The generic Tracker provides exit routines for two of those dump program user exits in order to extract and format, in text form that is very similar to the existing DISPLAY GTZ,TRACKDATA output format, any GTZ SMF records that are contained in the SMF record source:
Program GTZSMFU2, to be used as an exit routine for exit USER2, is given control only when the SMF data set dump program selects a record to be written. GTZSMFU2 gains control for each record that is selected by any optional general filtering that is specified through the existing supported input to the SMF dump programs. GTZSMFU2 ignores any non-GTZ SMF records and formats GTZ SMF records as text in a new output DD, named GTZOUT, of the SMF dump program.

Program GTZSMFU3, to be used as an exit routine for exit USER3, is given control after the output data set is closed. Pair it with USER2 exit routine GTZSMFU2 so that GTZSMFU3 can close any GTZ output data sets that GTZSMFU2 opened initially and shared across multiple calls for different SMF records that are fed into GTZSMFU2.

In addition to GTZOUT as output DD, the exit routines GTZSMFU2 and GTZSMFU3 also expect a DD GTZPRINT as target for additional messages from the GTZ processing. Both GTZ DDs require LRECL=80.

**Note:** Usage details are also described in the prologue of the GTZSMFJ sample job.

On exit, the GTZOUT DD contains text similar to that in the following example:

```c
/* GENERATED BY GTZSMFU2 (HBB77AZ-14260) 2014-09-17 19:40:09 */
------------------------------------------------------------------------
INSTANCE:      1                   COUNT:         1
EVENTDESC:     'GTZFCT neutral event description'
OWNER:         IBM_GTZ_FCT         SOURCE:        MYSOURCE
EVENTDATA:     xC7E9C63C3C2C5   xC5C6F1F500000004
PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000064
HOMEJOB:       MAINASID            HOMEASID:      x003A
EVENTJOB:      MAINASID            EVENTASID:     x003A
SYSPLEX:       PLEX1               SYSTEM:        SY39
SMF SID:       SY39
------------------------------------------------------------------------
INSTANCE:      2                   COUNT:         1
EVENTDESC:     'GTZTRACK DIAGNOSE'
OWNER:         IBMGTZ              SOURCE:        GTZKCTRL
EVENTDATA:     x0000000000000002   x4040404040404040
PROGRAM:       GTZKPVT             PROGRAMOFFSET: x000000000002A762
HOMEJOB:       *MASTER*            HOMEASID:      x0001
EVENTJOB:      *MASTER*            EVENTASID:     x0001
AUTHORIZED:    YES                 FIRST TIME:    2014-09-17 19:10:09
SYSPLEX:       PLEX1               SYSTEM:        SY39
SMF SID:       SY39
/* GTZSMFU2 END TIME 2014-09-17 19:40:10 */
```

Mapping macro GTZZSMF1 provides the mapping for SMF records of type 125 and all supported subtypes. There is currently only one subtype, for TRACKDATA.

Mapping macro GTZZSMF1 is also referenced in the standard SMF record mapping macro IFASMFRD, which covers record types 124-127 and is referenced by the main include IFASMFR. That way customers can also create mappings for the GTZ SMF record type 125 using standard SMF include protocol 'IFASMFR 125'.

Use new operator command SETGTZ PERSIST or new statement PERSIST in the GTZPRMxx parmlib member to enable or disable track data persistence. For more information, see the SETGTZ PERSIST command in **z/OS MVS System Commands** and GTZPRMxx (the Generic Tracker parameters) in **z/OS MVS Initialization and Tuning Reference**.

### Generic tracker exploiters

#### DFSMS tracking

- Event description starting with **GDGLIMIT**
  - EVENTDESC: 'GDGLIMIT jobname stepname procname'

  The field name GDGLIMIT was used in a call to Catalog Management and did not also include GDGLIMTE. This might indicate that a program or utility is not capable of handling extended
Generation Data Groups (GDGs). `jobname` is the name of the user application job, `stepname`, and `procname` are also listed if they are not blanks.

An example of tracked usage reported by the catalog for using GDGLIMIT (and not also using GDGLIMTE) could appear as the following:

```plaintext
 INSTANCE:      1                   COUNT:         1
 EVENTDESC:     'GDGLIMIT CSIRXJCL STEP1            '
 OWNER:         IBMDFSMS            SOURCE:        IGG0CLFA
 EVENTDATA:     x0000000000000000   x0000000000000000
 PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000000
 HOMEJOB:       CATALOG             HOMEASID:      x002F
 EVENTJOB:      CATALOG             EVENTASID:     x002F
 AUTHORIZED:    YES                 FIRST TIME:    2014-10-29 09:06:46
```

Figure 104. Example of tracked usage reported by the catalog for using GDGLIMIT (and not also using GDGLIMTE)

- Event description starting with SMS-
  - See the “EAV migration assistance tracker” section in z/OS DFSMSdfp Advanced Services.

**JES3 control statement tracking**

JES3 is instrumented to report the use of JES3 control statements (JECL) in jobs that have been submitted to the system. Occurrences of JES3 JECL statements in a job is reported during input service using the Generic Tracker macro, GTZTRACK. When GTZ tracking is enabled, JES3 records GTZ data identifying the JES3 JECL statements found within a job stream.

JES3 generated GTZ records are identified with the OWNER field set to IBMJES3. Information in the JES3 record aids in identifying the source of the job stream and the JES3 control statements found in the job stream.

```plaintext
 INSTANCE:      1                   COUNT:         1
 EVENTDESC:     '|01110000 000xxxxx| INTRDR   CRJOB002 IBMUSER '
 OWNER:         IBMJES3            SOURCE:        IATISLG
 EVENTDATA:     x0000000000000000   x0000000000000000
 PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000000
 HOMEJOB:       JES3                HOMEASID:      x001E
 EVENTJOB:      JES3                EVENTASID:     x001E
```

```plaintext
 INSTANCE:      2                   COUNT:         1
 EVENTDESC:     '|00000001 000xxxxx| RDR011   CRJOB001 RDR011 '
 OWNER:         IBMJES3            SOURCE:        IATISRI
 EVENTDATA:     x0000000000000000   x0000000000000000
 PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000000
 HOMEJOB:       JES3                HOMEASID:      x001E
 EVENTJOB:      JES3                EVENTASID:     x001E
 AUTHORIZED:    YES                 FIRST TIME:    2014-04-11 08:30:52
```

```plaintext
 INSTANCE:      3                   COUNT:         1
 EVENTDESC:     '|00110010 000xxxxx| RDR011   CRJOB001 '
 OWNER:         IBMJES3            SOURCE:        IATISLG
 EVENTDATA:     x0000000000000000   x0000000000000000
 PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000000
 HOMEJOB:       JES3                HOMEASID:      x001E
 EVENTJOB:      JES3                EVENTASID:     x001E
```

```plaintext
 INSTANCE:      4                   COUNT:         1
 EVENTDESC:     '|00110010 000xxxxx| RDR011   CRJOB0X1 '
 OWNER:         IBMJES3            SOURCE:        IATISLG
 EVENTDATA:     x0000000000000000   x0000000000000000
 PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000000
 HOMEJOB:       JES3                HOMEASID:      x001E
 EVENTJOB:      JES3                EVENTASID:     x001E
```

Figure 105. Examples of JES3 control statement GTZ records
Description of the GTZ record fields with data provided by JES3:

- **OWNER** is the string IBMJES3 and identifies the JES3 subsystem as the source of the GTZ record.
- **SOURCE** identifies the JES3 module which identified the occurrence of a JES3 control statement in the job stream. This is either IATISLG or IATISRI.
- **EVENTDATA** is set to zeros.
- **PROGRAM** is *UNKNOWN and PROGRAMOFFSET is zeros as JES3 provides no program specific information.
- **EVENTDESC** is a 46 character string in which JES3 provides information about the job stream and the JES3 control statement usage within the job stream. The contents of EVENTDESC by character position is:
  
  1 = A starting delimiter, which is the vertical bar character, for the JES3 control statement usage indicators.
  2-18 = Each character identifies whether a specific JES3 control statement is used in the job stream. 0=Not used. 1=Used.
  2 = JES3 command statement
  3 = /*DATASET statement
  4 = /*FORMAT statement
  5 = /*MAIN statement
  6 = /*NET statement
  7 = /*NETACCT statement
  8 = /*OPERATOR statement
  9 = /*PAUSE statement
  10 = Blank character
  11 = /*PROCESS statement
  12 = /*ROUTE statement
  13 = /*SIGNON statement
  14-18 = Reserved
  19 = An ending delimiter which is the vertical bar character.
  20 = Blank character
  21-28 = JES3 point of entry for the job stream.
  29 = Blank character
  30-37 = Job name when SOURCE=IATISLG.
  DDNAME of the reader when SOURCE=IATISRI.
  38 = Blank character
  39-46 = Submitting TSO user ID when SOURCE=IATISLG.
  DDNAME of the reader when SOURCE=IATISRI.

Data for the remaining GTZ record fields is supplied by the generic tracker.

### JES2 control statement tracking

JES2 is instrumented to report the use of JES2 and JES3 control statements (JECL) in jobs that have been submitted to the system. Note that any JES3 JECL that is tracked by JES2 still came from a JES2 input stream, which is possible now with JES2 supporting many JES3 JECL statements.

Occurrences of JES2 and JES3 JECL statements in a job is reported during input service using the Generic Tracker service GTZTRACK. When GTZ tracking is enabled, JES2 records GTZ data identifying the JES2 and JES3 JECL statements found within a job stream.

JES2 generated GTZ records are identified with the OWNER field set to IBMJES2. Information in the JES2 record aids in identifying the source of the job stream and the JES2 and JES3 control statements found in the job stream.
Description of the GTZ record fields with data provided by JES2:

- **OWNER** is the string IBMJES2 and identifies the JES2 subsystem as the source of the GTZ record.
- **SOURCE** identifies the JES2 module which identified the occurrence of a JES2 or JES3 control statement in the job stream. This is either HASCINJR, HASCNJJR, or HASPRDR.
- **EVENTDATA** is set to zeros.
- **PROGRAM** is *UNKNOWN and PROGRAMOFFSET is zeros as JES2 provides no program specific information.
- **EVENTDESC** is a 46 character string in which JES2 provides information about the job stream and the JES2 and JES3 control statement usage within the job stream. The contents of EVENTDESC by character position is:

  1 = A starting delimiter, which is the vertical bar character, for the JES2 and JES3 control statement usage indicators.
  2-22 = Each character identifies whether or not a specific JES2 or JES3 control statement is used in the job stream. 0=Not used. 1=Used.
  2 = /*DATASET statement (JES3)
  3 = /*FORMAT statement (JES3)
  4 = /*MAIN statement (JES3)
  5 = /*NET statement (JES3)
  6 = /*NETACCT statement (JES3)
  7 = /*OPERATOR statement (JES3)
  8 = /*PAUSE statement (JES3)
  9 = /*PROCESS statement (JES3)
 10 = Blank character
 11 = /*ROUTE statement (JES3)
 12 = Delimiter, vertical bar character
 13 = /*JOBPARM statement (JES2)
 14 = /*MESSAGE statement (JES2)
 15 = /*OUTPUT statement (JES2)
 16 = /*ROUTE statement (JES2)
 17 = /*SETUP statement (JES2)
 18 = /*XEQ statement (JES2)
 19 = /*NETACCT statement (JES2)
 20 = /*NOTIFY statement (JES2)
 21 = Blank character
 22 = Delimiter, vertical bar character
 23 = Delimiter, vertical bar character
 24 = Blank character
 25-34 = JES2 device name for point of entry for the job stream
 35 = Blank character
 36-43 = Job name
 44 = Blank character
 45-52 = Submitting TSO userid when SOURCE=HASCINJR
The generic tracker (GTZ)

53 = Blank character
54-57 = JES2 subsystem name

Data for the remaining GTZ record fields is supplied by the generic tracker.

If you do not want to have JES2 generated tracking records included when GTZ tracking is enabled, consider adding the following type of GTZ EXCLUDE statements to your GTZPRMxx parmlib members:

```sql
EXCLUDE(EVENTDESC='!??????????!??????????!*'  
OWNER=IBMJES2 SOURCETYPE=NOPATH SOURCE=HASCINJR)
EXCLUDE(EVENTDESC='!??????????!??????????!*'  
OWNER=IBMJES2 SOURCETYPE=NOPATH SOURCE=HASCNJJR)
EXCLUDE(EVENTDESC='!??????????!??????????!*'  
OWNER=IBMJES2 SOURCETYPE=NOPATH SOURCE=HASPRDR)
```

MVS Allocation tracking

Event description 'IEFALC 01: <step name> <DD name>'

• See message IEF384I “WARNING: VOLUME NOT RETRIEVED FROM CATALOG”.

Note that the ALLOCxx parmlib member option SYSTEM VERIFY_UNCAT(FAIL|TRACK|MSGTRACK|LOGTRACK) determines whether message IEF348I is issued and where:

– Option SYSTEM VERIFY_UNCAT(TRACK) enables tracking, but does not issue message IEF348I.
– Option SYSTEM VERIFY_UNCAT(MSGTRACK) specifies that message IEF348I is issued only to the job log.
– Option SYSTEM VERIFY_UNCAT(LOGTRACK) specifies that message IEF348I is issued to both the job log and hardcopy-only WTO.

The default for SYSTEM VERIFY_UNCAT is FAIL.

```
D GTZ,TRACKDATA
GTZ1002I  23.42.10 GTZ TRACKDATA 239
FOUND 1 MATCHING TRacked INSTANCE(S)

INSTANCE:      1                   COUNT:         1
EVENTDESC:     'IEFALC 01: STEP1    DD1'
OWNER:         IBMCNZ              SOURCE:        CNZTRKR
EVENTDATA:     x0000000000000000   x0000000000000000
PROGRAM:       *UNKNOWN            PROGRAMOFFSET: x0000000000000000
HOMEJOB:       BEANSZZ             HOMEASID:      x001D
EVENTJOB:      BEANSZZ             EVENTASID:     x001D

Figure 107. Example of MVS allocation tracking
```

SDSF tracking

• Event description: SDSF NOPARM FALLBACK: ISFPRMXX NOT ACTIVE
• Event description: SDSF MENU TABLE DISABLED: ISFMIGMN ALLOCATED

For these events:

– OWNER is IBMSDSF
– EVENTDATA is set to zeros
– PROGRAM is the SDSF module that detected the event

See z/OS SDSF Operation and Customization.
### TSO/E tracking

Event description: 'MVSSERV CALL'

The `MVSSERV` command was executed to invoke the Enhanced Connectivity Facility function.

An example of tracked usage reported by TSO/E could appear as the following:

<table>
<thead>
<tr>
<th>INSTANCE</th>
<th>COUNT</th>
<th>EVENTDESC</th>
<th>OWNER</th>
<th>SOURCE</th>
<th>EVENTDATA</th>
<th>PROGRAM</th>
<th>PROGRAMOFFSET</th>
<th>HOMEJOB</th>
<th>HOMEASID</th>
<th>EVENTJOB</th>
<th>EVENTASID</th>
<th>AUTHORIZED</th>
<th>FIRST TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>'MVSSERV CALL'</td>
<td>IBMTSO</td>
<td>MVSSERV</td>
<td>x0000000000000000</td>
<td>CHSTCPS</td>
<td>x0000000000000000</td>
<td>IBMUSER</td>
<td>x0022</td>
<td>IBMVSM</td>
<td>x0022</td>
<td>NO</td>
<td>2016-06-09 06:13:02</td>
</tr>
</tbody>
</table>

*Figure 109. Example of tracked usage by TSO/E*

### VSM tracking

Event description: 'JOB REQUESTED V=R REGION (ADDRSPC=REAL)'

An event with event description 'JOB REQUESTED V=R REGION (ADDRSPC=REAL)' indicates that a job ran with V=R (ADDRSPC=REAL) settings. See Verify that the new default value for REAL is acceptable in z/OS Migration for more information.

For this event:
- OWNER is always IBMVSM
- SOURCE is always IGVGRRGN
- EVENTDATA is always zero
- PROGRAM and PROGRAMOFFSET are not relevant and undefined
- The JOB and ASID fields identify an actual job that used ADDRSPC=REAL.
An example of a tracked event reported by VSM would look like the following:

```
INSTANCE:  4       COUNT:  1
EVENTDESC: 'JOB REQUESTED V=R REGION (ADDRSPC=REAL)'
OWNER:    IBMVSM   SOURCE: IGVGRGN
EVENTDATA: x0000000000000000 x0000000000000000
PROGRAM:  *UNKNOWN  PROGRAMOFFSET: x0000000000000000
HOMEJOB:  REAL0JB   HOMEOASID: x0039
EVENTJOB: REAL0JB   EVENTASID: x0039
AUTHORIZED: YES  FIRST TIME: 2017-03-02 12:29:34
```

*Figure 110. Example of an event tracked by VSM*
Chapter 12. Component trace

The component trace service provides a way for MVS components to collect problem data about events. Each component that uses the component trace service has set up its trace in a way that provides the unique data needed for the component. A component trace provides data about events that occur in the component. The trace data is used by the IBM Support Center, which uses the trace data to:

- Diagnose problems in the component
- See how the component is running.

You will typically use component trace while recreating a problem.

**Usage of System Resources:** Some component traces use minimal system resources, especially while tracing a small number of events. These minimal traces often run anytime the component is running. Other traces use significant system resources, especially when many kinds of events are traced. These large traces are usually requested only when the IBM Support Center asks for them.

**Run concurrent traces:** You can run more than one component trace at a time; you can run component traces:

- Concurrently for several components on one system.
- Concurrently for one or more components on some or all of the systems in a sysplex.
- Concurrently for one component on a system. Multiple concurrent traces for a component are **sublevel traces**.
- Concurrently for several components on some or all of the systems in a sysplex and with sublevel traces.

The following topics describe tasks for component traces:

- “Planning for component tracing” on page 354 tells you about the tasks needed to plan component tracing.
- “Obtaining a component trace” on page 362 tells you how to request a specific component trace that is needed to diagnose a problem. The tasks depend on where you plan to put trace output and if you are running traces on multiple systems in a sysplex; therefore, requesting traces is presented in three topics:
  - “Request component tracing to address space or data space trace buffers” on page 363
  - “Request writing component trace data to trace data sets” on page 365
  - “Request component tracing for systems in a sysplex” on page 370
- “Verifying component tracing” on page 371 tells how an operator can check that a requested trace is running and that a component trace writer is running.
- “Viewing the component trace data” on page 374 tells you how to format the trace output.

This topic uses tables to show the similarities and differences in the individual traces from different components. Table 56 on page 353 summarizes each BCP component trace that uses the component trace service.

<table>
<thead>
<tr>
<th>Component</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Program-to-Program Communication/MVS (APPC/MVS)</td>
<td>“SYSAPPC component trace” on page 375</td>
</tr>
<tr>
<td>Base control program internal interface (BCPIi)</td>
<td>“SYSBCPII component trace” on page 391</td>
</tr>
<tr>
<td>Basic HyperSwap® socket support</td>
<td>“SYSBHI component trace” on page 395</td>
</tr>
</tbody>
</table>
## Table 56. Summary of BCP component traces that use the component trace service (continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Event Adapter (CEA)</td>
<td>“SYSCEA component trace” on page 399</td>
</tr>
<tr>
<td>Cross-system coupling facility (XCF)</td>
<td>“SYSXCF component trace” on page 490</td>
</tr>
<tr>
<td>Cross-system extended services (XES)</td>
<td>“SYSXES component trace” on page 495</td>
</tr>
<tr>
<td>Data lookaside facility (DLF) of VLF</td>
<td>“SYSDLF component trace” on page 402</td>
</tr>
<tr>
<td>Distributed function of SOMobjects</td>
<td>“SYSDSON component trace” on page 404</td>
</tr>
<tr>
<td>Global resource serialization</td>
<td>“SYSGRS component trace” on page 410</td>
</tr>
<tr>
<td>Allocation Component</td>
<td>“SYSIEFAL component trace” on page 418</td>
</tr>
<tr>
<td>IOS Component Trace</td>
<td>“SYSIOS component trace” on page 424</td>
</tr>
<tr>
<td>JES common coupling services</td>
<td>“SYSJES component trace” on page 429</td>
</tr>
<tr>
<td>JES2 rolling trace table</td>
<td>“SYSjes2 component trace” on page 437</td>
</tr>
<tr>
<td>Library lookaside (LLA) of contents supervision</td>
<td>“SYSLLA component trace” on page 440</td>
</tr>
<tr>
<td>z/OS UNIX System Services (z/OS UNIX)</td>
<td>“SYSOMVS component trace” on page 447</td>
</tr>
<tr>
<td>Operations services (OPS)</td>
<td>“Requesting a SYSOPS trace” on page 458</td>
</tr>
<tr>
<td>Resource recovery services (RRS)</td>
<td>“SYSSRS component trace” on page 462</td>
</tr>
<tr>
<td>Real storage manager (RSM)</td>
<td>“SYSSRSM component trace” on page 468</td>
</tr>
<tr>
<td>SDUMP</td>
<td>“SYSDUMP component trace” on page 406</td>
</tr>
<tr>
<td>Service processor interface (SPI)</td>
<td>“SYSSPI component trace” on page 483</td>
</tr>
<tr>
<td>System logger</td>
<td>“SYSSLOGR component trace” on page 441</td>
</tr>
<tr>
<td>System REXX</td>
<td>“SYSSAXR component trace” on page 388</td>
</tr>
<tr>
<td>Transaction trace (TTRC)</td>
<td>“SYSTTRC component trace” on page 484</td>
</tr>
<tr>
<td>Virtual lookaside facility (VLF)</td>
<td>“SYSVLF component trace” on page 485</td>
</tr>
<tr>
<td>Workload manager (WLM)</td>
<td>“SYSWLM component trace” on page 488</td>
</tr>
</tbody>
</table>

A program product or application, if authorized, can also use the component trace service to provide an application trace. See the documentation for the program product or application for information about its trace.

- See z/OS MVS Initialization and Tuning Reference for the CTnccxx parmlib member.
- See z/OS MVS System Commands for the TRACE CT command.
- See z/OS MVS IPCS Commands for the COPYDUMP, COPYTRC, CTRACE, GTFTRACE, and MERGE subcommands.
- For a description of these messages, see MVS System Messages.
- See z/OS MVS Programming: Authorized Assembler Services Guide for information on creating an application trace.

## Planning for component tracing

Planning for component tracing consists of the following tasks, which are performed by the system programmer:

- “Create CTnccxx parmlib members for some components” on page 355:
  - “Specify buffers” on page 357
Create CTnccccxx parmlib members for some components

Table 57 on page 355 shows if a component has a parmlib member, if the member is a default member needed at system or component initialization, and if the component has default tracing. Some components run default tracing at all times when the component is running; default tracing is usually minimal and covers only unexpected events. Other components run traces only when requested.

When preparing your production SYS1.PARMLIB system library, do the following:

1. Make sure the parmlib contains all default members identified in the table. If parmlib does not contain the default members at initialization, the system issues messages.

   Make sure that the IBM-supplied CTIITT00 member is in the parmlib. PARM=CTIITT00 can be specified on a TRACE CT command for a component trace that does not have a parmlib member; CTIITT00 prevents the system from prompting for a REPLY after the TRACE CT command. In a sysplex, CTIITT00 is useful to prevent each system from requesting a reply.

2. Decide if each default member meets the needs of your installation. If it does not, customize it.

3. Decide if the buffer size specified in the default members meets the needs of your installation. Some component traces do not allow buffer size change after initialization. Change the buffer size, if needed.

Most components can run only one component trace at a time; some components can run concurrent traces, called **sublevel traces**. Each sublevel trace is identified by its sublevel trace name. For some components, you need to identify the component's CTnccccxx member in another parmlib member; the components with this requirement have the other parmlib member listed in the default member column in Table 57 on page 355.

For example, for XCF specify CTIXCF00 on the CTRACE parameter in the COUPLExx parmlib member.

```couple
COUPLE SYSPLEX(...
  CTRACE(CTIXCF00)
...)
```

<table>
<thead>
<tr>
<th>Trace</th>
<th>Parmlib member</th>
<th>Default member</th>
<th>Default tracing beginning at initialization</th>
<th>Sublevel traces</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAPPC</td>
<td>CTnAPPxx (see “CTnAPPxx parmlib member” on page 376)</td>
<td>No</td>
<td>No; cannot turn trace ON or OFF in CTnAPPxx</td>
<td>No</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>CTIAXRnn (see “CTIAXRnn parmlib member” on page 389)</td>
<td>CTIAXR00</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSBCPII</td>
<td>CTIHWI00</td>
<td>CTIHWI00</td>
<td>Yes; minimal diagnostic tracing is always in effect. The presence of a valid CTIHWI00 parmlib at BCPIi startup can modify these default trace options</td>
<td>No</td>
</tr>
<tr>
<td>SYSBHI</td>
<td>CTIBHIxx</td>
<td>CTIBHI00</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>CTICEA00 (see “CTICEA00 parmlib member” on page 400)</td>
<td>CTICEA00</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
### Table 57. Determining if a component has a parmlib member (continued)

<table>
<thead>
<tr>
<th>Trace</th>
<th>Parmlib member</th>
<th>Default member</th>
<th>Default tracing beginning at initialization</th>
<th>Sublevel traces</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSDLF</td>
<td>None</td>
<td>N/A</td>
<td>Yes; always on when DLF is running</td>
<td>No</td>
</tr>
<tr>
<td>SYSDSOM</td>
<td>None</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSDUMP</td>
<td>CTIDMPxx</td>
<td>CTIDMP00</td>
<td>Yes, full tracing</td>
<td>No</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>CTnGRSxx (see “CTnGRSxx parmlib member” on page 410).</td>
<td>CTIGRS00, which is specified in GRSCNF00 member.</td>
<td>Yes, if global resource serialization is active; CONTROL and MONITOR options.</td>
<td>No</td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>CTIEFxx (see “CTIEFxx parmlib member” on page 419)</td>
<td>CTIEFAL</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSIOS</td>
<td>CTnIOSxx (see “CTnIOSxx parmlib member” on page 426)</td>
<td>No</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSJES</td>
<td>CTnJESxx (see “CTnJESxx parmlib member” on page 431)</td>
<td>CTIJES01, CTIJES02, CTIJES03, CTIJES04. You should also receive and rename members IXZCTION and IXZCTIOF supplied in SYS1.SAMPLIB to CTIJESON and CTIJES0F.</td>
<td>Yes; full tracing for sublevels XCFEVT and FLOW; minimal tracing of unexpected events for sublevels USRXIT and MSGTRC.</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSjes2</td>
<td>None</td>
<td>N/A</td>
<td>Yes; always on when JES2 is running</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSLLA</td>
<td>None</td>
<td>N/A</td>
<td>Yes; always on when LLA is running</td>
<td>No</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>CTnLOGxx (see “CTnLOGxx parmlib member” on page 444).</td>
<td>CTILOG00, which can be specified in IXGCNFxx member.</td>
<td>Yes; activated during system logger (IXGLOGR) address space initialization.</td>
<td>No</td>
</tr>
<tr>
<td>SYSOMVS</td>
<td>CTnBPXxx (see “CTnBPXxx parmlib member” on page 448).</td>
<td>CTIBPX00, which must be specified in BPXPRM00 member.</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSOPS</td>
<td>CTnOPSxx (see “CTnOPSxx parmlib member” on page 458).</td>
<td>CTIOPS00, which must be specified in CONSOLxx member.</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSRRS</td>
<td>CTnRRSxx (see “CTnRRSxx parmlib member” on page 463).</td>
<td>None, but member ATRCTRRS supplied in SYS1.SAMPLIB can be used. See SET-UP and ACTIVATION instructions in the ATRCTRRS sample.</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSRSM</td>
<td>CTnRSMxx (see “CTnRSMxx parmlib member” on page 469).</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSSPI</td>
<td>None</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSTTRC</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSVLF</td>
<td>None</td>
<td>N/A</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
</tbody>
</table>
Specify buffers

Each component determines the buffer size and how it is specified. Depending on the component, you may or may not be able to change the buffer size. You may be able to change the size only at system or component initialization, or when the trace is started, or at any time, including while the trace is running. Table 58 on page 357 shows how the buffers specifications.

The buffer size determines whether you get all the records needed for diagnosis; when the buffer is full, the system wraps the buffer, overwriting the oldest records. To change the size of the buffer, specify an nnnnK or nnnnM parameter on the TRACE CT operator command or a BUFSIZE parameter in the parmlib member.

Usually you should increase the size of the trace buffer when you increase the amount of tracing. However, if you plan to place a component's trace records in a trace data set, you can probably leave the buffer at its original size. Many component traces do not allow you to change the buffer size after initialization; the table indicates those component traces. If you increase the amount of tracing for one of these traces, specify use of a trace data set, if the component supports its use.

<table>
<thead>
<tr>
<th>Trace</th>
<th>Parmlib member</th>
<th>Default member</th>
<th>Default tracing beginning at initialization</th>
<th>Sublevel traces</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSWLM</td>
<td>None</td>
<td>N/A</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSXCF</td>
<td>CTnXCFxx (see “CTnXCFxx parmlib member” on page 491)</td>
<td>CTIXCF00, which can be specified in COUPLE00 member</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSXES</td>
<td>CTnXESxx (see “CTnXESxx parmlib member” on page 497)</td>
<td>CTIXES00, which can be specified in COUPLE00 member</td>
<td>Yes; minimal; unexpected events</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 58. Component trace options

<table>
<thead>
<tr>
<th>Trace</th>
<th>Default size and size range</th>
<th>Size set by</th>
<th>Change size after IPL</th>
<th>Buffer location</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAPPC</td>
<td>512KB 64KB - 32MB</td>
<td>CTnAPPxx member or REPLY for TRACE CT command</td>
<td>Yes, while a trace is running</td>
<td>Data space. A TRACE CT,OFF command requests a dump, which includes the trace buffers</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>2MB 1MB - 2GB</td>
<td>CTIAXRnn parmlib member or REPLY to TRACE CT command</td>
<td>Yes, when restarting a trace after stopping it</td>
<td>AXR private; AXR trace dataspace</td>
</tr>
<tr>
<td>SYSBCPII</td>
<td>4M 4M</td>
<td>MVS system</td>
<td>No</td>
<td>Data space. A SLIP or DUMP command can always be issued to capture the trace buffers for the BCPii address space. (Specify ASID=(BCPii's ASID),DSPNAME=('HWIBCPII'**)) In addition, if CTrace for SYSBCPII is ON, a Trace CT,OFF command requests a dump, which includes the trace buffers.</td>
</tr>
</tbody>
</table>
## Table 58. Component trace options (continued)

<table>
<thead>
<tr>
<th>Trace</th>
<th>Default size and size range</th>
<th>Size set by</th>
<th>Change size after IPL</th>
<th>Buffer location</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSBHI</td>
<td>4MB</td>
<td>CTIBHIxx parmlib member or REPLY to TRACE CT command</td>
<td>Yes, while trace is running</td>
<td>64-bit Common Service Area (ECSA)</td>
</tr>
<tr>
<td></td>
<td>4MB - 64MB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSCEA</td>
<td>2MB</td>
<td>CTICEAn parmlib member or REPLY to TRACE CT command</td>
<td>Yes, when restarting a trace after stopping it</td>
<td>CEA private; CEA trace dataspase</td>
</tr>
<tr>
<td></td>
<td>1MB - 2GB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSDLF</td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>Data space. In the REPLY for the DUMP command, specify DSPNAME= ('DLF:CCOFGSDO)</td>
</tr>
<tr>
<td>SYSDSOM</td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>Private address space</td>
</tr>
<tr>
<td>SYSDUMP</td>
<td>4MB</td>
<td>CTIDMPxx parmlib member or TRACE CT command</td>
<td>Yes</td>
<td>64-bit common storage area</td>
</tr>
<tr>
<td></td>
<td>4MB - 32MB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSGRS</td>
<td>16M</td>
<td>CTnGRSxx member</td>
<td>Yes.</td>
<td>In the GRS address space above the bar which means it will not constrain GRS virtual storage. Options such as FLOW, REQUEST, and MONITOR produce a large number of entries in a short period of time. When dumping by SDUMP, specify ASID=GRS's asid and SDATA=(RGN,NUC). The RGN is needed for blocks that address the ctrace buffer. Note that SDATA=GRSQ does not collect GRS CTRACE.</td>
</tr>
<tr>
<td></td>
<td>128KB - 2047MB</td>
<td>(System rounds size up to nearest 64KB boundary.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>4M</td>
<td>CTIIIEFxx member</td>
<td>Yes.</td>
<td>In the component address space</td>
</tr>
<tr>
<td></td>
<td>256KB - 8MB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSIOS</td>
<td>324KB</td>
<td>CTnIOSxx member</td>
<td>Yes</td>
<td>Extended system queue area (ESQA).</td>
</tr>
<tr>
<td></td>
<td>324KB - 1.5MB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td>SYSJES</td>
<td>N/A</td>
<td>JES2</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td>SYSjes2</td>
<td>N/A</td>
<td>JES2</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td>Trace</td>
<td>Default size and size range</td>
<td>Size set by</td>
<td>Change size after IPL</td>
<td>Buffer location</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------</td>
<td>-------------</td>
<td>-----------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SYSLLA</td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>2MB</td>
<td>MVS system, CTnLOGxx member, or REPLY for TRACE CT command.</td>
<td>Yes</td>
<td>Data space. In the REPLY for the DUMP command, specify DSPNAME=('IXLOGR.*'). See &quot;Obtaining a dump of system logger information&quot; on page 441.</td>
</tr>
<tr>
<td>SYSOMVS</td>
<td>4MB</td>
<td>CTxBPXxx member or REPLY for TRACE CT command</td>
<td>Yes, when initializing z/OS UNIX.</td>
<td>Data space. In the REPLY for the DUMP command, specify DSPNAME=(asid.SYSZBPX2) where asid is the ASID for z/OS UNIX.</td>
</tr>
<tr>
<td>SYSOPS</td>
<td>2M</td>
<td>CTnOPSxx member or REPLY for TRACE CT command</td>
<td>Yes, when restarting a trace after stopping it</td>
<td>Console address space (private).</td>
</tr>
<tr>
<td>SYSRRS</td>
<td>1MB</td>
<td>CTxRRSxx member or REPLY for TRACE CT command</td>
<td>Yes, when restarting a trace after stopping it</td>
<td>Data space and component address space. In the REPLY for the DUMP command, specify DSPNAME=('RRS'.ATR TRACE) and SDATA=RGN.</td>
</tr>
<tr>
<td>SYSRSM</td>
<td>3 buffers of 132 pages</td>
<td>CTnRSMxx member or REPLY for TRACE CT command</td>
<td>Yes, when starting a trace</td>
<td>Common service area (LIKECSA) or, if specified in CTnRSMxx, high virtual private storage of the RASP address space.</td>
</tr>
<tr>
<td>SYSSPI</td>
<td>64KB</td>
<td>MVS system</td>
<td>Yes, when starting a trace</td>
<td>In the component address space</td>
</tr>
<tr>
<td>SYSTTRC</td>
<td>1 MB</td>
<td>MVS system</td>
<td>Yes</td>
<td>Data space owned by the system trace address space</td>
</tr>
</tbody>
</table>
### Table 58. Component trace options (continued)

<table>
<thead>
<tr>
<th>Trace</th>
<th>Default size and size range</th>
<th>Size set by</th>
<th>Change size after IPL</th>
<th>Buffer location</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSVL F</td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>Data space. Enter DISPLAY J,VLF to identify the VLF data spaces. In the REPLY for the DUMP command, specify DSPNAME=('VLF'.Dclsname, 'VLF'.Cclsname), where clsname is a VLF class name.</td>
</tr>
<tr>
<td>SYSWLM</td>
<td>64KB 64KB - 16M</td>
<td>MVS system</td>
<td>Yes, when starting a trace</td>
<td>Extended common service area (ECSA)</td>
</tr>
<tr>
<td>SYSXCF</td>
<td>4MB 16KB - 16MB (System rounds size up to a multiple of 72 bytes.)</td>
<td>CTnXCFxx member</td>
<td>No</td>
<td>Extended local system queue area (ELSQA) of the XCF address space</td>
</tr>
<tr>
<td>SYSXES</td>
<td>336KB 16KB - 16MB</td>
<td>CTnXESxx member or REPLY for TRACE CT command</td>
<td>Yes, while a trace is running.</td>
<td>64-bit common storage above the 2 GB bar. In the REPLY for the DUMP command, specify SDATA=XESDATA.</td>
</tr>
</tbody>
</table>

**Select the trace options for the component trace**

If the IBM Support Center requests a trace, the Center might specify the options, if the component trace uses an OPTIONS parameter in its parmlib member or REPLY for the TRACE CT command. The options are:

<table>
<thead>
<tr>
<th>Trace</th>
<th>Trace Request OPTIONS parameter.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAPPC</td>
<td>See “OPTIONS parameter” on page 377</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>See “OPTIONS parameter” on page 390</td>
</tr>
<tr>
<td>SYSBPII</td>
<td>See “OPTIONS parameter” on page 393</td>
</tr>
<tr>
<td>SYSBHI</td>
<td>See “OPTIONS parameter” on page 397</td>
</tr>
<tr>
<td>SYSCB</td>
<td>See “OPTIONS parameter” on page 401</td>
</tr>
<tr>
<td>SYSDLF</td>
<td>None</td>
</tr>
<tr>
<td>SYSDOM</td>
<td>None</td>
</tr>
<tr>
<td>SYSDUM</td>
<td>See “OPTIONS parameter” on page 401</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>See “OPTIONS parameter” on page 411</td>
</tr>
<tr>
<td>SYSIEF</td>
<td>See “OPTIONS parameter” on page 420</td>
</tr>
<tr>
<td>SYSIOS</td>
<td>See “OPTIONS parameter” on page 426</td>
</tr>
<tr>
<td>SYSJES</td>
<td>None</td>
</tr>
<tr>
<td>SYSjes2</td>
<td>None</td>
</tr>
</tbody>
</table>
You must specify all options you would like to have in effect when you start a trace. Options specified for a previous trace of the same component do not continue to be in effect when the trace is started again.

If the component has default tracing started at initialization by a parmlib member without an OPTIONS parameter, you can return to the default by doing one of the following:

- Stopping the tracing with a TRACE CT,OFF command.
- Specifying OPTIONS() in the REPLY for the TRACE CT command or in the CTncccxx member.

For XCF, the IBM Support Center identifies the options needed to diagnose a particular problem as both of the following:

### Decide where to collect the trace records

As Table 59 on page 361 shows, depending on the component, the potential locations of the trace data are:

- In address-space buffers, which are obtained in a dump
- In data-space buffers, which are obtained in a dump
- In a trace data set or sets, if supported by the component trace

<table>
<thead>
<tr>
<th>Component</th>
<th>Address-Space Buffer</th>
<th>Data-Space Buffer</th>
<th>Trace Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAPPC</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSBCPII</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSBHII</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

**Table 59. Location of trace buffers for components**

Component Trace
If the trace records of the trace you want to run can be placed in more than one location, you need to select the location. For a component that supports trace data sets, you should choose trace data sets for the following reasons:

- Because you expect a large number of trace records
- To avoid interrupting processing with a dump of the trace data
- To keep the buffer size from limiting the amount of trace data
- To avoid increasing the buffer size

Depending on the component, you might also want to dump the address-space trace buffers and data-space trace buffers.

**Note:** You may need to consider the amount of auxiliary storage required to back data space buffers. In general, most components which use data space buffers establish a small default value less than 500 kilobytes of virtual storage. Some components allow you to specify values up to 2 gigabytes. The SYSIOS component trace uses a default of 512 megabytes for data space buffers. You should consider SYSIOS and other component data space buffers to ensure that the potential cumulative effect of all CTRACE data space buffers for your system can be accommodated by the local page data sets that you have allocated. For more information on auxiliary storage, refer to *z/OS MVS Initialization and Tuning Guide*.

## Obtaining a component trace

To obtain a specific component trace, use one of the following procedures:

---

### Table 59. Location of trace buffers for components (continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Address-Space Buffer</th>
<th>Data-Space Buffer</th>
<th>Trace Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSDLF</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSDSOM</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSDUMP</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSIOS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSJES</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSjes2</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSLLA</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSOMV</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSOPS</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSRRS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSRSM</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSTTRC</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSSPI</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSVLF</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSWLM</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSXCF</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSXES</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Request component tracing to address space or data space trace buffers

This topic describes how to obtain component trace records in dumps. The trace records are in address-space or data-space trace buffers. The topic contains information about how to:

- “Prepare for a specific component trace to trace buffers” on page 363
- “Perform component tracing to trace buffers” on page 364.

Prepare for a specific component trace to trace buffers

The system programmer performs the tasks.

1. **Select How the Operator Is to Request the Trace:** For most component traces, the request is made by:
   - A TRACE CT operator command without a PARM parameter, followed by a reply containing the options
   - A TRACE CT operator command with a PARM parameter that specifies a CTnccxx parmlib member containing the options

   If you do not use a parmlib member, tell the operator the options.

2. **Create a parmlib member, if used:** If you use a parmlib member, create the member and place it on SYS1.PARMLIB. Use a parmlib member if the options are complicated and you have access to the SYS1.PARMLIB data set, or if a parmlib member is required by the component, or if you had already set up a parmlib member with the needed options. Use a REPLY for simple options. See “Create CTnccxx parmlib members for some components” on page 355. For XCF, for example, you can create CTWXCF03 to specify the options.

   ```
   TRACEOPTS ON
   OPTIONS('SERIAL','STATUS')
   ```

3. **Determine the dump to be used to obtain the trace records:** Table 60 on page 363 shows how to request SVC dumps for the component traces. Possible ways of requesting SVC dumps are:
   - By a DUMP operator command
   - By a SLIP trap
   - By the component

   For the following failures, use another type of dump:
   - Failure of an application program or program product: The program requests a SYSMDUMP dump.
   - The system waits, hangs, or enters a loop: The operator requests a stand-alone dump.

<table>
<thead>
<tr>
<th>Trace</th>
<th>Request of SVC Dump</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAPPC</td>
<td>By the component when the operator stops SYSAPPC tracing with a TRACE CT,OFF command</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSBCPII</td>
<td>By DUMP or SLIP command, or by the component, if Ctrace is ON for SYSBCPII and a TRACE CT,OFF command is issued.</td>
</tr>
<tr>
<td>SYSBHI</td>
<td>By DUMP or SLIP command if the Basic HyperSwap Management address space or one of the BHIHSRV address spaces are to be included in the dump.</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>By DUMP or SLIP command</td>
</tr>
</tbody>
</table>
### Table 60. How to request SVC dumps for component traces (continued)

<table>
<thead>
<tr>
<th>Trace</th>
<th>Request of SVC Dump</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSDLF</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSDSOM</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSIOS</td>
<td>By DUMP or SLIP command, or by the component</td>
</tr>
<tr>
<td></td>
<td>• In the REPLY for the DUMP command, specify the IOS address space to be dumped</td>
</tr>
<tr>
<td>SYSJES</td>
<td>By the component</td>
</tr>
<tr>
<td>SYSjes2</td>
<td>By DUMP or SLIP command or component</td>
</tr>
<tr>
<td>SYSLLA</td>
<td>By the component</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSOMVS</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSOPS</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSSRRS</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSRSM</td>
<td>• By DUMP or SLIP command</td>
</tr>
<tr>
<td></td>
<td>• Through the DMPREC option on the CTnRSMxx parmlib member or on the REPLY for the</td>
</tr>
<tr>
<td></td>
<td>TRACE CT command when RSM enters recovery processing (default)</td>
</tr>
<tr>
<td></td>
<td>• Through the DMPOFF option of CTnRSMxx or the TRACE CT reply when SYSRSM</td>
</tr>
<tr>
<td></td>
<td>tracing is turned off</td>
</tr>
<tr>
<td>SYSTTRC</td>
<td>Automatically dumped by the Tailored SVC Dump Exits function</td>
</tr>
<tr>
<td>SYSSPI</td>
<td>By the component</td>
</tr>
<tr>
<td>SYSVLFL</td>
<td>By DUMP or SLIP command or when SYSVLFL full tracing is turned off</td>
</tr>
<tr>
<td>SYSWLM</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSXCF</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSXES</td>
<td>By DUMP or SLIP command</td>
</tr>
</tbody>
</table>

4. **Make Sure the component trace Buffers Will Be Dumped:** The location of the address-space and data-space buffers depends on the component being traced. See the table in “Specify buffers” on page 357 for the location of the buffers. When the component being traced requests an SVC dump, the dump will contain the address-space and/or data-space trace buffers.

**Perform component tracing to trace buffers**

The operator performs the tasks. Note that these tasks are for a specific component trace, rather than for a trace started by the system at initialization.

1. **Start the component trace:** The operator enters a TRACE operator command on the console with MVS master authority. The operator replies with the options that you specified.

In the following example, the TRACE CT command does not specify a parmlib member.

```
trace ct,on,comp=sysxcf
* 21 ITT006A ....
r 21,options=(serial,status),end
```
This next example requests the same trace using parmlib member CTWXCF03. When TRACE CT specifies a parmlib member, the system does not issue message ITT006A.

```
trace ct,on,comp=sysxcf,parm=ctwxcf03
```

2. **Verify that the Trace Is Running:** See “Verifying component tracing” on page 371.

3. **Obtain the Dump Containing the component trace Records:** The operator obtains the dump that contains the component trace records: an SVC dump, a stand-alone dump, or a dump requested by the component when a problem occurs or when the operator stops the tracing.

   This example shows a DUMP operator command entered on the console with MVS master authority. The system issues message IEE094D in response to the DUMP command. If you requested, the operator enters dump options in the reply to IEE094D. SDATA options are needed to obtain the trace buffers. An address space identifier (ASID) should be specified for the XCF address space; in the example, XCF is in address space 6.

```
dump  comm=(dump for xcf component trace)
  * 32  IEE094D ...
  r 32,sdata=(couple,sqa,lsqa),asid=6,end
  ...
IEA911E ...
```

The system identifies the data set containing the dump in message IEA911E. If an installation exit moves the dump, the operator should look for a message identifying the data set containing the moved dump and tell you the name of the dump and the data set containing it.

If desired, the operator can request more than one dump while a component trace is running.

4. **Stop the component trace:** The operator enters a TRACE CT,OFF command on the console with MVS master authority. For some component traces, the command requests a dump, which contains the trace records.

   The following example shows how to specify the TRACE CT,OFF command.

```
trace ct,off,comp=sysxcf
```

### Request writing component trace data to trace data sets

The following topics describe only the component traces that can write to trace data sets. You can also change the trace data sets that are in use without stopping the trace. See “Change trace data sets” on page 369.

**Prepare for a specific component trace to trace data sets**

The system programmer performs the following tasks:

1. **Determine the dispatching priority required for the external writer started task, the server address space for the component’s trace:**

   While component trace runs under the master scheduler address space, you need to verify that the priority of the external writer is at least equal to, and preferably greater than the priority of the component being traced. For example, if you are tracing COMP(SYSXES) for JOBNAME(IRLMA), the dispatching priority of the external writer should be equal to or greater than that assigned to IRLMA. See z/OS MVS Initialization and Tuning Guide for more information on setting priorities.

2. **Select How the Operator Is to Request the Trace:**

   For most component traces, the request can be made by:

   - A TRACE CT operator command without a PARM parameter, followed by a reply containing the options
   - A TRACE CT operator command with a PARM parameter that specifies a CTnccxx parmlib member containing the options
If you do not use a parmlib member, tell the operator the options.

3. **Create Source JCL for the External Writer:**

Create source JCL to invoke an external writer, which will send the component trace output to one or more trace data sets. Add a procedure to the SYS1.PROCLIB system library or a job as a member of the data set in the IEFJOBS or IEFPDSI concatenation.

An external writer is not specific for a component but can be used by any application. So you can use the same source JCL again for other tracing later, if needed.

Concurrent traces for different components must use separate source JCL to place their traces in separate data sets.

Because the writer source JCL specifies data sets, use a different set of source JCL for each system in a sysplex. Several systems cannot share the same data set; attempting to share the same data set will lead to contention problems. If your sysplex uses a common SYS1.PROCLIB, you need to specify a unique writer procedure for each system or use a unique job as the source JCL, when tracing the same component on several systems.

The procedure shown in Figure 111 on page 366 places trace data on two DASD data sets. The procedure is placed in member WTRD2 of SYS1.PROCLIB.

```plaintext
//WTDASD2 PROC
//IEFPROC EXEC PGM=ITTTRCWR,REGION=32M
//TRCOUT01 DD DSNAME=SYS1.CTRACE1,VOL=SER=TRACE6,UNIT=DASD,
//         SPACE=(CYL,10),DISP=(NEW,KEEP),DSORG=PS
//TRCOUT02 DD DSNAME=SYS1.CTRACE2,VOL=SER=TRACE7,UNIT=DASD,
//         SPACE=(CYL,10),DISP=(NEW,KEEP),DSORG=PS
```

Figure 111. Example: Cataloged Procedure for an External Writer

### Rules for the Source JCL for an External Writer:

- The name specified on the TRACE CT command or CTnccccx parmlib member is the member name of the source JCL; in the preceding example, WTRD2. The name is 1 to 7 alphanumeric or national characters, with the first character alphabetic or national. National characters are represented by the following hexadecimal codes (in other languages, the codes represent different characters):

<table>
<thead>
<tr>
<th>Code</th>
<th>U.S. English EBCDIC Character</th>
</tr>
</thead>
<tbody>
<tr>
<td>X'5B'</td>
<td>$</td>
</tr>
<tr>
<td>X'7B'</td>
<td>#</td>
</tr>
<tr>
<td>X'7C'</td>
<td>@</td>
</tr>
</tbody>
</table>

- The procedure must invoke the external writer program ITTTRCWR. Code the REGION= keyword on the EXEC statement to specify the maximum storage size required by the external writer.
- The source JCL can specify up to 16 trace data sets. The DD statements have ddnames of TRCOUTxx, where xx is 01 through 16.
- The trace data sets must be sequential data sets. You can use extended format sequential data sets as dump data sets for trace output. Extended format sequential data sets have the following features:
  - Have a greater capacity than sequential data sets
  - Support striping
  - Support compression
- To help you manage the trace data sets, establish a naming convention so that the data set name indicates the component trace, the date, and so on.
- All of the data sets must be on DASD or tape. Do not mix device classes, such as tape and DASD.
Within a device class, IBM recommends that you do not mix several types of devices, such as 3380 and 3390. In a mix of device types, the system would use the smallest block size for all the data sets.

- Do not specify the following DCB parameters:
  - BLKSIZE. The system uses the optimal block size, which is 4096 or larger.
  - RECFM. The system uses VB.
  - LRECL. The system uses BLKSIZE minus 4.

- Do not specify DISP=SHR.
- Do not concatenate trace data sets.
- Use a separate member for each component's trace, even though you can connect more than one trace to the same member.
- Use the same member for all the sublevel traces for a component. This approach reduces the number of data sets you must manage.
- Use a separate member for each system's component trace, when a component trace runs in two or more of the systems of a sysplex. If the component traces specify the same cataloged procedure in a shared SYS1.PROCLIB, they will use the same data set or group of data sets; in this case, contention might develop for the data set or sets.
- System security may require that you have RACF SYSHIGH authority to access the trace data sets.

z/OS V1R7 supports the following types of external media:

- DSNTYPE=LARGE data sets
- VSAM linear data sets

  GTF and CTRACE accept a single VSAM linear data set as output. VSAM's support for striping can increase data rate without the complexity associated with the use of distinct data sets.

For the details of the external data sets guidelines, see “Guidelines for defining GTF trace output data sets in a cataloged procedure” on page 219.

**Wrapping DASD Trace Data Sets:** If the WTRSTART parameter on the CTnccxx parmlib member or TRACE CT operator command specifies:

- WRAP or omits the parameter: When the system reaches the end of the data set or group of data sets, it writes over the oldest data at the start of the data set or first data set.

  The system also uses only the primary extent or extents for the data set or sets. To obtain the maximum degree of control over the number of trace entries for which space will be allocated, specify space allocation in units of the BLKSIZE of your trace data set, no secondary space, and use the option for contiguous allocation. For example, if your BLKSIZE is 8192, code the SPACE keyword as follows:

  ```
  SPACE=(8192,(500,0),,CONTIG)
  ```

- NOWRAP: When the data set or sets are full, the system stops writing trace records to the data set or sets. The system continues writing trace records in the address-space buffers.

  The system also uses the primary and secondary extents of the data set or sets.

**Note:** Wrapping is not supported for Extended Format Sequential data sets, which are treated as NOWRAP even if WRAP is specified.

**Tape Data Sets:** CTRACE writes an end-of-file record. The tape is rewound and unloaded, then a new volume is mounted on the tape unit. If CTRACE has only one tape data set and only one unit for the data set, CTRACE does not write trace records while the tape is unavailable, thus losing trace data. CTRACE can write to multiple tape units in the way that multiple TRCOUTxx DD statements can specify tape data sets. When CTRACE fills one data set, it changes to the next data set.
Note: GTF and CTRACE support placement of NOWRAP traces in cylinder-managed space. WRAP traces placed in VSAM linear data sets can reside in cylinder-managed space too. WRAP traces in non-VSAM data sets cannot be placed in large format data sets, extended format data sets, or cylinder-managed space.

Multiple Trace Data Sets: Use multiple data sets to capture all the trace records, even during spikes of activity. For a SYSRSM trace, which typically produces large numbers of trace records, use multiple data sets to keep from losing records. Multiple trace data sets using different DASD devices can improve performance. To view the trace records in chronological sequence, the system programmer can:

- Combine the trace records into one data set, using an IPCS COPYTRC subcommand, then use the CTRACE subcommand to format the records from the data set.
- Use an IPCS MERGE subcommand to format the records from multiple data sets.

The system places component trace records into each trace data set in sequence. For example, for three data sets, the system places:

- Record 1 into data set 1
- Record 2 into data set 2
- Record 3 into data set 3
- Record 4 into data set 1
- Record 5 into data set 2
- And so on

Lost Trace Data: Ctrace will give an indication in the next successfully written record of any trace data that did not reach the output medium. If no further records are written, the following message is displayed when the external writer is stopped:

```
ITI120I SOME CTRACE DATA HAS BEEN LOST.
LAST nnn BUFFERS NOT WRITTEN.
```

Create a parmlib member

If you use a parmlib member, create the member and place it on SYS1.PARMLIB. Use a parmlib member if the options are complicated and you have access to the SYS1.PARMLIB data set, or if a parmlib member is required by the component, or if you had already set up a parmlib member with the needed options. Use a REPLY for simple options. See “Create CTncccxx parmlib members for some components” on page 355 for more information. Example: CTWXCF04 parmlib member For XCF, create CTWXCF04. Notice the two statements for the writer; the WTRSTART statement starts the writer and the WTR statement connects the writer to the component.

```
TRACEOPTS
  WTRSTART(WTDASD2)
  ON
  WTR(WTDASD2)
  OPTIONS('SERIAL','STATUS')
```

Perform component tracing to trace data sets

The operator performs the tasks. Note that these tasks are for a specific component trace, rather than for a trace started by the system at initialization.

1. Start the Writer and component trace: The operator enters TRACE operator commands on the console with MVS master authority and replies with the options specified by the system programmer.

Example: TRACE CT command not specifying a parmlib member: The second TRACE CT command starts the SYSXCF trace; the trace options were selected in a previous example. Notice the two writer operands; the WTRSTART operand starts the writer and the WTR operand connects the writer to the component.

```
trace ct,wtrstart=wtddasd2
trace ct,on,comp=sysxcf
```
2. Verify that the Trace and the Writer Are Running: See “Verifying component tracing” on page 371.

3. Stop the component trace: The operator enters a TRACE CT command on the console with MVS master authority.

Example 1: TRACE CT,OFF Command

```
trace ct,off,comp=sysxcf
```

Example 2: TRACE CT Command to Disconnect the Writer: To stop sending trace records to the trace data set, but keep the trace running, the operator can enter the following when the trace is currently running.

```
trace ct,on,comp=sysxcf
```

The operator should stop the external writer.

4. Stop the External Writer: The operator enters a TRACE CT command on the console with MVS master authority.

Example: TRACE CT,WTRSTOP Command:

```
trace ct,wtrstop=wtdasd2
```

Change trace data sets

If you are running a component trace to a trace data set or sets, you can determine if you have the needed records without stopping the trace. Ask the operator to perform the following actions:

1. Enter a TRACE CT,WTRSTART command for a different set of source JCL for each external writer to trace data sets.
2. Enter a TRACE CT command that starts the trace with the different source JCL for the writer.

The new source JCL sends the trace records to the new data set or sets.

Note: You might lose one or more trace records.

You can view the previous data set or sets to verify the collected trace records, then continue or stop the trace, as needed.

Example: Changing the trace data sets

1. Enter the following command to start the new external writer NewWtr:

```
TRACE CT,WTRSTART=NewWtr
```

2. Enter the following commands to disconnect SYSxxx CTRACE from the current writer CurrWtr:

```
TRACE CT,ON,COMP=SYSxxx
REPLY xx,WTR=DISCONNECT,END
```

3. Enter the following commands to connect the new external writer NewWtr to SYSxxx CTRACE:

```
TRACE CT,ON,COMP=SYSxxx
REPLY xx, WTR=NewWtr, END
```
4. Enter the following command to stop the current external writer CurrWtr:

```
TRACE CT,WTRSTOP=CurrWtr
```

**Request component tracing for systems in a sysplex**

The following topics describe one way to obtain traces for a component on more than one system in a sysplex. The approach is to obtain a trace in the dump of each system and merge the traces from the dumps, using an IPCS MERGE subcommand. To be useful for diagnosis, the traces must cover the same time period and end at the same time.

You can also trace to data sets, if each system uses a unique source JCL for each external writer, so that the trace for each system goes to its own data set. If your installation has a shared SYS1.PROCLIB system library, use a unique parmlib member for each system; each unique parmlib member must specify a unique set of source JCL. If the source JCL is shared, all systems will write trace records on one data set, possibly causing contention problems.

**Prepare for specific component traces on systems in a sysplex**

The system programmer performs the tasks.

**1. Create a Parmlib Member to Start the Traces:** Create a parmlib member to start the traces of the component. Place the member in the shared SYS1.PARMLIB for the sysplex or in the parmlib for each system to be traced. If a parmlib member is used for each system, give it the same name so that one TRACE CT command can start all the component traces on the systems. See “Create CTncccxx parmlib members for some components” on page 355.

**Example:** CTWXCF33 to Start XCF Trace: For XCF, create CTWXCF33 to start the trace.

```
TRACEOPTS
ON
OPTIONS('SERIAL','STATUS')
```

The directions for the task assume that a parmlib member can be used. If the component to be traced does not have a parmlib member, the operator can start it with a TRACE CT command in a ROUTE command. The operator has to enter a reply for each system. (The ROUTE command can be used only on MVS systems with JES2.)

**2. Make Sure the component trace Buffers Will Be Dumped:** The location of the address-space and data-space trace buffers depends on the component being traced. For XCF, the extended local system queue area (ELSQA) of the XCF address space contains the XCF component trace buffers.

**Example:** Obtaining XCF and XES Trace Buffers:
- For XCF, the operator should specify SQA and LSQA on the REPLY for the DUMP command.
- For XES, the operator should specify SDATA=(XESDATA).

**Perform component tracing on the systems in the sysplex**

The operator performs the tasks. Note that these tasks are for a specific component trace, rather than for a trace started by the system at initialization.

**1. Start the component traces:** On a console with MVS master authority on one system in the sysplex, the operator enters a ROUTE command containing a TRACE CT command. (The ROUTE command can be used only on MVS systems with JES2.)

The command specifies a parmlib member with the same name in each system being traced. Note that, if parmlib members are not specified, all systems issue message ITT006A to prompt for options. If the component to be traced does not have a parmlib member, specify the IBM-supplied CTIITT00 member to avoid the prompts.
Example 1: Command to start traces in all systems: The command starts the trace in all systems in the sysplex.
```
route *all,trace ct,on,comp=sysxcf,parm=ctwxcf33
```

Example 2: Command to start traces in some systems: The command starts the trace in a subset of systems. Both commands specify the CTWXCF33 parmlib member on each system being traced.
```
route subs2,trace ct,on,comp=sysxcf,parm=ctwxcf33
```

Example 3: Command for a component without a parmlib member: The following command turns on tracing for a SYSVLF trace in the systems of a sysplex, without prompts for replies to the TRACE command. The SYSVLF component trace has no parmlib member.
```
route *all,trace ct,on,comp=sysvlf,parm=ctiitt00
```

2. Verify that the traces Are running: See “Verifying component tracing” on page 371.

3. Obtain the dumps containing the component trace records: The operator requests an SVC dump for each system being traced.

Example: DUMP command for systems in a sysplex: The example shows the DUMP operator command entered on a console with MVS master authority on one system in the sysplex. The reply requests dumps on all of the systems named in the pattern of S*. The example assumes that the systems being traced have the following names: S1, S2, S3, and S4; any other systems in the sysplex have names that do not fit the pattern, such as B1 or T2.
```
dump comm=(dump for xcf component trace) * 32 IEE094D ...
r 32,remote=(syslist=(s*)),end . 
IEA911E ... 
```

The system identifies the data set containing the dump in message IEA911E. If an exit moves a dump, the operator should look for a message identifying the data set containing the moved dump and tell you the name of the dump and the data set containing it.

4. Stop the component traces: On a console with MVS master authority on one system in the sysplex, the operator enters a ROUTE command containing a TRACE CT,OFF command to stop the traces. (The ROUTE command can be used only on MVS systems with JES2.)

Example 1: Command to stop traces in all systems: The command stops the traces in all systems in the sysplex.
```
route *all,trace ct,off,comp=sysxcf
```

Example 2: Command to Stop Traces in Some Systems: The command stops the traces in a subset of systems in the sysplex.
```
route subs2,trace ct,off,comp=sysxcf
```

Verifying component tracing

The operator should do the following tasks after starting a component trace to make sure that it started successfully. How the task is done depends on whether the component trace has sublevels and whether an external writer is used.

Verify tracing for component traces without sublevels
The operator should do one of the following:
Identify all current tracing by entering the following DISPLAY TRACE command on the console with MVS master authority. The response, in message IEE843I, gives the status in short form of all current component traces.

```
display trace
IEE843I ...
```

Identify current tracing and the options for the traces by entering one of the following DISPLAY TRACE commands on the console with MVS master authority. The first command requests the status for all current component traces; the second command requests it for one component trace, such as XCF. The response, in message IEE843I, gives full information about the status.

```
display trace,comp=all
IEE843I ...

display trace,comp=sysxcf
IEE843I ...
```

**Verify tracing for component traces with sublevels**

The commands for verification depend on the component trace.

To verify a SYSJES component trace, the operator enters the following command to verify a SYSJES trace; the system will show the 4 sublevel traces.

```
display trace,comp=sysjes,sublevel,n=4
```

When a SYSXES component trace has multiple sublevel traces, a DISPLAY command shows only one sublevel. To verify a SYSXES component trace, the operator needs to enter multiple DISPLAY commands to see the multiple sublevels.

A SYSXES component trace has structures, address spaces, and connections. The following examples show the DISPLAY (D) command entered by the operator and the type of information that the system returns.

1. To see how the SYSXES component trace is set up.

```
D TRACE,COMP=SYSXES
IEE843I 15.24.40 TRACE DISPLAY 213
SYSTEM STATUS INFORMATION
ST=(ON,0064K,00128K) AS=ON BR=OFF EX=ON MT=(ON,024K)
COMPONENT MODE BUFFER HEAD SUBS
--------------------------------------------------------
SYSXES ON 0168K HEAD 2
ASIDS *NOT SUPPORTED*
JOBNAMES *NOT SUPPORTED*
OPTIONS LOCKMGR
WRITER *NONE*
```

2. To display the structure level trace for each structure and the number of subtraces available.

```
D TRACE,COMP=SYSXES,SUB=(LT01),N=99
IEE843I 15.25.08 TRACE DISPLAY 216
SYSTEM STATUS INFORMATION
ST=(ON,0064K,00128K) AS=ON BR=OFF EX=ON MT=(ON,024K)
TRACENAME
==============
SYSXES
--------------
MODE BUFFER HEAD SUBS
---------------------
ON 0168K HEAD 2
ASIDS *NOT SUPPORTED*
JOBNAMES *NOT SUPPORTED*
OPTIONS LOCKMGR
WRITER *NONE*
SUBTRACE MODE BUFFER HEAD SUBS
--------------------------------------
LT01 HEAD 1
LIKEHEAD -------------------------------
```
3. To display the address space level trace for each structure. (The ASID specified is the asid in hex of the address space of the connector.)

D TRACE,COMP=SYSXES, SUB=(LT01.ASID(19)), N=99

IEE843I 15.25.39 TRACE DISPLAY 221
SYSTEM STATUS INFORMATION
ST=(ON,0064K,00128K) AS=ON BR=OFF EX=ON MT=(ON,024K)
TRACENAME
==============
SYSXES.LT01

MODE BUFFER HEAD SUBS
=======================
LIKEHEAD
ON 0168K HEAD 1

ASIDS       *NOT SUPPORTED*
JOBNAMES    *NOT SUPPORTED*
OPTIONS     LOCKMGR
WRITER      *NONE*

4. To display the external writer and the buffer size and options associated with the connection.

D TRACE, COMP=SYSXES, SUB=(LT01.ASID(19).A1), N=99

IEE843I 15.25.56 TRACE DISPLAY 224
SYSTEM STATUS INFORMATION
ST=(ON,0064K,00128K) AS=ON BR=OFF EX=ON MT=(ON,024K)
TRACENAME
==============
SYSXES.LT01.ASID(0019)

MODE BUFFER HEAD SUBS
=======================
LIKEHEAD
ON 0168K HEAD 8

ASIDS       *NOT SUPPORTED*
JOBNAMES    *NOT SUPPORTED*
OPTIONS     CONNECT,RECOVERY
WRITER      *NONE*

Verify that the writer is active

If an external writer is being used, the operator should verify that the writer is active for the trace by entering one of the following DISPLAY TRACE commands on the console with MVS master authority. The first command requests writer status for all current component traces; the second command requests it for one writer by specifying the membername of the source JCL for the writer, such as WTDASD2. The response is in message IEE843I.

display trace,wtr=all
IEE843I ...
display trace,wtr=wtdasd2
IEE843I ...

The operator should verify that the source JCL for the writer in this display is the same as the source JCL for the writer that was started for the trace. If the membernames do not match, the component trace data is lost. The operator should stop the writer job identified in the display and the component trace; then start the correct writer source JCL and start the trace again.
Viewing the component trace data

During diagnosis, the system programmer performs the tasks, using IPCS. See z/OS MVS IPCS Commands for the COPYDUMP, COPYTRC, CTRACE, GTFTRACE, and MERGE subcommands.

1. If your trace is in a dump in a SYS1.DUMPxx data set, enter a COPYDUMP subcommand to move the dump to another data set. Use option 5.3 of the IPCS dialog to select the COPYDUMP subcommand.

2. For all traces on trace data sets, use a COPYTRC subcommand to reorder component trace records that are out of chronological sequence. Use option 5.3 of the IPCS dialog to select the COPYTRC subcommand.

3. If your trace is on multiple data sets, do one of the following to view the trace records in one chronological sequence, which is needed to understand what was happening when the problem occurred. The input data sets can be component trace data sets, SVC dumps, and stand-alone dumps.
   - Use the COPYTRC subcommand to combine the records on several data sets into a chronological sequence on one data set. Use this data set as input to the CTRACE subcommand, which formats the trace records. Use option 5.3 of the IPCS dialog to select the COPYTRC subcommand.
   - Use a MERGE subcommand to format trace records from one or more input data sets. MERGE lets you combine and format the following:
     - Component traces
     - GTF traces
     - Sublevel traces from one component on one trace data set
     - Sublevel traces from one component on separate trace data sets
   For sublevel traces, MERGE groups together the trace records for each sublevel.
   Use option 2.7 of the IPCS dialog to select the MERGE subcommand. MERGE allows you to issue individual CTRACE or GTFTRACE subcommands for each input data set.

4. Use the subcommands in Table 61 on page 374 when formatting the component trace records. See z/OS MVS IPCS Commands for the SHORT, SUMMARY, FULL, and TALLY report type keywords and other keywords for the CTRACE subcommand.

<table>
<thead>
<tr>
<th>Trace</th>
<th>IPCS subcommand</th>
<th>CTRACE OPTIONS parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAPPC</td>
<td>CTRACE COMP(SYSAPPC)</td>
<td>See “Formatting a SYSAPPC trace” on page 379</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>CTRACE COMP(SYSAXR)</td>
<td>See “Formatting a SYSAXR trace” on page 390</td>
</tr>
<tr>
<td>SYSBCPII</td>
<td>CTRACE COMP(SYSBCPII)</td>
<td>See “SYSBCPII component trace” on page 391</td>
</tr>
<tr>
<td>SYSBHI</td>
<td>CTRACE COMP(SYSBHI)</td>
<td>See “SYSBHI component trace” on page 395</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>CTRACE COMP(SYSCEA)</td>
<td>See “Formatting a SYSCEA trace” on page 401</td>
</tr>
<tr>
<td>SYSDLF</td>
<td>CTRACE COMP(SYSDLF)</td>
<td>None</td>
</tr>
<tr>
<td>SYSDSOM</td>
<td>CTRACE COMP(SYSDSOM)</td>
<td>See “SYSDSOM component trace” on page 404</td>
</tr>
<tr>
<td>SYSDUMP</td>
<td>CTRACE COMP(SYSDUMP)</td>
<td>See “SYSDUMP component trace” on page 406</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>CTRACE COMP(SYSGRS)</td>
<td>None</td>
</tr>
<tr>
<td>SYSHZS</td>
<td>CTRACE COMP(SYSHZS)</td>
<td>See “SYSHZS component trace” on page 415</td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>CTRACE COMP(SYSIEFAL)</td>
<td>None</td>
</tr>
<tr>
<td>SYSIOS</td>
<td>CTRACE COMP(SYSIOS)</td>
<td>See “Formatting a SYSIOS trace” on page 428</td>
</tr>
<tr>
<td>SYSJES</td>
<td>CTRACE COMP(SYSJES)</td>
<td>See “Formatting a SYSJES trace” on page 434</td>
</tr>
</tbody>
</table>
### Table 61. Subcommands that format component trace records (continued)

<table>
<thead>
<tr>
<th>Trace</th>
<th>IPCS subcommand</th>
<th>CTRACE OPTIONS parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSjes2</td>
<td>CTRACE COMP(SYSjes2)</td>
<td>None</td>
</tr>
<tr>
<td>SYSLLA</td>
<td>CTRACE COMP(SYSLLA)</td>
<td>None</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>CTRACE COMP(SYSLOGR)</td>
<td>See “Formatting a SYSLOGR trace” on page 446</td>
</tr>
<tr>
<td>SY SOMVS</td>
<td>CTRACE COMP(SY SOMVS)</td>
<td>See “Formatting a SY SOMVS trace” on page 450</td>
</tr>
<tr>
<td>SYS OPS</td>
<td>CTRACE COMP(SYS OPS)</td>
<td>See “Formatting a SYS OPS trace” on page 460</td>
</tr>
<tr>
<td>SYSRRS</td>
<td>CTRACE COMP(SYSRRS)</td>
<td>See “Formatting a SYSRRS trace” on page 466</td>
</tr>
<tr>
<td>SY SRSM</td>
<td>CTRACE COMP(SYSRSM)</td>
<td>None</td>
</tr>
<tr>
<td>SY SSP1</td>
<td>CTRACE COMP(SY SSP1)</td>
<td>None</td>
</tr>
<tr>
<td>SYSTTRC</td>
<td>CTRACE COMP(SYSTTRC)</td>
<td>None</td>
</tr>
<tr>
<td>SYSVL F</td>
<td>CTRACE COMP(SYSVL F)</td>
<td>None</td>
</tr>
<tr>
<td>SY SW LM</td>
<td>CTRACE COMP(SYSW LM)</td>
<td>None</td>
</tr>
<tr>
<td>SYSXCF</td>
<td>CTRACE COMP(SY SX CF)</td>
<td>See “Formatting a SY SX CF trace” on page 494</td>
</tr>
<tr>
<td>SYSXES</td>
<td>CTRACE COMP(SYSX ES)</td>
<td>See “Formatting a SY SX ES trace” on page 499</td>
</tr>
</tbody>
</table>

If some of the output in a combined or merged trace data set is for a GTF trace, use a GTFTRACE subcommand to format the GTF records and a CTRACE subcommand to format the component trace records. See Chapter 10, “The Generalized Trace Facility (GTF),” on page 213 for GTF tracing.

This example shows the CTRACE subcommand for a SYSXCF component trace, when the SERIAL and STATUS options are requested in the OPTIONS parameter.

```
ctrace comp(sysxcf) options((serial,status))
```

## SYSAPPC component trace

Table 62 on page 375 summarizes information for requesting a SYSAPPC component trace for APPC/MVS.

### Table 62. Requesting SYSAPPC component trace for APPC/MVS

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSAPPC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnAPPxx; there is no default member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>No; cannot turn trace ON or OFF in CTnAPPxx</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnAPPxx or REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 32 MB</td>
</tr>
<tr>
<td></td>
<td>• Range: 64 KB - 256 MB</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnAPPxx member or REPLY for TRACE command</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes, while a trace is running</td>
</tr>
<tr>
<td></td>
<td>• Location: In data space. A TRACE CT,OFF command requests a dump, which includes the trace buffers.</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Dataspace buffer</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By the component when the operator stops SYSAPPC tracing with a TRACE CT,OFF command</td>
</tr>
</tbody>
</table>
Table 62. Requesting SYSAPPC component trace for APPC/MVS (continued)

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSAPPC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSAPPC)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>NO</td>
</tr>
</tbody>
</table>

Requesting a SYSAPPC trace

Specify options for requesting a SYSAPPC component trace on a CTnAPPxx parmlib member or on the reply for a TRACE CT command.

CTnAPPxx parmlib member

You can specify the parameters listed in Table 63 on page 376 on a CTnAPPxx parmlib member.

Table 63. CTnAPPxx parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnAPPxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>No</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>No</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>No</td>
</tr>
</tbody>
</table>

TRACE and REPLY commands

Table 64 on page 376 and Table 65 on page 376 summarize the parameters you can specify on TRACE CT commands and a REPLY.

Table 64. Parameters allowed on TRACE CT

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnM, or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 65. Parameters allowed on REPLY

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Table 65. Parameters allowed on REPLY (continued)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>No</td>
</tr>
</tbody>
</table>

**Automatic Dump:** The component requests an SVC dump when the operator stops the trace.

**OPTIONS parameter**

APPC trace request options are **hierarchical**. Figure 112 on page 377 shows the hierarchy of SYSAPPC trace options. Each option traces its own events, plus all the events of the options below it. For example, if you specify the SCHEDULE trace option, the system also traces ENQWORK, DEQWORK, and ASMANAGE events.

---

SYSAAPPC tracing always includes all exception (error) events. If no trace options are specified, the trace output includes only the exception events.

If you do not know where the errors are occurring, use the GLOBAL trace option to catch the full range of APPC/MVS events. GLOBAL can slow performance, but you will catch the error in one re-create.

The values for the OPTIONS parameter for the CTnAPPrxx parmib member and reply for a TRACE command, in alphabetical order, are:

- **ASMANAGE**
  - Traces events related to the creation and deletion of the APPC/MVS transaction scheduler’s subordinate address space. ASMANAGE is a subset of SCHEDULE events.

- **BADFMH5**
  - Traces events related to incorrect FMH-5s. BADFMH5 is a subset of FMH-5 events.

- **CONVCLUP**
  - Traces events related to conversation cleanup. CONVCLUP is a subset of GLOBAL events.

- **DEQWORK**
  - Traces the process of removing work requests from an APPC/MVS scheduler queue. DEQWORK is a subset of SCHEDULE events.
ENQWORK
Traces the process of adding work requests to an APPC/MVS scheduler queue. ENQWORK is a subset of SCHEDULE events.

FMH5
Traces FMH-5 events. FMH5 is a subset of INBOUND events.

FMH7
Traces FMH-7 events. FMH7 is a subset of INBOUND events.

GLOBAL
Traces the full range of APPC/MVS events.

GLOBALQK
Traces a subset of important GLOBAL trace events.

INBOUND
Traces inbound transaction processor (TP) requests. INBOUND is a subset of GLOBAL events.

NODUMP
Specifies no dumping when the operator stops the SYSAPPC component trace. Otherwise, component trace requests an SVC dump with the trace data when the operator stops tracing with a TRACE CT,OFF command.

IBM does not recommend the NODUMP option because the option makes obtaining the trace buffers difficult. The operator would have to identify the data space containing the buffers and specify it in a SLIP command or the reply for a DUMP command.

PBI
Traces events related to protocol boundary. PBI is a subset of VERBS events.

RR
Traces events related to the participation of APPC/MVS in resource recovery for protected conversations. RR is a subset of VERBS events.

SERVER
Traces events related to the APPC/MVS servers. SERVER is a subset of GLOBAL events.

SCHEDULE
Traces events related to the APPC/MVS transaction scheduler. SCHEDULE is a subset of GLOBAL events.

TRANSCH
Traces events related to APPC/MVS transaction scheduler interface support. TRANSCH is a subset of GLOBAL events.

USERID=(userid,userid)
Traces events for only the specified userid or userids. Specify the TSO/E userid of the person reporting a problem with an APPC/MVS application. Specify from 1 through 9 userids.

VERBS
Traces events related to outbound TPs or LU services. VERBS is a subset of GLOBAL events.

Examples of requesting SYSAPPC traces
This section contains examples of how to request SYSAPPC traces.

• Example 1: CTnAPPxx Member
  The member requests SERVER and VERBS options for the address space or spaces for the TSO/E userid JOHNDOE.
  ```plaintext
  TRACEOPTS
  OPTIONS('SERVER', 'VERBS', 'USERID=(JOHNDOE)')
  ```

• Example 2: TRACE command specifying a parmlib member
The example specifies that options are to be obtained from the parmlib member CTWAPP03.

```
trace ct, on, comp=sysappc, parm=ctwapp03
```

- **Example 3: TRACE Command with Options Specified in a REPLY**
  The example requests the same trace as Example 2, but specifies all options in the REPLY.

```
trace ct, on, comp=sysappc
* 15 ITT006A ...
reply 15, options=(server, verbs, userid=(johndoe)), end
```

- **Example 4: TRACE Command Requesting GLOBAL Options**
  The example requests GLOBAL options for all address spaces using APPC/MVS.

```
trace ct, on, comp=sysappc
* 14 ITT006A ...
reply 14, options=(global), end
```

**Formatting a SYSAPPC trace**

Format the trace with an IPCS CTRACE COMP(SYSAPPC) subcommand. Its OPTIONS parameter specifies the options that select trace records to be formatted. Your formatting options depend to a great extent on the tracing options you requested. Use the options to narrow down the records displayed so that you can more easily locate any errors. If the CTRACE subcommand specifies no options, IPCS displays all the trace records.

The options follow. The first option is either FILTER or CORRELATE, which are mutually exclusive; the first option controls how the other options select the records.

**FILTER**

The FILTER option selects the trace records that match only one of the specified options. The options that are valid with the FILTER option are:

- AQTOKEN
- CONVCOR
- CONVID
- FUNCID
- INSTNUM
- LUNAME
- LUWID
- NETNAME
- SEQNUM
- SESSID
- TPIDPRI
- TPIDSEC
- URID
- USERID

The formats of the OPTION parameter with FILTER are:

```
OPTION((FILTER, option))  
OPTION((FILTER, option, option, ..., option))
```
CORRELATE
The CORRELATE option selects the trace records that match a specified option and, for an unspecified option, uses the option's default values. The DEFAULTS keyword defines how default values are found for the unspecified options. The options that are valid with the CORRELATE option are:

- AQTOKEN
- CONVCOR
- CONVID
- DEFAULTS
- INSTNUM
- LUNAME
- LUWID
- NETNAME
- SEQNUM
- SESSID
- TPIDPRI
- TPIDSEC
- URID

The formats of the OPTION parameter with CORRELATE are:

```
OPTION((CORRELATE,option))
OPTION((CORRELATE,option,option, ... ,option))
```

AQTOKEN(*allocate-queue-token*)
Use with either the FILTER or CORRELATE option to specify an allocate queue token. The *allocate-queue-token* is an 8-byte hexadecimal string.

CONVCOR(*conversation-correlator*)
Use with either the FILTER or CORRELATE option to specify a conversation correlation. The *conversation-correlator* is an 8-byte hexadecimal string.

CONVID(*conversation-id*)
Use with either the FILTER or CORRELATE option to specify a conversation identifier. The *conversation-id* is a 4-byte hexadecimal string.

||DEFAULTS(NONE|ANY|EXACT)
Use only with the CORRELATE option to specify the values to be used for matching unspecified options.

NONE
Tells component trace to format only the trace records that match one or more of the specified options. NONE is the default.

ANY
Tells component trace to format:
- Trace records matching one or more of the specified options.
- Related trace records that match default values established for the unspecified options. Component trace derives the defaults from the values for unspecified options found in the first records that match any of the specified options.

EXACT
Tells component trace to format:
- Trace records matching one or more of the specified options.
• Related trace records matching default values established for the unspecified options. Component trace derives the defaults from the values for unspecified options found in the first records that match all of the specified options.

**FUNCID**(function-id)
Use only with the FILTER option to specify the APPC/MVS subcomponent trace records to format. Specify one function-id:

01  
Recovery

02  
Verb services

03  
FMH-5 manager

04  
Conversation manager

05  
System data file manager (SDFM)

06  
VTAM exits

07  
LU manager

08  
State machine

09  
Test enablement

10  
APPC/MVS scheduler (ASCH)

11  
Transaction scheduler interface

12  
Allocate queue services

**INSTNUM**(instance-number)
Use with either the FILTER or CORRELATE option to specify the instance number for a logical unit of work. The instance-number is a 6-byte hexadecimal string.

**LUNAME**(local-luname)
Use with either the FILTER or CORRELATE option to specify the LU name for the local logical unit of work. The local-luname is an 8-byte EBCDIC character string.

**LUWID**(logical-unit-of-work-id)
Use either the FILTER or CORRELATE option to specify a logical unit of work identifier, which represents the processing a program performs from one sync point to the next. To specify the logical-unit-of-work-id, enter the hexadecimal string as it appears in the CTRACE report, without including blank spaces.

**NETNAME**(network-name)
Use with either the FILTER or CORRELATE option to specify the network name for a logical unit of work. The network-name is an 8-byte EBCDIC character string, which is the same as the network-ID portion of a network-qualified LU name.

**SEQNUM**(sequence-number)
Use with either the FILTER or CORRELATE option to specify the sequence number for a logical unit of work. The sequence-number is a 2-byte hexadecimal string.

**SESSID**(session-id)
Use with either the FILTER or CORRELATE option to specify the session identifier. The session-id is an 8-byte hexadecimal string.
**TPIDPRI**(tp-id)
Use with either the FILTER or CORRELATE option to specify the primary TP identifier. The tp-id is an 8-byte hexadecimal string.

**TPIDSEC**(tp-id)
Use with either the FILTER or CORRELATE option to specify the secondary TP identifier, which is used for multi-trans TPs. The tp-id is an 8-byte hexadecimal string.

**URID**(unit-of-recovery-id)
Use with either the FILTER or CORRELATE option to specify a unit of recovery identifier, which represents part of a TP's processing for a protected conversation. The unit-of-recovery-id is a 32-byte hexadecimal string.

**USERID**(userid)
Use only with the FILTER option to specify a userid as a filter. The userid is an 8-byte EBCDIC character string.

**Examples of subcommands to format a SYSAPPC trace**

- **Example 1**: CTRACE subcommand to view all trace entries
  
  To view all the SYSAPPC trace records, enter:
  ```
  CTRACE COMP(SYSAPPC)
  ```

- **Example 2**: CTRACE Subcommand to view exception entries
  
  To format abnormal SYSAPPC events, such as abends or VTAM return codes, enter:
  ```
  CTRACE COMP(SYSAPPC) EXCEPTION
  ```

- **Example 3**: CTRACE subcommand for subcomponent
  
  To format all the records for one APPC/MVS subcomponent, enter the following subcommand. Use this subcommand to locate an error if you have narrowed the problem down to one subcomponent.
  ```
  CTRACE COMP(SYSAPPC) OPTIONS((FILTER,FUNCID(nn)))
  ```

- **Example 4**: CTRACE subcommand to view a userid's entries
  
  To format all the records for userid JOHNDOE, who is experiencing problems, enter the following subcommand. If you specified the USERID option when requesting the trace, this formatting option is redundant.
  ```
  CTRACE COMP(SYSAPPC) OPTIONS((FILTER,USERID(JOHNDOE)))
  ```

**Output from a SYSAPPC Trace**

The following topics contain examples of different types of output produced by a SYSAPPC trace.

**CTRACE COMP(SYSAPPC) SHORT subcommand output**

The SHORT parameter shows one line of output for each trace record. Figure 113 on page 382 shows an example of SYSAPPC component trace output formatted with the SHORT parameter.

```
  VEFMHSXT  00004101  155705.182844  VEFMH-5 RECEIVED
  VEFMHSER  00000101  155705.367233  VEFMH-5 IN TPEND
```

*Figure 113. CTRACE COMP(SYSAPPC) SHORT subcommand output*

The fields in each SHORT report line are:
**Mnemonic**

For example, VEFMH5XT.

**Entry ID**

The identifier for the trace record. For example, 00004101.

**Time**

The time in hh:mm:ss.tttttt format. For example, 15:57:05.182844.

**Title**

The title of the record. For example, VE:FMH-5 RECEIVED. Each title begins with a prefix that indicates the APPC/MVS subcomponent that wrote the trace record. For example, VE, which represents the VTAM exits subcomponent. Table 66 on page 383 relates the title prefixes to their APPC/MVS subcomponents.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Subcomponent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMI</td>
<td>Verb services</td>
</tr>
<tr>
<td>ASCH</td>
<td>APPC/MVS scheduler (ASCH)</td>
</tr>
<tr>
<td>CM</td>
<td>Conversation manager</td>
</tr>
<tr>
<td>ERROR</td>
<td>Recovery</td>
</tr>
<tr>
<td>FMH5</td>
<td>FMH-5 manager</td>
</tr>
<tr>
<td>LUM</td>
<td>LU manager</td>
</tr>
<tr>
<td>PC</td>
<td>Protected conversations</td>
</tr>
<tr>
<td>SDFM</td>
<td>MVS system data file manager (SDFM)</td>
</tr>
<tr>
<td>SF</td>
<td>Allocate queue services</td>
</tr>
<tr>
<td>SM</td>
<td>State machine</td>
</tr>
<tr>
<td>TE</td>
<td>Test enablement</td>
</tr>
<tr>
<td>TSI</td>
<td>Transaction scheduler interface</td>
</tr>
<tr>
<td>VC</td>
<td>Verb services</td>
</tr>
<tr>
<td>VE</td>
<td>VTAM exits</td>
</tr>
<tr>
<td>VS</td>
<td>Verb services</td>
</tr>
</tbody>
</table>

**CTRACE COMP(SYSAPPC) SUMMARY subcommand output**

The SUMMARY parameter gives the line in the SHORT report and most fields in each trace record. An example of SYSAPPC component trace output formatted with the SUMMARY parameter follows in Figure 114 on page 383.

```
SY1       PCESC     00007802  13:07:29.491950  PC:ENTRY STATE CHECK EXIT
  FUNCID... 02
  USERID... IBMUSER             JOBNAME... APPC
  ASIDHOME. 001C                ASIDPRI... 001C
  TPIDPRI... 00000000  TPIDSEC... 00000000
  SESSID... E723E63 AAB04BDF CONVID... 01000014
  CONVCOR... 063313F8 00000000  AQTOKEN... 00000000
  LUWID..... 10E4E2C9 C2D4E9F0 4BE9F0C3 F0C1D7F0 F36FD82A C0220700 01
  NETNAME.. USIBMZ0             LUNAME... ZS9CA0P03
  INSTNUM.. 6FD82AC0 2207  SEQNUM... 0001
  URIID..... AD355FD8 7EEF8000 00000007 01010000
```

Figure 114. CTRACE COMP(SYSAPPC) SUMMARY subcommand output

The fields in the SUMMARY report, after the first line, follow. See the SHORT report for the first line.
**FUNCID**

An identifier of the APPC/MVS subcomponent that wrote the trace record. See the FUNCID option for the identifiers.

**USERID**

The system was processing work for this userid when the trace record event occurred.

**JOBNAME**

The name of the job that the system was processing when the trace record event occurred.

**ASIDHOME**

The address space identifier (ASID) of the primary address space the system was processing when the trace record event occurred.

**TPIDPRI**

The TP identifier of a primary TP. (Multitrans TPs have a primary and a secondary TP.)

**TPIDSEC**

The TP identifier for a secondary TP. (Multitrans TPs have a primary and a secondary TP.)

**SESSID**

The identifier for a session.

**CONVID**

The identifier for a conversation.

**AQTOKEN**

The identifier for an allocate queue.

**LUWID**

The identifier for a logical unit of work. The following fields refer to the logical unit of work: If the LUWID is either all zeros or not valid,* the fields contain asterisks (•).

**NETNAME**

The network name for the logical unit of work.

**LUNAME**

The name of the local LU.

**INSTNUM**

The instance number for the logical unit of work.

**SEQNUM**

The sequence number for the logical unit of work.

**URID**

The identifier for a unit of recovery.

**CTRACE COMP(SYSAPPC) FULL subcommand output**

The FULL parameter gives all the data in the trace records. It contains the line in the SHORT report, the fields in the SUMMARY report, and KEY and ADDR fields. An example of SYSAPPC component trace output formatted with the FULL parameter follows in Figure 115 on page 385.
See the SHORT report and the SUMMARY report for the fields in the report. IBM might need the KEY and ADDR fields for diagnosis.

**FMH-5 trace data**

FMH-5 trace records contain information useful for tracking TP flow and diagnosing the following types of problems:

- Persistent verification problems
- Password maintenance problems
- APPC/MVS security problems

To obtain FMH-5 data, request the SYSAPPC component trace with an FMH5, INBOUND, or GLOBAL option. To isolate the FMH-5 records in the trace output, enter the following IPCS subcommand:

```
CTRACE COMP(SYSAPPC) OPTIONS((FILTER,FUNCID(03))) FULL
```

Table 67 on page 385 gives the mnemonic and title for each FMH-5 trace record and explains the record. Most of the trace records have FMH-5 itself formatted in KEY field X’0012’:

For the format of the FMH-5, see:

- z/OS Communications Server: SNA Programmer’s LU 6.2 Guide
- z/OS Communications Server: SNA Programmer’s LU 6.2 Reference.
<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Title</th>
<th>Description/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMH5LUNA</td>
<td>FMH5:LU IS NOT ACTIVE</td>
<td>An LU is not active. See the LUNAME field in the trace output. Enter a DISPLAY APPC command to find the status of this LU.</td>
</tr>
<tr>
<td>FMH5NOTP</td>
<td>FMH5:TP NAME IS NOT RECOGNIZED</td>
<td>The TP name was not specified correctly in the FMH-5.</td>
</tr>
<tr>
<td>FMH5NSCH</td>
<td>FMH5:NOT SERVED AND NO SCHEDULER</td>
<td>The TP cannot be scheduled because no scheduler is associated with the LU.</td>
</tr>
<tr>
<td>FMH5PFST</td>
<td>FMH5:FMH-5 PROFILE IS NOT VALID</td>
<td>The FMH-5 profile is incorrect; it is greater than 8 characters.</td>
</tr>
<tr>
<td>FMH5PIP</td>
<td>FMH5:PIP DATA PRESENT IN FMH-5</td>
<td>APPC/MVS found profile initialization parameters (PIP) data in the FMH-5; PIP data is not valid in FMH-5 for APPC/MVS.</td>
</tr>
<tr>
<td>FMH5PWCC</td>
<td>FMH5:PW CONV CLEANUP FAILED</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWDE</td>
<td>FMH5:PW DEALLOCATE FAILED</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWDF</td>
<td>FMH5:PW DEQUE REQUEST FAILED</td>
<td>An attempt to attach the SIGNON/Change password TP failed. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWQF</td>
<td>FMH5:PW QUEUE REQUEST FAILED</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWRF</td>
<td>FMH5:PW QUEUE REQUEST FAILED</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWSD</td>
<td>FMH5:PW SEND DATA FAILED</td>
<td>A SIGNON/Change password TP SendData call failed. Verify that your TP has a valid conversation established with the SIGNON/Change password TP. If you cannot resolve the problem, contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWRF</td>
<td>FMH5:PW SEND MESSAGE FAILED</td>
<td>A persistent verification signoff flow to the partner LU failed. The __SIGNONTO list in the partner LU may not be in sync with the local __SIGNONFROM list. See the following KEY fields:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KEY X'0026' contains the TCB address.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KEY X'001A' contains the name of the partner LU.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Key X'002F' contains the userid of the user whose SIGNOFF failed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure that your GDS variable was sent correctly. If you cannot resolve the problem, contact the IBM Support Center.</td>
</tr>
<tr>
<td>Mnemonic</td>
<td>Title</td>
<td>Description/Action</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| FMH5PWSM   | FMH5:PW SEND MESSAGE          | APPC/MVS could not attach the X’30F0F5F2’ expired password notification program to notify a partner system user that the user's password expired. See the following KEY fields:  
• KEY X’0026’ contains the TCB address.  
• KEY X’001A’ contains the name of the partner LU.  
• KEY X’002F’ contains the USERID of the user whose attach request failed.  
If you cannot resolve the problem, contact the IBM Support Center.                                                                                                        |
| FMH5PWSR   | FMH5:PW SIF RESERVE FAILURE   | Internal error. Contact the IBM Support Center.                                                                                                                                                                                                                                                                                                     |
| FMH5PWST   | FMH5:FMH-5 PASSWORD IS NOT VALID | The FMH-5 password is incorrect; it is greater than 8 characters.                                                                                                                                                                                                                                                                                  |
| FMH5QMFL   | FMH5:FMFP QUEUE MANAGER FAILURE | Internal error. Contact the IBM Support Center                                                                                                                                                                                                                                                                                                     |
| FMH5RECV   | FMH5:FMH-5 SUCCESSFULLY RECEIVED | An FMH-5 was successfully received by the local MVS LU.                                                                                                                                                                                                                                                                                             |
| FMH5RFRJ   | FMH5:RACF REQUEST REJECTED    | The system received a bad return code from one of the RACF services. See KEY X’0053’ for a code identifying the RACF service that failed. The code can be one of the following:  
1  
RACROUTE REQUEST=VERIFY  
2  
RACROUTE REQUEST=SIGNON TYPE=SIGNIN  
3  
RACROUTE REQUEST=SIGNON TYPE=QSIGNON  
4  
RACROUTE REQUEST=SIGNON TYPE=SIGNOFF  
See the following KEY fields:  
• KEY X’0054’ contains the return code for the RACF service request.  
• KEY X’0055’ contains the reason code for the RACF service request.  
• KEY X’0021’ contains the security authorization facility (SAF) return code for the service.                                                                 |
Table 67. FMH-5 trace entries in the SYSAPPC component trace (continued)

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Title</th>
<th>Description/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMH5TEST</td>
<td>FMH5:FMH5 ACCEPTED FOR TESTING</td>
<td>An FMH-5 is accepted for testing.</td>
</tr>
<tr>
<td>FMH5TPAD</td>
<td>FMH5:TP PROFILE ACCESS DENIED</td>
<td>TP profile access denied. Request=AUTH failed.</td>
</tr>
<tr>
<td>FMH5TPNA</td>
<td>FMH5:TP PROFILE IS NOT ACTIVE</td>
<td>The TP profile is not active. Get the TP name from the FMH-5 formatted at KEY X'0012' in this trace record. Then use the SDFM utility to look at the TP profile.</td>
</tr>
<tr>
<td>FMH5TPRQ</td>
<td>FMH5:TP PROFILE IS REQUIRED</td>
<td>The system found no TP profile for the requested TP. The scheduler associated with the TP requires a TP profile. The error is probably due to an SDFM problem. Look for trace records with a prefix of SDFM.</td>
</tr>
<tr>
<td>FMH5UIST</td>
<td>FMH5:FMH-5 USERID IS NOT VALID</td>
<td>The FMH-5 user ID is incorrect; it is greater than 8 characters.</td>
</tr>
<tr>
<td>FMH5VALID</td>
<td>FMH5:FMH5 SUCCESSFULLY VALIDATED</td>
<td>An FMH-5 has been successfully validated.</td>
</tr>
<tr>
<td>FMH5XLFNF</td>
<td>FMH5:EXCHANGE LOG NAME FAILED</td>
<td>APPC/MVS rejected the protected conversation because required log-name exchange processing did not occur.</td>
</tr>
<tr>
<td>QMANFAIL</td>
<td>FMH5:FMAX QUEUE MANAGER FAILURE</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>RESVFAIL</td>
<td>FMH5:SIF RESERVE FAILURE</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
</tbody>
</table>

### SYSAXR component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSAXR component trace for System REXX component.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSAXR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIAXRnn. Default member: CTIAXR00</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; error; error events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTIAXRxx and REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 2MB</td>
</tr>
<tr>
<td></td>
<td>• Range: 1MB - 2GB</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTIAXRnn parmlib member or REPLY to TRACE CT command</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes, when restarting a trace after stopping it</td>
</tr>
<tr>
<td></td>
<td>• Location: System REXX trace data space</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer; System REXX trace data space; trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSAXR)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Requesting a SYSAXR trace**

Specify options for requesting a SYSAXR component trace in a CTIAXRxx parmlib member or on the reply for a TRACE CT command. Changing SYSAXR trace options after AXR has started requires stopping and restarting the trace.

**CTIAXRnn parmlib member**

The following table indicates the parameters you can specify in a CTIAXRnn parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTIAXRnn?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>No</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>MOD</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Note:** The buffer size can be changed after IPL. To become effective the System REXX address space (AXR) must be restarted. Specify the new buffer size in the BUFSIZE parameter in the CTIAXRnn member being used.

The IBM supplied CTIAXR00 parmlib member initializes error tracing as soon as the System REXX address space starts. The contents of CTIAXR00 are:

```
TRACEOPTS
ON
OPTIONS('ERROR')
BUFSIZE(2M)
```

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, OFF or nnnnM</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Parameters**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**OPTIONS parameter**

The values for the OPTIONS parameter in the CTIAXRxx parmlib member and reply for a TRACE command are:

**ALL**
- Trace everything.

**AXRCMD**
- Trace Command function package events.

**AXRMLWTO**
- Trace multiline WTO function package events.

**AXRWTO**
- Trace WTO function package events.

**AXRWAIT**
- Trace wait function package events.

**AXRINFO**
- Trace information function package events.

**GETRXLIB**
- Trace AXREXX REQUEST=GETREXXLIB events.

**CANCEL**
- Trace AXREXX REQUEST=CANCEL events.

**COMMAND**
- Trace System REXX command events.

**ERROR**
- Trace error events.

**EXEC**
- Traces only events that occur under the specified exec name.

**REXXARGS**
- Trace all events associated with REXX arguments.

**REXXVARS**
- Trace all events associated with REXX variables.

**RXCLIENT**
- Trace events that occur under the invoker of AXREXX.

**RXSERVER**
- Trace all server events.

**Formatting a SYSAXR trace**

Format the trace with an IPCS CTRACE COMP(SYSAXR) subcommand.

**Output from a SYSAXR Variables Trace**

Each trace record has a header associated with it, as Figure 116 on page 391 shows. This header is consistent among ALL trace records, although not all fields are filled in (for example, there is no TracePrefixReqToken for command processing).

**Note:** This is NOT an interface and should only be used for diagnostic purposes.
The following shows the formatted IPCS output produced from the CTRACE COMP(SYSAXR) subcommand after running a REXX exec invoked using the AXREXX programming interface with the CTRACE REXXVARS option enabled.

The 1st 4 bytes following the header contains the index of the variable in the variable list (AXRArgLst). The remainder of the trace entry contains the value of the variable name.

The input/output variable contained 1 on entry to the exec and its final value when the exec completed was 101.

**SYSBCPII component trace**

Before using this component trace, ensure that you have read:
- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following table summarizes information for requesting a SYSBCPII component trace for base control program internal interface (BCPii).
Information | For SYSBCPII:
--- | ---
Parmlib member | CTIHWI00
Default and only member: CTIHWI00. If no valid CTIHWI00 member exists, minimal tracing is activated at BPCPII address space initialization.
Default tracing | Minimal tracing is always in effect for SYSBCPII. If no valid CTIHWI00 member exists, if CTrace is turned OFF, or if CTrace is ON with no format OPTIONS specified, minimal tracing occurs.
Trace request OPTIONS parameter | In CTIHWI00 and REPLY for TRACE command
Buffer | • Size: 4M
• Size set by: BCPII address space
• Change size after IPL: No
• Location: In the component data space
Trace records location | Data space buffer
Request of SVC dump | By DUMP or SLIP command, or by the component if trace is ON for SYSBCPII and a TRACE CT,OFF command is issued.
Trace formatting by IPCS | CTRACE COMP(SYSBCPII)
Trace format OPTIONS parameter | MIN, ALL

### Requesting a SYSBCPII trace

Specify options for requesting a SYSBCPII component trace in a CTIHWI00 parmlib member or on a reply to a TRACE CT,ON command.

You can change options for SYSBCPII tracing while the trace is running.

#### CTIHWI00 parmlib member

The following table indicates the parameters you can specify on a CTIHWI00 parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTIHWI00?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
</tbody>
</table>

You cannot change the SYSBCPII component trace buffer size of 4M.

The IBM-supplied CTIHWI00 parmlib member initializes minimal error tracing as soon as the HWIBCPII address space starts.

The contents of CTIHWI00 are:

```
TRACEOPTS ON OPTIONS('MIN')
```

It is suggested that you use these default settings in the CTIHWI00 parmlib member, unless the IBM Support Center requests different tracing options for BCPII. If the CTIHWI00 parmlib member cannot be found during BCPII initialization, or if it is in error, minimal tracing will be activated.

#### TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>Parameters</td>
<td>Allowed on TRACE CT for trace?</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
</tbody>
</table>

You can change options while a SYSBCPII trace is running.

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTIHWI00 parmlib member and reply for a TRACE command, in an alphabetical order, are:

**ALL**
Traces events listed for all the options, including module flow and tracing for every request in both success and failure paths.

**MIN**
Traces events related to BCPii component recovery, abnormal conditions, and other non-mainline paths.

**Examples of requesting SYSBCPII traces**

- The CTIHWI00 member requests ALL options.
  ```plaintext
  TRACEOPTS ON OPTIONS('ALL')
  ```

- The TRACE command specifying a Parmlib Member
  ```plaintext
  trace ct,on,comp=sysbcpii,parm=ctihw100
  ```

- The TRACE command with Options Specified in a REPLY
  ```plaintext
  trace ct,on,comp=sysbcpii
  * 8 ITT006A ...
  reply 8,options=(all),end
  ```

- The TRACE command to Stop Tracing
  ```plaintext
  trace ct,off,comp=sysbcpii
  ```

**Formatting a SYSBCPII trace**

Format the trace with an IPCS CTRACE COMP(SYSBCPII) subcommand.
Output from a SYSBCPII trace

Figure 117 on page 394 is an example of SYSBCPII component trace records formatted with the CTRACE COMP(SYSBCPII) SHORT subcommand:

<table>
<thead>
<tr>
<th>COMPONENT TRACE SHORT FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP(SYSBCPII)</td>
</tr>
<tr>
<td>**** 07/25/2008</td>
</tr>
<tr>
<td>SY1 Message 10012130 13:50:09.359769 HWIPHCPI About to call</td>
</tr>
<tr>
<td>SY1 Request 100321C0 13:50:09.359963 HWIPHRES HSDB created</td>
</tr>
<tr>
<td>SY1 State 10002007 13:50:09.361439 HWIPHARI Appl Extension located</td>
</tr>
<tr>
<td>SY1 Request 1000200E 13:50:09.369177 HWIPHARI Request Elem created</td>
</tr>
<tr>
<td>SY1 Request 10002011 13:50:09.368871 HWIPHARI Session Elem defined</td>
</tr>
<tr>
<td>SY1 Request 10002005 13:50:09.369328 HWIPHARI Request Elem queued</td>
</tr>
<tr>
<td>SY1 Request 10052220 13:50:09.374042 HWIPHSPI EDB Mds_MU created</td>
</tr>
<tr>
<td>SY1 State 10072351 13:50:09.427487 HWIPHMNX Appl Extension located</td>
</tr>
<tr>
<td>SY1 Request 10072352 13:50:09.427678 HWIPHMNX MDS_MU Req received</td>
</tr>
</tbody>
</table>

Figure 117. Example: SYSBCPII component trace records formatted with CTRACE COMP(SYSBCPII) SHORT subcommand
CTRACE COMP(SYSBCPII) FULL subcommand output

Figure 118 on page 395 is an example of SYSBCPII component trace records formatted with the CTRACE COMP(SYSBCPII) FULL subcommand.

<table>
<thead>
<tr>
<th>COMPONENT TRACE FULL FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP(SYSBCPII)</td>
</tr>
<tr>
<td>**** 07/25/2008</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTYPE</th>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY1</td>
<td>Message</td>
<td>10012130</td>
<td>13:50:09.359769</td>
<td>HWIPHCSI About to call HWIPHRES</td>
</tr>
<tr>
<td>ASIDHOME.0018</td>
<td>ASIDPRI..0018</td>
<td>JOBNAME..HWINBCPII</td>
<td>TCBADDR..005DFA48</td>
<td></td>
</tr>
<tr>
<td>KEY....0004</td>
<td>LEN....0026</td>
<td>COUNT....0001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BCPii about to pass HSDB to HWIPHRES.

| SY1     | Request | 100321C0 | 13:50:09.359963 | HWIPHRES HSDB created |
| ASIDHOME.0018 | ASIDPRI..0018 | JOBNAME..HWINBCPII | TCBADDR..005DFA48 |
| KEY....0005 | LEN....003C | COUNT....0001 |

| C8E2C4C2 | 080100B4 | 7ED57A54 | 000000001 | HSDB....N:...... |
| 40000000 | 00000000 | 00000000 | CBE6C9E2 | ...........HWIS |
| C5D9E540 | 00000000 | 00000000 | 00000000 | 5C404040 | ERV.......* |
| 40404040 | 5C404040 | 40404040 |

| SY1     | State   | 10002007 | 13:50:09.361439 | HWIPHARI Appl Extension located |
| ASIDHOME.0018 | ASIDPRI..0018 | JOBNAME..HWINBCPII | TCBADDR..005DFA48 |
| KEY....0005 | LEN....0060 | COUNT....0001 |

| C8E6C1E7 | 01100060 | C2BE9BC7 | 013E74E4 | HSE ....B..G...U |
| 00000000 | 00000000 | 7ED54FA0 | 000000001 |
| 00FB2A00 | 005DFA48 | 00000060 | 00000001 |
| 00000000 | 00000000 | 00000000 | 0000001C | ERV........* |
| 7F548228 | 00000000 | 00000000 | 00000000 |

| SY1     | Request | 1000200E | 13:50:09.368871 | HWIPHARI Session Elem defined |
| ASIDHOME.0018 | ASIDPRI..0018 | JOBNAME..HWINBCPII | TCBADDR..005DFA48 |
| KEY....0005 | LEN....0080 | COUNT....0001 |

| C8E2C540 | 01100080 | F2BE9BC7 | 013E74E4 | HSE ....B..G...U |
| 00000000 | 00000000 | 7ED54FA0 | 000000001 |
| 00000000 | 00000000 | 00000000 | 00000000 |
| 00000000 | 00000000 | 00000000 | 00000000 |

---

**SYSBHI component trace**

Before using this component trace, ensure that you have read:

• “Planning for component tracing” on page 354
• “Obtaining a component trace” on page 362
• “Viewing the component trace data” on page 374

Basic HyperSwap socket support component trace is described by the following attributes:

• Trace buffers reside in 64-bit common ECSA. Size is controlled by the TRACE CT operator command.
Component Trace

- Minimal and unexpected event tracing is activated during Basic HyperSwap management address space initialization.
- Component trace buffers externalized through:
  - DUMP or SLIP operator command when the Basic HyperSwap management address space or a BHIHSRV address space is requested to be dumped.
  - SVC dumps issued by Basic HyperSwap management address space or the BHIHSRV address space.
  - MVS component trace (CTRACE) external writer.
- Trace options revert to minimal event and exception tracing when the operator turns the trace off.

The following summarizes information for requesting a SYSBHI component trace for Basic HyperSwap.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSBHI:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIBHIxx; Default member: CTIBHI00 (IBM provides a sample in SYS1.SAMPLIB)</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; error; error events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTIBHIxx and REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 4MB&lt;br&gt;• Range: 4MB - 64MB&lt;br&gt;• Size set by: CTIBHIxx parmlib member or REPLY to TRACE CT command&lt;br&gt;• Change size after IPL: Yes&lt;br&gt;• Location: 64-bit Common Storage Area (ECSA)</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer; trace data sets</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command when dumping the HyperSwap Management address space or one of the BHIHSRV address spaces</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSBHI)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Requesting a SYSBHI trace

Specify options for requesting a SYSBHI component trace in a CTIBHIxx parmlib member or on the reply for a TRACE CT command

**CTIBHIxx parmlib member**

The following table indicates the parameters you can specify in a CTIBHIxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTICEAnn?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>MOD</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
</tbody>
</table>
The IBM supplied CTIBHI00 parmlib member in SYS1.SAMPLIB can be used as a starting point for defining BHI CTRACE options. The contents of CTIBHI00 are:

```
TRACEOPTS
   ON
   BUFSIZE('4M')
   OPTIONS('MINIMUM')
```

### TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

#### Parameters allowed on TRACE CT for Trace?

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, OFF or nnnnM</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### Parameters allowed on TRACE CT for Write?

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

#### Parameters allowed on REPLY for Trace?

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### OPTIONS parameter

The values for the OPTIONS parameter in the CTIBHIxx parmlib member and reply for a TRACE command are:

- **ALL**
  - Trace everything.

- **FLOW**
  - Trace the flow of all requests through their processing.

- **INITTERM**
  - Trace the initialization and termination process of the BHIHSRV address spaces and tasks.

- **MINIMUM**
  - Trace errors and unusual events.

#### Formatting a SYSBHI trace

Format the trace with an IPCS CTRACE COMP(SYSBHI) subcommand.
**Output from a SYSBHI trace**

Figure 119 on page 398 shows an example of the formatted IPCS output produced from the CTRACE COMP(SYSBHI) SHORT subcommand.

<table>
<thead>
<tr>
<th>COMPtrace SHORT FORMAT</th>
<th>COMP(SYSBHI)</th>
<th>**** 12/20/2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY1 InitMsg 00000001 19:20:28.105817 CTrace Initialized</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1 TskStrtd 00000002 19:20:28.105858 Task has been started</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1 BPXRslt 0000002B 19:20:28.106110 BPX Service Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1 BPXRslt 0000002B 19:20:28.107162 BPX Service Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1 RACFRslt 00000035 19:20:56.880588 Racf Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1 LognRejt 00000036 19:20:56.880589 Logon Rejection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1 BPXRslt 0000002B 19:20:56.880626 BPX Service Results</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 119. Example: formatted IPCS output produced from CTRACE COMP(SYSBHI) SHORT subcommand*
Figure 120 on page 399 shows an example of the formatted IPCS output produced from the CTRACE COMP(SYSBHI) FULL subcommand.

<table>
<thead>
<tr>
<th>SYNAME</th>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY1</td>
<td>InitMsg</td>
<td>00000001</td>
<td>19:20:28.105817</td>
<td>CTrace Initialized</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..... 0025 IssueMod. IOSHMSRT TCB...... 005D6048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HSAITidx. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MiscEbcdd. CTrace Initialization Complete</td>
</tr>
<tr>
<td>SY1</td>
<td>TskStrtd</td>
<td>00000002</td>
<td>19:20:28.105858</td>
<td>Task has been started</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..... 0025 IssueMod. IOSHMSRT TCB...... 005D6048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HSAITidx. 00000000</td>
</tr>
<tr>
<td>SY1</td>
<td>BPXRslt</td>
<td>00000002B</td>
<td>19:20:28.106110</td>
<td>BPX Service Results</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..... 0025 IssueMod. IOSHMSRT TCB...... 005D6048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HSAITidx. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BPXServ.... BPX10DB - Querying DUB Status</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RetValue. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RetCode.. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RsnCode.. 00000000</td>
</tr>
<tr>
<td>SY1</td>
<td>BPXRslt</td>
<td>00000002B</td>
<td>19:20:28.107162</td>
<td>BPX Service Results</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..... 0025 IssueMod. IOSHMSRT TCB...... 005D6048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HSAITidx. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BPXServ.... BPX1ENV - Reg USS Shutdown Exit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RetValue. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RetCode.. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RsnCode.. 00000000</td>
</tr>
<tr>
<td>SY1</td>
<td>RACFRslt</td>
<td>000000035</td>
<td>19:20:56.880588</td>
<td>Racf Results</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..... 0025 IssueMod. IOSHMSRT TCB...... 005D6048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HSAITidx. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MiscEbcdd. Req=Verify Envir=Create</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RetCode.. 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RsnCode.. 00000000</td>
</tr>
<tr>
<td>SY1</td>
<td>LognRejt</td>
<td>000000036</td>
<td>19:20:56.880589</td>
<td>Logon Rejection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..... 0025 IssueMod. IOSHMSRT TCB...... 005D6048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HSAITidx. 00000000</td>
</tr>
</tbody>
</table>

--- TOH Start ---
Acronym.. TOH   Version.. 01  Size..... 00000038
Function Code: 000000C8 (Logon Request)
User Token     D4A8E396 92859540 40404040 40404040 | MyToken |
BuffSize. 00000000 Buff_Off. 0000
Return Code: 00000390 (SAF or RACF not available or error)
Reason Code: 05080800
RACROUTE Function : Req=Verify Envir=Create
RACROUTE Return Code: 08
RACF Return Code : 08  RACF Reason Code: 00
--- TOH End ---

Figure 120. Example: formatted IPCS output produced from CTRACE COMP(SYSBHI) FULL subcommand

**SYSCEA component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374
The following summarizes information for requesting a SYSCEA component trace for common event adapter component.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSCEA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTICEAnn; default member: CTICEA00</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; error; error events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTICEAxx and REPLY for TRACE command</td>
</tr>
</tbody>
</table>

**Buffer**
- Default: 2MB
- Range: 1MB - 2GB
- Size set by: CTICEAnn parmlib member or REPLY to TRACE CT command
- Change size after IPL: Yes, when restarting a trace after stopping it
- Location: common event adapter trace data space.

**Trace records location**
- Address-space buffer; common event adapter trace data space; trace data set

**Request of SVC dump**
- By DUMP or SLIP command

**Trace formatting by IPCS**
- CTRACE COMP(SYSCEA)

**Trace format OPTIONS parameter**
- Yes

### Requesting a SYSCEA trace

Specify options for requesting a SYSCEA component trace in a CTICEAxx parmlib member or on the reply for a TRACE CT command. Changing SYSCEA trace options after CEA has started requires stopping and restarting the trace.

**CTICEAnn parmlib member**

The following table indicates the parameters you can specify in a CTICEAnn parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTICEAnn?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>No</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>MOD</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Note:** The buffer size can be changed after IPL. To become effective, the common event adapter address space (CEA) must be restarted. Specify the new buffer size in the BUFSIZE parameter in the CTICEAnn member being used.
The IBM supplied CTICEA00 parmlib member initializes error tracing as soon as the common event adapter address space starts. The contents of CTICEA00 are:

```
TRACEOPTS
  ON
  BUFSIZE (2M)
  OPTIONS('ERROR')
```

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, OFF or nnnnM</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**OPTIONS parameter**

The values for the OPTIONS parameter in the CTICEAxx parmlib member and reply for a TRACE command are:

- **ALL**
  - Trace everything.

- **CNTLFLOW**
  - Trace CNTLFLOW events.

- **EVNTFLOW**
  - Trace EVNTFLOW events.

- **JOBSFLOW**
  - Trace JOBSFLOW events.

- **PDWBFLOW**
  - Trace PDWBFLOW events.

- **ERROR**
  - Trace error events.

**Formatting a SYSCEA trace**

Format the trace with an IPCS CTRACE COMP(SYSCEA) subcommand.
Output from a SYSCEA trace

Figure 121 on page 402 shows an example of the formatted IPCS output produced from the CTRACE COMP(SYSCEA) FULL subcommand.

```plaintext
COMPONENT TRACE FULL FORMAT
COMP(SYSCEA)
***** 06/09/2008
SYSTYPE            ENTRY ID    TIME STAMP     DESCRIPTION
------------------ --------  ---------------  -------------------------------
SY1                ALL       05030001 11:37:11.181208 CEA CTRACE DEBUG INFO
FF00003E 7F47A000 00000000 00000000 00028000 7F74ACA0 | .0.."........... |
00000000 00000000 00000000 00000000 | ................ |
00000000 00000000 00000000 00000000 | ................ |
SY1                CNTLFLOW 04910001 11:37:11.181208 CEA SERVER
00160000 C3C5C140 48404040 008E2E88 | ....CEA ...h |
C3C5C1E2 60C905C9 E30C1D3 C9E9C5C4 | CEAS_INITIALIZED |
C3C5C1E2 60C905C9 E30C1D3 C9E9C5C4 | CEAS_INITIALIZED |
00000000 00000000 00000000 00000000 00000000 | ................ |
00000000 00000000 | ............ |
SY1                PDWBFLOW 04940001 11:38:01.616152 PDWB -- DONE WITH GETINCIDENT
00160000 C3C5C140 48404040 008E2E88 | ....CEA ...h |
E4E2E26D C9E26DE4 D7404040 40404040 | USS IS UP |
00000000 00000000 00000133 00000000 | ................ |
00000000 00000000 | ............ |
SY1                CNTLFLOW 04910001 11:37:11.181208 CEA SERVER
00160000 C3C5C140 48404040 008E2E88 | ....CEA ...h |
E4E2E26D C9E26DE4 D7404040 40404040 | USS IS UP |
00000000 00000000 00000133 00000000 | ................ |
00000000 00000000 | ............ |
SY1                PDWBFLOW 04940001 11:38:01.616152 PDWB -- DONE WITH GETINCIDENT
00160000 C3C5C140 48404040 008E2E88 | ....CEA ...h |
E4E2E26D C9E26DE4 D7404040 40404040 | USS IS UP |
00000000 00000000 00000133 00000000 | ................ |
00000000 00000000 | ............ |
```

Figure 121. Example: formatted IPCS output produced from CTRACE COMP(SYSCEA) FULL subcommand

SYSDLF component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSDLF component trace for the data lookaside facility (DLF).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSDLF:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; always on when DLF is running</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>None</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: N/A</td>
</tr>
<tr>
<td></td>
<td>• Range: N/A</td>
</tr>
<tr>
<td></td>
<td>• Size set by: MVS system</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: No</td>
</tr>
<tr>
<td></td>
<td>• Location: Data space. In the REPLY for the DUMP command, specify DSPNAME=('DLF.CC0FGSD0)</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer, data-space buffer</td>
</tr>
</tbody>
</table>
### Requesting a SYSDLF trace

The trace runs whenever DLF is in control. No actions are needed to request it.

### Formatting a SYSDLF trace

Format the trace with an IPCS CTRACE COMP(SYSDLF) subcommand. The subcommand has no OPTIONS values.

### Output from a SYSDLF trace

Figure 122 on page 403 is an example of DLF component trace records formatted with a CTRACE COMP(SYSDLF) FULL subcommand. It shows formatted exception records from the trace buffers.

---

**DLF COMPONENT TRACE FULL FORMAT**

```
COFRCVRY 00000000 15:47:40.397545 DLF RECOVERY ENTRY
HASID... 000E SASID... 000E CPUID... FF170067 30900000
MODNAME. COFMCON2 ABEND... 840C1000 REASON.. 00000001
EPTABLE. CON2 EST2 .... .... .... .... .... .... ....
COFRCVRY 00000001 15:47:40.397625 DLF RECOVERY EXIT
HASID... 000E SASID... 000E CPUID... FF170067 30900000
MODNAME. COFMCON2 ABEND... 840C1000 REASON.. 00000001
RETCODE. 0000002C RSNCODE. 0000C200 FTPRTS.. C0000000 DATA.... 00000000
```

*Figure 122. CTRACE COMP(SYSDLF) FULL subcommand output*

The fields in the report are:

**COFRCVRY**

The name or identifier of the trace record.

**00000000**

The identifier in hexadecimal.

**15:47:40.397545**

The time stamp indicating when the record was placed in the trace table.

**HASID... 000E**

The home address space identifier.

**SASID... 000E**

The secondary address space identifier.

**CPUID... FF170067 30900000**

The identifier of the processor that placed the record in the trace table.

**CALLER**

The address of the routine that issued a DLF service request.

**MODNAME COFMCON2**

The name of the module that was running.

**ABEND... 840C1000**

The abend that occurred and caused DLF to enter recovery.

**REASON.. 00000001**

The reason code associated with the abend.
SYSDSOM component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSDSOM component trace for distributed SOMobjects (DSOM).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSDSOM:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>No</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: N/A</td>
</tr>
<tr>
<td></td>
<td>• Range: N/A</td>
</tr>
<tr>
<td></td>
<td>• Size set by: MVS system</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: No</td>
</tr>
<tr>
<td></td>
<td>• Location: Address space</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSDSOM)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Requesting a SYSDSOM trace

Request the trace by specifying any non-zero value on the SOMDTRACELEVEL DSOM environment variable.

Formatting a SYSDSOM trace

Format the trace with an IPCS CTRACE COMP(SYSDSOM) subcommand. The subcommand has the following OPTIONS values:

**SKIPID**

Omits the jobname, ASID, and thread identifier from the output.
LONGFORM
Tells the system to display detailed output. In the output, each trace function might have multiple
trace elements, each on a separate line. If you do not specify LONGFORM, the default is SHORTFORM.
Do not specify both LONGFORM and SHORTFORM on the OPTIONS parameter.

SHORTFORM
Tells the system to display abbreviated output. In the output, each trace function is on one line.
SHORTFORM is the default value. Do not specify both LONGFORM and SHORTFORM on the OPTIONS
parameter.

Output from a SYSDSOM trace
The output shown in Figure 123 on page 405 is an example of DSOM component trace records formatted
with a CTRACE COMP(SYSDSOM) FULL OPTIONS((SKIPID,SHORTFORM)) subcommand. It shows
formatted exception records from the trace buffers.

```
KESYS522  METRETRN  00000004  21:31:34.864277  Return from method
  Entry to method: ImplRepository::somInit
```

Figure 123. Example: DSOM component trace records formatted with CTRACE COMP(SYSDSOM) FULL
OPTIONS((SKIPID,SHORTFORM))

Figure 124 on page 405 is an example of DSOM component trace records formatted with a CTRACE
COMP(SYSDSOM) FULL subcommand. It shows formatted exception records from the trace buffers.

```
SYSTYPE  MNEMONIC  ENTRY ID    TIME STAMP     DESCRIPTION
-------   --------  --------  ---------------  -------------
KESYS522  GETBUFF   00000001  21:31:30.198289  Get new trace buffer
  JOBNAME. KREPROC  ASID.... 0029     THREADID 04233100 00000000
  Buffer address: 7F672508
KESYS522  METDEBUG  00000004  21:31:39.410681  Method debug
  JOBNAME. KREPROC  ASID.... 0029     THREADID 04233100 00000000
  Entry to method: SOMOA::somInit
KESYS522  METRETRN  00000005  21:31:40.000019  Return from method
  JOBNAME. KREPROC  ASID.... 0029     THREADID 04233100 00000000
  Exiting method: SOMOA::somInit, RC(hex)=00000000, RSN=00000000
```

Figure 124. Example: DSOM component trace records formatted with CTRACE COMP(SYSDSOM) FULL

The output shown in Figure 125 on page 406 is an example of DSOM component trace records formatted
with a CTRACE COMP(SYSDSOM) FULL OPTIONS((SKIPID)) DSN('dsom.trace.dsn') subcommand. It shows
formatted exception records from the trace buffers.
COMPONENT TRACE FULL FORMAT
SYSNAME(KESYS522)
COMP(SYSDSOM)
OPTIONS((SKIPID))
**** 09/29/1995

SYSTYPE  MNEMONIC  ENTRY ID    TIME STAMP     DESCRIPTION
-------   --------  --------  ---------------  --------------
KESYS522  GETBUFF   00000001  21:31:30.198289  Get new trace buffer
KESYS522  METDEBUG  00000004  21:31:39.410681  Method debug
KESYS522  METRETRN  00000005  21:31:40.000019  Return from method

Figure 125. Example: DSOM component trace records formatted with CTRACE COMP(SYSDSOM) FULL OPTIONS((SKIPID)) DSN('dsom.trace.dsn')

The fields in the report are:

KESYS522
The name of the system.

METDEBUG
The name of the trace event.

00000004
The decimal identifier of the trace event.

21:31:39.410681
The time stamp indicating when the record was placed in the trace table.

ASID
The ASID of the job listed in the JOBNAME field.

JOBNAME. KREPROC
The job name.

THREADID 04233100 00000000
The POSIX thread identifier.

Entry to method
The entry to the somInit method in class SOMOA.

Exiting Method
The exit from the somInit method in class SOMOA.

**SYSDUMP component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

SDUMP component trace is described by the following attributes:

- Trace buffers reside in 64-bit common storage area. Size is controlled by the TRACE CT operator command.
- Tracing is activated during DUMPSRV address space initialization.
- SDUMP CTRACE is captured at the end of the SDUMP capture phase and dumped at the end of the dump. If the trace data is needed at other times, you must request a new dump to collect the SDUMP CTRACE.
- The MVS component trace (CTRACE) external writer can also capture SDUMP CTRACE.
• Trace options revert to minimal event tracing when the operator turns the trace off.

The following table summarizes the information required to request a SYSDUMP component trace for SDUMP.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSDUMP:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIDMPxx; Default member: CTIDMPP00</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; full tracing</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTIDMPxx and REPLY for TRACE CT command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 4MB</td>
</tr>
<tr>
<td></td>
<td>• Range: 4MB – 32MB</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTIDMPxx parmlib member or TRACE CT command</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes</td>
</tr>
<tr>
<td></td>
<td>• Location: 64-bit Common Storage Area</td>
</tr>
<tr>
<td>Trace records location</td>
<td>64-bit Common Storage Area; trace data sets</td>
</tr>
<tr>
<td>Externalizing trace data</td>
<td>Included in every SDUMP; can also use external writer to write data to a trace data set</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSDUMP)</td>
</tr>
<tr>
<td>IPCS trace format OPTIONS parameter</td>
<td>None</td>
</tr>
<tr>
<td>Maximum trace entry size</td>
<td>4050 bytes</td>
</tr>
</tbody>
</table>

### Requesting a SYSDUMP trace

Specify options for requesting a SYSDUMP component trace in a CTIDMPxx parmlib member or on the reply for a TRACE CT command.

#### CTIDMPxx parmlib member

The following table indicates the parameters you can specify in a CTIDMPxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTIDMPxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>MOD</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>
You can use the IBM supplied CTIDMP00 parmlib member in SYS1.PARMLIB as a starting point for defining SDUMP CTRACE options. The contents of CTIDMP00 are as follows:

```
TRACEOPTS
ON
BUFSIZE(4M)
OPTIONS('ALL')
```

**TRACE and REPLY commands**

The following tables indicate the parameters that you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, OFF or nnnnM</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**OPTIONS parameter**

The following values are available for the OPTIONS parameter in the CTIDMPxx parmlib member and reply for a TRACE command:

- **ALL**
  - Trace everything.
- **MINIMUM**
  - Trace errors.

**Formatting a SYSDUMP trace**

Format the trace with an IPCS CTRACE COMP(SYSDUMP) subcommand.

**Output from a SYSDUMP trace**

Figure 126 on page 409 is an example of the formatted IPCS output that is produced from the CTRACE COPM(SYSDUMP) FULL subcommand.
### Component Trace

**COMPONENT TRACE FULL FORMAT**
**COMP(SYSDUMP)**  
**** 08/20/2014

<table>
<thead>
<tr>
<th>SYNAME</th>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S790</td>
<td>WtDSVSST</td>
<td>0000007F</td>
<td>17:59:02.744031</td>
<td>Wait for DSVSSTECB to be posted</td>
</tr>
</tbody>
</table>
|        |          |          |            | ASID:.... 0005 IssueMod. IEAVTSST TCB....... 004FD900  
|        |          |          |            | RetnAddr. 8980258A |
| S790   | LockSdmp | 00000024 | 18:03:35.343314 | Sdump is locked |
|        |          |          |            | ASID:.... 001B IssueMod. IEAVAD00 TCB....... 004FF200  
|        |          |          |            | RetnAddr. 862D28EC  
|        |          |          |            | CVTSDBF... 89956FF8  
|        |          |          |            | RTCTSDPL. 0000000000  
|        |          |          |            | JobName... DCMTESTC |
| S790   | DmpStrtd | 00000002 | 18:03:35.343317 | Sdump started |
|        |          |          |            | ASID:.... 001B IssueMod. IEAVAD00 TCB....... 004FF200  
|        |          |          |            | RetnAddr. 862D29D4  
|        |          |          |            | RTCTSDPL. 894CF620 |
| S790   | ClrStor  | 00000029 | 18:03:35.343782 | Storage cleared for new dump |
|        |          |          |            | ASID:.... 001B IssueMod. IEAVAD00 TCB....... 004FF200  
|        |          |          |            | RetnAddr. 862D2A78 |
| S790   | EntyTSPR | 00000013 | 18:03:35.343788 | Entry at IEAVTSPR |
|        |          |          |            | ASID:.... 001B IssueMod. I... TCB....... 004FF200  
|        |          |          |            | RetnAddr. 812D61B8  
|        |          |          |            | RTSDFNCD. 0081 |
| S790   | EntyTSPR | 00000013 | 18:03:35.343795 | Entry at IEAVTSPR |
|        |          |          |            | ASID:.... 001B IssueMod. I... TCB....... 004FF200  
|        |          |          |            | RetnAddr. 812D61B8  
|        |          |          |            | RTSDFNCD. 0085 |
| S790   | SdumpPml | 00000004 | 18:03:35.343813 | Sdump PLst after calling TSPR |
|        |          |          |            | ASID:.... 001B IssueMod. IEAVAD00 TCB....... 004FF200  
|        |          |          |            | RetnAddr. 862D3120  
|        |          |          |            | RTCTSDPL. 023CCF40  
|        |          |          |            | Sdump ParmList: |
|        |          |          |            | +0000 10A9010 00000000 00000000 023CC838 | .........H.. |
|        |          |          |            | +0010 00000000 00000000 00000000 00000000 | ...[...& |
|        |          |          |            | +0020 00000000 00000000 00C00003 25504000 | ...[...0... |
|        |          |          |            | +0030 00000000 00000000 00000000 00000000 | ...[...0... |
|        |          |          |            | +0040 00000000 00000000 00000000 00000000 | ...[...0... |
|        |          |          |            | +0050 00000000 00000000 00000000 00000000 | ...[...0... |
|        |          |          |            | +0060 00000000 00000000 00000000 00000000 | ...[...0... |
|        |          |          |            | +0070 00000000 00000000 025B4190 00000000 | ...[...0...
|        |          |          |            | +0080 00000000 00000000 00000000 00000000 | ...[...0...
|        |          |          |            | +0090 00000000 00000000 00000000 00000000 | ...[...0...
|        |          |          |            | +00A0 00000000 00000000 00000000 00000000 | ...[...0...
|        |          |          |            | +00B0 00000000 00000000 00000000 00000000 | ...[...0...
|        |          |          |            | Title.... DMPTEST: Test case dump for >2G local capture optimization............................ |
| S790   | DumpSupp | 00000006 | 18:03:35.343820 | Dump is not being suppressed |
|        |          |          |            | ASID:.... 001B IssueMod. IEAVAD00 TCB....... 004FF200  
|        |          |          |            | RetnAddr. 862D33CC |

Figure 126. Example: SDUMP component trace records formatted with CTRACE COMP(SYSDUMP) FULL

---

**Viewing SDUMP CTRACE in IPCS Active**

You can view SDUMP CTRACE data in IPCS from active system storage. Ensure that the dump source is set to 'ACTIVE' and that the user has authorized READ access to the FACILITY class resource BLSACTV.ADDRSPAC. See "Active Storage Processing" in **z/OS MVS IPCS User's Guide** for more information.
### SYSGRS component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSGRS component trace for global resource serialization.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSGRS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnGRSxx; default member: CTIGRS00 specified in GRSCNF00 member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes, if global resource serialization ring is active; CONTROL and MONITOR options</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes, if global resource serialization star is active; CONTROL1, CONTROL2, SIGNAL0 and MONITOR options</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnGRSxx and REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 16MB</td>
</tr>
<tr>
<td></td>
<td>• Range: 128KB - 2047MB (System rounds size up to nearest 64KB boundary.)</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnGRSxx member</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes, when restarting a trace after stopping it</td>
</tr>
<tr>
<td></td>
<td>• Location: In the GRS address space above the bar.</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer, trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>“SYSGRS component trace” on page 410</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>FLOW, CONTROL, MONITOR, REQUEST, SIGNAL, and RSA. See “OPTIONS parameter” on page 411 for details on sub-options.</td>
</tr>
</tbody>
</table>

### Requesting a SYSGRS trace

Specify options for requesting a SYSGRS component trace on a CTnGRSxx parmlib member or on the reply for a TRACE CT command.

You can change options for SYSGRS tracing while the trace is running.

#### CTnGRSxx parmlib member

The following table indicates the parameters you can specify on a CTnGRSxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnGRSxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
</tbody>
</table>
IBM-supplied GRSCNF00 parmlib member specifies CTIGRS00 as the default.

IBM-supplied CTIGRS00 parmlib member:
- Specifies that GRS tracing is begun at IPL
- The parmlib member contains:

  **TRACEOPTS OFF**
  This parameter turns off all SYSGRS tracing options except for the minimum options (MINOPS).
- See the “Specify buffers” on page 357 section for information about the buffer size default and possible sizes.

IBM recommends that you use the CTIGRS00 parmlib member, unless the IBM Support Center requests different tracing for global resource serialization.

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnGRSxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

IBM-supplied GRSCNF00 parmlib member specifies CTIGRS00 as the default.

IBM-supplied CTIGRS00 parmlib member:
- Specifies that GRS tracing is begun at IPL
- The parmlib member contains:

  **TRACEOPTS OFF**
  This parameter turns off all SYSGRS tracing options except for the minimum options (MINOPS).
- See the “Specify buffers” on page 357 section for information about the buffer size default and possible sizes.

IBM recommends that you use the CTIGRS00 parmlib member, unless the IBM Support Center requests different tracing for global resource serialization.

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnnnM, or OFF</td>
<td>One is required. The buffer size can be changed only when the trace is OFF or the trace is ON.</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

You can change options while a SYSGRS trace is running. However, to change the buffer size, you have to stop the trace and restart it with the new buffer size.

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTnGRSxx parmlib member and reply for a TRACE command are listed below. The sub-options on the CONTROL, REQUEST, MONITOR, SIGNAL and FLOW, allow you to refine the set of events traced for the major option. When you select the major option, all events pertaining to that option are traced. However, you can select one or more of the sub-options instead of the major option and thus limit the trace to only those events included in the sub-options specified. A major option, such as MONITOR, and all of its sub-options (in this case MONITOR0, MONITOR1, and MONITOR2 through MONITORF) is referred to as an option group. In alphabetical order the values for the OPTIONS parameter are:
CONTROL
Traces unusual events and events related to the establishment, modification, or termination of the control structure needed for processing such as:

• Dynamic RNL changes
• Error events
• XCF services used when setting up for processing

When you specify CONTROL, all of the following sub-options are traced.

CONTROL0
Traces dynamic RNL changes only.

CONTROL1
Traces events related to the establishment of or termination of membership in the global resource serialization group connection to the global resource serialization coupling facility structures.

CONTROL2
Traces global resource serialization recovery processing only.

CONTROL3
Traces global resource serialization resource manager events for abnormal task and ASID termination only.

CONTROL4-CONTROLE
Reserved for IBM use.

CONTROLF
Traces all other unusual events not included in sub-options CONTROL0 through CONTROL3.

FLOW
Traces the flow of control from one entry point to another.

FLOW0
Traces GRS Star system server processing only.

FLOW1
Traces GQSCAN processing only.

FLOW2
Traces cross-system communications processing only.

FLOW3
Traces command processing only.

FLOW4
Traces storage manager services only.

FLOW5
Traces coupling facility processing only.

FLOW6
Traces initialization processing only.

FLOW7
Traces contention monitor processing only.

FLOW8
Traces general ENQ/DEQ processing only.

FLOW9
Traces entry to GQSCAN/ISGQUERY only.

FLOWA
Traces GRS Latch Manager processing only.

FLOWB-FLOWD
Reserved for IBM use.
FLOWE
Activates extended tracing for the GRS Storage Manager. Do not turn on this option without
direction from IBM Service.

FLOWF
Reserved for IBM use.

Monitor
Traces events for selected global resource serialization invocations of monitoring and communication
services provided by other components.

MONITOR0
Traces use of XES services.

MONITOR1
Traces use of XCF services.

MONITOR2-MONITORF
Reserved for IBM use.

REQUEST
Traces events for global ENQ, DEQ, GQSCAN, and RESERVE macro requests, and GRS command
processing.

REQUEST0
Traces ENQ/RESERVE requests only.

REQUEST1
Traces DEQ requests only.

REQUEST2
Traces GQSCAN only.

REQUEST3
Traces IXLLOCK only.

REQUEST4
Traces command processing only.

REQUEST5
Traces lock structure (ISGLOCK) rebuild processing only.

REQUEST6-REQUESTF
Reserved for IBM use.

RSA
Traces events for RSA control information.

SIGNAL
Traces events for selected global resource serialization invocations of cross-system coupling facility
(XCF) signalling service processing.

SIGNAL0
Traces migration signals only.

SIGNAL1
Traces GQSCAN signals only.

SIGNAL2
Traces ENQ/DEQ signals, including RNL change signals only.

SIGNAL3
Traces contention monitor signals only.

SIGNAL4-SIGNALF
Reserved for IBM use.

Examples of requesting SYSGRS traces
• Example 1: CTnGRSxx member
The member requests CONTROL, MONITOR, and RSA options and doubles the default buffer size.

```plaintext
TRACEOPTS
  ON
  OPTIONS('CONTROL','MONITOR','RSA')
  BUFSIZE(32M)
```

• Example 2: TRACE command

The example requests a trace of CONTROL, MONITOR, and REQUEST trace events.

```plaintext
trace ct,on,comp=sysgrs
* 17 ITT006A ...
reply 17,options=(control,monitor,request),end
```

### Formatting a SYSGRS trace

Format the trace with an IPCS CTRACE COMP(SYSGRS) subcommand. It is possible to use the OPTIONS subcommand for COMP (SYSGRS) with values of FLOW, CONTROL, REQUEST, MONITOR, SIGNAL, and RSA for filtering.

### Output from a SYSGRS trace

Figure 127 on page 414 is an example of SYSGRS component trace records formatted with the CTRACE COMP(SYSGRS) SHORT subcommand.

```

<table>
<thead>
<tr>
<th>Component</th>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRPXCNTL</td>
<td>00000030</td>
<td>GROUP EXIT IN CONTROL</td>
</tr>
<tr>
<td>DISRUPT</td>
<td>00000008</td>
<td>RING DISRUPTION TRIGGERED</td>
</tr>
<tr>
<td>CEXBCI1</td>
<td>0000000C</td>
<td>CONTROL EXITED FROM ISGBCI</td>
</tr>
<tr>
<td>SETUS</td>
<td>00000035</td>
<td>CALL TO XCF SETUS SERVICE</td>
</tr>
<tr>
<td>GRPXCNTL</td>
<td>00000030</td>
<td>GROUP EXIT IN CONTROL</td>
</tr>
<tr>
<td>STAXIN</td>
<td>00000033</td>
<td>STATUS EXIT IN CONTROL</td>
</tr>
</tbody>
</table>
```

*Figure 127. Example: SYSGRS component trace records formatted with CTRACE COMP(SYSGRS) SHORT*

Figure 128 on page 415 is an example of SYSGRS component trace records formatted with the CTRACE COMP(SYSGRS) TALLY subcommand.
## SYSHZS component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSHZS component trace for IBM Health Checker for z/OS.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSHZS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIHZS00</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTIHZS00 and REPLY for TRACE command</td>
</tr>
</tbody>
</table>
| Buffer                            | - Default: 4MB  
- Range: 16KB - 4MB (System rounds size up to nearest 64KB boundary.)  
- Size set by: CTIHZS00 member  
- Change size after IPL: Yes, when restarting a trace  
- Location: In the IBM Health Checker for z/OS address space |
| Trace records location            | Address-space buffer |
| Request of SVC dump               | By DUMP or SLIP command |
| Trace formatting by IPCS          | CTRACE COMP(SYSHZS) - see “Output from a SYSHZS trace” on page 417 |
| Trace format OPTIONS parameter    | None        |
Requesting a SYSHZS trace

Specify options for requesting a SYSHZS component trace on a CTIHZS00 parmlib member or on the reply for a TRACE CT command.

You can change options for SYSHZS tracing while the trace is running.

CTIHZS00 parmlib member

The following table indicates the parameters you can specify on a CTIHZS00 parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTIHZS00</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

IBM supplies the CTIHZS00 parmlib member, which specifies the IBM Health Checker for z/OS tracing begun at IPL. The contents of CTIHZS00 are:

```
TRACEOPTS
OFF
```

This parameter turns off all SYSHZS tracing options.

If additional SYSHZS tracing options are turned on, additional buffer space might be required.

The default trace buffer size is 4MB.

IBM recommends that you use the CTIHZS00 parmlib member, unless the IBM Support Center requests different tracing for IBM Health Checker for z/OS.

TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnnnM, or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
</tbody>
</table>
Parameters | Allowed on REPLY for trace?
--- | ---
JOBNAME | No
OPTIONS | Yes
WTR | Yes

You can change options while a SYSHZS trace is running. However, to change the buffer size, you have to stop the trace and restart it with the new buffer size.

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTnHZSxx parmlib member and reply for a TRACE command are listed below:

**CHECKS**

- Traces unusual events and events related to IBM Health Checker for z/OS checks.

**COMMANDS**

- Traces information about the F hzsproc command, the HZPRMxx parmlib member and the HZSCHECK macro.

**STORAGE**

- Traces information about storage used by the IBM Health Checker for z/OS address space.

**LOGGER**

- Traces information about the IBM Health Checker for z/OS log stream.

**MISC**

- Traces miscellaneous information.

**ALL**

- Traces all events for IBM Health Checker for z/OS. ALL is the default.

**Examples of requesting SYSHZS traces**

- Example 1: CTIHZS00 member

  The member requests ALL IBM Health Checker for z/OS component tracing:

  ```plaintext
  TRACEOPTS
  ON
  OPTIONS('ALL')
  BUFSIZE(4M)
  ```

- Example 2: TRACE command

  The example requests a trace of ALL trace events.

  ```plaintext
  trace ct,on,comp=syshzs
  * 17 ITT006A ...
  reply 17,options=(all),end
  ```

**Formatting a SYSHZS trace**

Format the trace with an IPCS CTRACE COMP(SYSHZS) FULL subcommand.

**Output from a SYSHZS trace**

Figure 129 on page 418 is an example of SYSHZS component trace records formatted with the CTRACE COMP(SYSHZS) FULL subcommand.
Figure 129. Example: SYSHZS component trace records formatted with the CTRACE COMP(SYSHZS) FULL

SYSIEFAL component trace

Before using this component trace, ensure that you have read:

• “Planning for component tracing” on page 354
• “Obtaining a component trace” on page 362
• “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSIEFAL component trace for Allocation.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSIEFAL:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIIEFxx; default member: CTIIEFAL</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; FLOW0, FLOW1, FLOW6, FLOWF, DATA, CONTROL0, CONTROL1, CONTROL6, CONTROLF, SERIAL1, and SERIALF options</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTIIEFxx or REPLY for TRACE command</td>
</tr>
</tbody>
</table>
Information | For SYSIEFAL:
--- | ---
Buffer | • Default: 8M  
• Range: 256KB - 64MB  
• Size set by: CTIIEFxx member  
• Change size after IPL: Yes  
• Location: In the component address space

Trace records location | Address-space buffer
Request of SVC dump | By DUMP or SLIP command
Trace formatting by IPCS | CTRACE COMP(SYSIEFAL)
Trace format OPTIONS parameter | Yes; FLOW, CONTROL, SERIAL, DATA, MISC, and ERROR

### Requesting a SYSIEFAL trace

Specify options for requesting a SYSIEFAL component trace on a CTIIEFxx parmlib member or on the reply for a TRACE CT command.

You can change options for SYSIEFAL tracing while the trace is running.

#### CTIIEFxx parmlib member

The following table indicates the parameters you can specify on a CTIIEFxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTIIEFxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

IBM supplies the CTIIEFAL parmlib member, which specifies the Allocation tracing begun at IPL. The contents of CTIIEFAL are:

```
TRACEOPTS
ON
OPTIONS(  
  'FLOW0',  
  'FLOW1',  
  'FLOW6',  
  'FLOWF',  
  'SERIAL1',  
  'SERIALF',  
  'DATA',  
  'CONTROL0',  
  'CONTROL1',  
  'CONTROL6',  
  'CONTROLF'  
)  
BUFSIZE(8M)
```

If additional SYSIEFAL tracing options are turned on, additional buffer space may be required.
The default trace buffer size is 8M.

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnnnM, or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

You can change options while a SYSIEFAL trace is running. However, to change the buffer size immediately, you have to stop the trace and restart it with the new buffer size. If the trace is not stopped and restarted, the buffer size will be changed when the current set of buffers has filled up and a new set is acquired.

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTIIEFxx parmlib member and reply for a TRACE command are listed. The suboptions on the CONTROL, DATA, FLOW, and SERIAL, allow you to refine the set of events traced for the major option. When you select the major option, all events pertaining to that option are traced. However, you can select one or more of the suboptions instead of the major option and thus limit the trace to only those events included in the suboptions specified. A major option, such as DATA, and all of its suboptions (in this case DATA0, DATA1, and so forth) is referred to as an option group. In alphabetical order the values for the OPTIONS parameter are:

**CONTROL**

Traces the control within a module.

**CONTROL0**

Traces common allocation processing only.

**CONTROL1**

Traces allocation services 1 processing only.

**CONTROL2**

Traces unallocation processing only.

**CONTROL3**

Traces volume mount and verify processing only.

**CONTROL4**

Traces assign/unassign processing only.

**CONTROL5**

Traces allocation services 2 processing only.
CONTROL6
Traces allocation device management processing only.

CONTROL7
Traces Dynamic Allocation processing only.

CONTROL8
Reserved for IBM use.

CONTROL9
Traces JFCB Houskeeping processing only.

CONTROLA
Traces TCTIOT management processing only.

CONTROLB-CONTROLE
Reserved for IBM use.

CONTROLF
Traces unexpected or unusual control within a module.

DATA
Traces when data is processed or changed.

DATA0
Traces when an ATSP device type array is being processed only.

DATA1
Traces when an ATSP device array is being processed only.

DATA2
Traces when an IGDE is going through XCF messaging only.

DATA3
Traces when an IGDE goes through a state change only.

DATA4
Traces UCB changes only.

DATA5
Traces ENQ changes for DDR SWAP processing only.

DATA6
Traces device management data only.

DATA7
Traces Dynamic Allocation processing only.

DATA8
Traces when an allocation occurs only.

DATA9
Traces JFCB Housekeeping data only.

DATAB
Traces TCTIOT management data only.

DATAF
Reserved for IBM use.

DATAF
Traces when data is unexpected or unusual.

FLOW
Traces the flow of control from one entry point to another.

FLOW0
Traces common allocation processing only.

FLOW1
Traces allocation services 1 processing only.
FLOW2  
Traces unallocation processing only.

FLOW3  
Traces volume mount and verify processing only.

FLOW4  
Traces assign/unassign processing only.

FLOW5  
Traces allocation services 2 processing only.

FLOW6  
Traces device management data only.

FLOW7  
Traces Dynamic Allocation processing only.

FLOW8  
Reserved for IBM use.

FLOW9  
Traces JFCB Housekeeping processing only.

FLOWA  
Traces TCTIOT management processing only.

FLOWB-FLOWE  
Reserved for IBM use.

FLOWF  
Traces unexpected or unusual flow from one entry point to another.

SERIAL  
Traces serialization events.

SERIAL0  
Traces locking (SETLOCK) serialization events only.

SERIAL1  
Traces ENQ/DEQ serialization events only.

SERIAL2  
Traces latch manager serialization events only.

SERIAL3  
Traces compare and swap serialization events only.

SERIAL4  
Traces SYSDSN ENQ/DEQ serialization events only.

SERIAL5–SERIALE  
Reserved for IBM use.

SERIALF  
Traces unexpected or unusual serialization events.

**Examples of requesting SYSIEFAL traces**

- Example 1: CTIIEFxx member
  
The member requests FLOW and DATA options and requests a buffer size of 8 megabytes.

  ```plaintext
  TRACEOPTS ON
  OPTIONS('FLOW', 'DATA')
  BUFSIZE(8M)
  ```

- Example 2: TRACE command
The example requests a trace of DATA1 and CONTROL1 trace events.

```
trace ct, on, comp=sysiefal
* 17 ITT006A ...
reply 17, options=(data1, control1), end
```

### Formatting a SYSIEFAL trace

Format the trace with an IPCS CTRACE COMP(SYSIEFAL) subcommand. You can filter trace records for COMP (SYSIEFAL) by using the OPTIONS subcommand. Specify one or more of the following values on the OPTIONS subcommand:

- FLOW
- DATA
- CONTROL
- SERIAL
- ERROR
- MISC

Events in the ERROR and MISC trace groups are always recorded, and are always displayed regardless of what filters are requested.

### Output from a SYSIEFAL trace

Figure 130 on page 423 is an example of SYSIEFAL component trace records formatted with the CTRACE COMP(SYSIEFAL) SHORT subcommand.

```
COMPONENT TRACE SHORT FORMAT
COMP(SYSIEFAL)
**** 09/13/2001

<table>
<thead>
<tr>
<th>SYSTYPE</th>
<th>MNEMONIC</th>
<th>ENTRY_ID</th>
<th>TIME_STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>N67</td>
<td>FLOW0</td>
<td>00000100</td>
<td>15:40:34.104633</td>
<td>Common Allocation Flow</td>
</tr>
<tr>
<td>N67</td>
<td>CONTROL0</td>
<td>00000200</td>
<td>15:40:34.104639</td>
<td>Common Allocation Control</td>
</tr>
<tr>
<td>N67</td>
<td>CONTROL0</td>
<td>00000200</td>
<td>15:40:34.104693</td>
<td>Common Allocation Control</td>
</tr>
<tr>
<td>N67</td>
<td>CONTROL0</td>
<td>00000200</td>
<td>15:40:34.104852</td>
<td>Common Allocation Control</td>
</tr>
<tr>
<td>N67</td>
<td>FLOW0</td>
<td>00000100</td>
<td>15:40:34.104859</td>
<td>Common Allocation Flow</td>
</tr>
<tr>
<td>N67</td>
<td>FLOW0</td>
<td>00000100</td>
<td>15:40:34.106631</td>
<td>Common Allocation Flow</td>
</tr>
<tr>
<td>N67</td>
<td>FLOW0</td>
<td>00000100</td>
<td>15:40:34.125582</td>
<td>Common Allocation Flow</td>
</tr>
</tbody>
</table>
```

**Figure 130. Example: SYSIEFAL component trace records formatted with CTRACE COMP(SYSIEFAL) SHORT subcommand**

Figure 131 on page 424 is an example of SYSIEFAL component trace records formatted with the CTRACE COMP(SYSIEFAL) FULL subcommand.
Component Trace

COMPONENT TRACE FULL FORMAT
COMP(SYSIEFAL)
**** 09/13/2001

SYSNAME MNEMONIC ENTRY ID TIME STAMP DESCRIPTION
------- -------- -------- --------------- -------------
N67 FLOW0 00000100 15:40:47.306228 Common Allocation Flow
ASID..007A TCB..008E1980 MODNAME..IEFAB492 JOBNAME..T015067
EBCDIC Data...
ENTR

N67 FLOW0 00000100 15:40:47.306231 Common Allocation Flow
ASID..007A TCB..008E1980 MODNAME..IEFAB492 JOBNAME..T015067
EBCDIC Data...
EXIT
Hex Data...
00000000 | .... | ...

Figure 131. Example: SYSIEFAL component trace records formatted with CTRACE COMP(SYSIEFAL) FULL subcommand

SYSIOS component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

IOS component trace is described by the following attributes:

- Trace buffers reside in common ESQA Subpool 248. Size is controlled by the TRACE CT operator command. As the buffers become full they are copied to a private IOS data space. For information on specifying an IOS data space size, see “OPTIONS parameter” on page 426.
- Minimal and unexpected event tracing is activated during IOS NIP processing.
- Component trace buffers externalized through:
  - DUMP or SLIP operator command when the IOS address space is requested to be dumped.
  - SVC dumps issued by IOS, dynamic device reconfiguration (DDR), or execute channel program (EXCP) component recovery.
  - MVS component trace (CTRACE) external writer
- Trace options revert to minimal event and exception tracing when the operator turns the trace off.

The following summarizes information for requesting a SYSIOS component trace for IOS:

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSIOS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CtNIOSxx specified in the IECIOSxx member through the CTRACE(CtNIOSxx) statement. Default member: None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes, activated during IOS NIP processing.</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CtNIOSxx or REPLY for TRACE command</td>
</tr>
</tbody>
</table>
**For SYSIOS:**

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSIOS:</th>
</tr>
</thead>
</table>
| Buffer                             | • Default: 324KB  
• Range: 324KB - 1.5M  
• Size set by: CTnIOSxx member or REPLY for TRACE command  
• Change size after IPL: Yes, when component trace (CTRACE) is active  
• Location: Common ESQA subpool 248 and SYSIOS private IOS data space. |
| Trace records location             | Common ESQA subpool 248 and SYSIOS private IOS data space and trace data set.  
By DUMP or SLIP command when the IOS address space is requested to be dumped. In the REPLY for the DUMP command, specify the IOS address space to be dumped.  
By SLIP command.  
By the component during SVC dumps issued by IOS, DDR, or EXCP component recovery. |
| Trace formatting by IPCS           | CTRACE COMP(SYSIOS)                                                                                                                          |
| Trace format OPTIONS parameter     | No                                                                                                                                              |

The areas of IOS traced as part of minimal and unexpected event tracing include:

- Dynamic Configuration Changes
- Parallel Access Volume (PAV) Processing
- Dynamic Channel Path Management (DCM) Processing
- Unconditional Reserve (U/R) Recovery Processing
- Channel Subsystem Call (CHSC) Processing
- Channel Report Word (CRW) Processing
- Missing Interrupt Handler (MIH) Recovery Processing
- Control Unit Initiated Reconfiguration (C.U.I.R.) Request Processing
- Dynamic Pathing Support (DPS) Validation
- Dynamic Device Reconfiguration (DDR) Processing
- Self-Description Processing
- PCIE Initialization and Exceptional Conditions Processing

**Note:** Additional areas are traced when OPTIONS are set for IOS component trace. See “OPTIONS parameter” on page 426.

### Requesting a SYSIOS trace

No actions are required to request a SYSIOS trace. Minimal and unexpected event tracing is activated during IOS NIP processing and is always active, even when TRACEOPS OFF is specified in CTnIOSxx.

Some functions CTRACE more data than others; for example, when z/OS Hyperswap is enabled, SYSIOS CTRACE entry usage will increase. In addition to this tracing, the user can request a SYSIOS trace using specific options by doing the following:

- Using a CTnIOSxx SYS1.PARMLIB member during NIP processing by specifying the CTRACE(C'TnIOSxx) statement in the IECIOSxx SYS1.PARMLIB member.
- Using a CTnIOSxx SYS1.PARMLIB member after NIP by issuing the TRACE system command.
- Using the TRACE system command and specifying the options in response to the prompts that CTRACE provides.
CTnIOSxx parmlib member

The following table indicates the parameters you can specify in a CTnIOSxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnIOSxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

If additional SYSIOS tracing options are turned on, additional buffer space might be required.

TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK, nnnnM</td>
<td>Yes</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The WTR and WTRSTART parameters can be used in a parmlib member specified on the TRACE CT command. The parameters cannot be specified in a parmlib member that is read at IPL because the external writer is not available when the IOS component is defined.

OPTIONS parameter

The values for the OPTIONS parameter for the CTnIOSxx parmlib member and reply for a TRACE command are listed below.
DCM
Traces events relating to Dynamic Channel Path Management.

**Note:** When DCM is active and this option is set, large amounts of trace data will be recorded. Users may wish to consider using an external writer when this option is set.

Traces the results of the cancel subchannel (XSCH) instruction.

EXTEND
Traces all functions that are attached in the IOS address space.

**Note:** Some functions attached in the IOS address space are traced during minimum or unexpected event tracing.

Traces the results of the cancel subchannel (XSCH) instruction.

STORAGE
Traces events related to IOS or EXCP storage management. When the STORAGE option is specified, the NOFILTER option or ASID/JOBNAME keywords must also be set.

CAPTURE
Traces the capturing and uncapturing of UCBs. When the CAPTURE option is specified, the NOFILTER option or ASID/JOBNAME keywords must also be set.

NOFILTER
Allows the STORAGE option to be set without requiring ASID or JOBNAME filtering.

DS=nnnn
Allows the user to tailor the IOS Trace Data Space where nnnn is the data space size in megabytes.

**Note:**
1. nnnn must be a valid decimal digit within the range of 1-1024.
2. This option can only be specified once at IPL time and cannot be modified using the TRACE CT command.
3. The default size for the IOS Trace Data Space is 512M. This can require additional auxiliary storage on systems with a small amount of available auxiliary storage. Please refer to “Decide where to collect the trace records” on page 361 for information about auxiliary storage for CTRACE data space buffers. Since some options such as STORAGE and DCM will cause more CTRACE entries to be recorded, the IOS Trace Data Set may fill up more rapidly than if none of these options is specified. Users who do not have enough auxiliary storage capacity to handle a full data space may choose to use the DS=nnnn option to set up a smaller IOS Trace Data Space. Similarly, users who do have enough auxiliary storage capacity to handle a full data space may choose to use the DS=nnnn option to set up a larger IOS Trace Data Space. Doing this will prevent potentially valuable debug information from being lost due to wrapping. Note that the number of records contained in a trace data set are highly variable and dependent upon trace settings and system usage.
4. If the DS=nnnn option is specified more than once, the request is rejected and the following message is issued:
   
   IOS622I IOS COMPONENT TRACE OPTION xxxxxxxx IS NOT VALID - THE TRACE DATA SPACE SIZE HAS ALREADY BEEN SET FOR THIS IPL

   5. If the size specified is not valid, then the request is rejected, the default IOS Trace Data Space size is used, and the following message is issued:

   IOS622I IOS COMPONENT TRACE OPTION xxxxxxxx IS NOT VALID - THE REQUESTED SIZE FOR THE TRACE DATA SPACE IS INCORRECT

HPAV
Traces events relating to HyperPAV bind and unbind activity. This option may cause large amounts of trace data to be recorded. It should be utilized as a debug tool when needed and not enabled for normal operations.
**PCIE**
Traces events related to PCIE activity.

**Examples of Requesting SYSIOS traces**
- Example 1: CTnIOSxx SYS1.PARMLIB member
  
  This SYS1.PARMLIB member sets the STORAGE option using JOBNAME filtering for JOB001 and sets the buffer size to 600K.

<table>
<thead>
<tr>
<th>TRACEOPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
</tr>
<tr>
<td>BUFSIZE(600K)</td>
</tr>
<tr>
<td>OPTIONS(STORAGE)</td>
</tr>
<tr>
<td>JOBNAME(JOB001)</td>
</tr>
</tbody>
</table>

**Formatting a SYSIOS trace**

IPCS CTRACE formatting services can be used to format the contents of the CTRACE trace entries. Format the trace with the following IPCS subcommand:

```plaintext
IPCS CTRACE COMP(SYSIOS) SUMMARY|FULL|SHORT|TALLY
```

- **SUMMARY**
  Shows the trace entry header and the formatted data for each trace entry.
- **FULL**
  Shows the trace entry header and the unformatted (hex) data for each trace entry.
- **SHORT**
  Shows the trace entry header for each trace entry.
- **TALLY**
  Shows each trace entry and how many times they were traced.

The subcommand has no options.

**CTRACE COMP(SYSIOS) subcommand output**

The following is an example of SYSIOS component trace records formatted with the CTRACE COMP(SYSIOS) SUMMARY option.

**Example: SYSIOS component trace records formatted with CTRACE COMP(SYSIOS) SUMMARY option**

```plaintext
CTRACE COMP(SYSIOS) SUMMARY
**** 03/28/1996
SYSTYPE MNEMONIC ENTRY ID TIME STAMP DESCRIPTION
------ -------- -------- --------------- ---------------
S530 MIH 00080001 19:42:42.220726 MIH Recovery Halt/Clear Block
Trace Record Function: MIH
MIH condition detected: Start Pending
Record ID: IOSDMHCB.MHCBSHIB Length: 0034
  +0000 00F168E8 289B0180 F00000F0 0027FFF0 | .1.Y.0..0...0 |                                                                 |
  +0010 3868B8E8 FFFFFFFF 00000000 00804400 | ...Y............ |                                                                 |
  +0020 3885DA88 00000000 00000000 | .e.h............ |                                                                 |
  +0030 00000000 | .... |                                                                 |
Record ID: IOSDMHCB.MHCBUCB Length: 0080
  +0000 00000940 20200000 01E13480 00000000 | ... ............ |                                                                 |
  +0010 00000000 00FCC8B4 00F16890 00000000 | ......H.1...... |                                                                 |
  +0020 00040040 00FC3800 00FC3100 0001001F | ... ............ |                                                                 |
  +0030 28980027 F00000F0 3868B8E8 FFFFFF | .q..0..0...Y.... |                                                                 |
  +0040 01000040 00000001 00000041 00FC3800 | ... ............ |                                                                 |
  +0050 0088FF84 01800080 00F16968 00F180F0 | .h.d.....1...180 |
```

---

Component Trace

428 z/OS: MVS Diagnosis: Tools and Service Aids
### SYSJES Component Trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSJES component trace for the JES common coupling services component, also known as JES XCF.
**Information**

<table>
<thead>
<tr>
<th>For SYSJES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
</tr>
<tr>
<td>CTnJESxx. Default members: CTIJES01, CTIJES02, CTIJES03, CTIJES04</td>
</tr>
</tbody>
</table>

Default tracing

- Yes; detailed tracing for sublevel FLOW; minimal tracing of unexpected events for sublevels MSGTRC, USRXIT, XCFEV

Trace request OPTIONS parameter

- None

Buffer

- Default: N/A
- Range: N/A
- Size set by: MVS system
- Change size after IPL: No
- Location: In the component address space

Trace records location

- Address-space buffer, trace data set

Request of SVC dump

- By the component

Trace formatting by IPCS

- CTRACE COMP(SYSJES)

Trace format OPTIONS parameter

- Yes

**Note:** To get a complete dump for JES XCF, request also the JES and JES XCF address spaces and data spaces, plus SDATA options RGN, SQA, and CSA.

SYSJES tracing is started during initialization. SYSJES contains 4 sublevel traces, which run concurrently. Each sublevel must be started individually. The sublevels are:

- **MSGTRC, message tracing:** MSGTRC records message data sent by the IXZXIXSM service. The default tracing for this sublevel is minimal tracing of unexpected events only. You can optionally start and stop detailed MSGTRC tracing. Use the data from this sublevel in conjunction with USRXIT trace data to get information about message data modified by installation exits IXZXIT01 or IXZXIT02.

- **USRXIT, installation exit tracing:** USRXIT records the exit parameter list (SPELL) passed to and returned from installation exits IXZXIT01, IXZXIT02, and IXZXIT03 processing. The default tracing for this sublevel is minimal tracing of unexpected events only. You can optionally start and stop detailed USRXIT tracing. Use the data from this sublevel in conjunction with MSGTRC trace data to get information about message processing through installation exits IXZXIT01, IXZXIT02, and IXZXIT03.

- **FLOW, module footprint tracing:** FLOW records messages and events as they flow through the JES common coupling services component. By default, FLOW is always active and produces detailed tracing.

  **Note:** IBM recommends that this trace always remain active to record diagnostic data such as errors, system state changes, and processing events.

- **XCFEV, system event (SYSEVENT) tracing:** XCFEV records SYSEVENT data processed by the JES common coupling services component. By default, XCFEV always produces minimal tracing.

Tracing for SYSJES can run all 4 sublevels concurrently. USRXIT and MSGTRC trace only error events by default; you can turn on detailed tracing for these two sublevels.

**Requesting a SYSJES trace**

IBM recommends the following when requesting SYSJES TRACING:

- Start and stop the four sublevels for a system all at once in one parmlib member. Request SYSJES component tracing in a CTnJESxx parmlib member which you specify on a TRACE CT command.

IBM provides two parmlib members, IXZCTION and IXZCTIOF, in SYS1.SAMPLIB as examples of how to start and stop SYSJES sublevels. Copy the members into parmlib, and rename them CTIJESON and CTIJESOF. The CTIJESON parmlib member starts all the sublevels and connects them to the external writer. The CTIJESOF parmlib member stops tracing in all sublevels and disconnects them from the external writer.
• Use the external writer for gathering trace records, because SYSJES tracing produces a large volume of data. Create source JCL for the external writer, using the following guidelines:

  – Code all TRCOUTnn DD statements with a SPACE parameter of at least 10 cylinders to accommodate the volume of SYSJES trace data.
  – For traces larger than 10 cylinders, specify a unique volser for each TRCOUTnn statements if you need to reduce I/O contention on one volume.
  – The data set name defined in the TRCOUT01 DD statement must be unique on each system.
  – Use the IPCS COPYTRC command to merge records from multiple TRCOUTnn DD statements into one data set. See z/OS MVS IPCS Commands for information.

The following example shows an external writer procedure, IXZCTW, that sends SYSJES trace output to trace data sets.

```
//CTWDASD PROC
//CTFPROC EXEC PGM=ITTTRCWR
//SYSPRINT DD SYSOUT=A
//TRCOUT01 DD DSN=SYS1.JESXCF1,VOL=SER=TRACE6,UNIT=DASD,
//          SPACE=(CYL,10),DISP=(NEW,KEEP),DSORG=PS
//TRCOUT02 DD DSN=SYS1.JESXCF2,VOL=SER=TRACE7,UNIT=DASD,
//          SPACE=(CYL,10),DISP=(NEW,KEEP),DSORG=PS
```

Figure 132. Example: Cataloged procedure for SYSJES

• If you are tracing in a sysplex environment, the data set names on TRCOUTnn DD statements must be unique throughout the sysplex. An ENQUEUE error results if the data set names are not unique.

CTnJESxx parmlib member

The following table indicates the parameters you can specify on a CTnJESxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnJESxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>No</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>No</td>
</tr>
<tr>
<td>SUB</td>
<td>Yes</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
</tbody>
</table>
Parameters | Allowed on TRACE CT for trace?
---|---
SUB | Yes
PARM | Yes

Parameters | Allowed on TRACE CT for Writer?
---|---
WTRSTART or WTRSTOP | One is required, if a writer is being used

Parameters | Allowed on REPLY for trace?
---|---
ASID | No
JOBNAME | No
OPTIONS | No
WTR | Yes

Examples of requesting SYSJES traces

- **Example 1: Start SYSJES tracing with the CTIJESON member**

  The following example shows the CTIJESON parmlib member supplied in SYS1.SAMPLIB to start tracing for one system:

  ```
  TRACEOPTS
  WTRSTART (IXZCTW) WRAP
  SUB (MSGTRC)
  ON
  WTR (IXZCTW)
  SUB (USRXIT)
  ON
  WTR (IXZCTW)
  SUB (FLOW)
  ON
  WTR (IXZCTW)
  SUB (XCFEVT)
  ON
  WTR (IXZCTW)
  ```

- **Example 2: Stop SYSJES tracing with the CTIJESOF member**

  The following example shows the CTIJESOF parmlib member supplied in SYS1.SAMPLIB to stop tracing for one system:

  ```
  TRACEOPTS
  SUB (MSGTRC)
  OFF
  SUB (USRXIT)
  OFF
  SUB (FLOW)
  OFF
  SUB (XCFEVT)
  OFF
  ```

  Stop tracing with the following command:

  ```
  TRACE CT,OFF,COMP=SYSJES,PARM=CTIJESOF
  ```

  Then specify the following command to stop the external writer (assuming IXZCTW is the membername of the source JCL for the external writer):

  ```
  TRACE CT,WTRSTOP=IXZCTW
  ```

**Requesting a SYSJES trace for problems during initialization**

Use this procedure only when requested to by the IBM Support Center. The procedure requests SYSJES tracing for JES XCF problems occurring during JES subsystem initialization. The procedure consists of
using the default parmlib members CTIJES01, CTIJES02, and CTIJES04 to request tracing of these
SYSJES sublevels. Note that parmlib member CTIJES03 contains module footprint tracing that is active,
by default, on your system. Therefore, you do not need to take any action to modify this trace.

Activating all four traces can negatively impact system performance because of the heavy volume of trace
data produced. For that reason, you should only use this procedure when requested by IBM, and you
should not leave this full tracing on. The identical parmlib members are supplied with tracing set off, since
you should only run with full tracing at IBM’s request. The default contents of parmlib members
CTIJES01, CTIJES02, and CTIJES04 is:

<table>
<thead>
<tr>
<th>TRACEOPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
</tr>
</tbody>
</table>

The default contents of parmlib members CTIJES03 is:

<table>
<thead>
<tr>
<th>TRACEOPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
</tr>
</tbody>
</table>

IBM recommends that you keep this tracing sublevel on at all times.

1. **Modify the CTIJES01, CTIJES02, and CTIJES04 parmlib members to turn tracing on:** In parmlib
   members CTIJES01, CTIJES02, and CTIJES04, alter the parmlib members to return sublevel tracing on
   and connect the sublevel to the external writer. The parmlib members are supplied with tracing off and no
   connection to the writer.

   When you initialize the JES subsystem with the modified parmlib members, full tracing for JES XCF starts
   automatically.

   Figure 133 on page 433 is an example of the CTIJESxx parmlib member after having been modified for
gathering trace data during JES subsystem initialization at the direction of the IBM Support Center. The
member turns tracing on for the sublevel and connects the sublevel to the external writer.

<table>
<thead>
<tr>
<th>TRACEOPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART(IXZCTW)</td>
</tr>
<tr>
<td>ON</td>
</tr>
<tr>
<td>WTR(IXZCTW)</td>
</tr>
</tbody>
</table>

   **Figure 133. Example: Turning on tracing in a CTIJESxx member**

2. **Create a CTIJESOF parmlib member to stop SYSJES tracing:** Use the CTIJESOF parmlib member to
   stop the full SYSJES tracing turned on during initialization and to disconnect them from the external
   writer.

3. **Stop SYSJES tracing after initialization tracing is complete:** Enter a TRACE CT operator command
   referencing the CTIJESOF parmlib member on the console with master authority as follows:

   | TRACE CT,OFF,COMP=SYSJES,PARM=CTIJESOF |

4. **Remodify the CTIJES01, CTIJES02, and CTIJES04 parmlib members to return to default Tracing:** In
   parmlib members CTIJES01, CTIJES02, and CTIJES04, alter the parmlib member to return sublevel
   tracing to off.

   Figure 134 on page 433 shows the CTIJES01, CTIJES02, and CTIJES04 parmlib members after having
   been returned to their original contents, with tracing set off.

<table>
<thead>
<tr>
<th>TRACEOPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
</tr>
</tbody>
</table>

   **Figure 134. Example: Return to default in a CTIJESxx member**
Formatting a SYSJES trace

Format the trace with an IPCS CTRACE COMP(SYSJES) subcommand. To format SYSJES tracing, you must:

• Enter the CTRACE command for SYSJES once for each of the four sublevels you wish to format. See “Format SYSJES sublevel information” on page 434.
• Specify SYSJES options on the OPTIONS parameter. See “OPTIONS parameter for formatting a SYSJES trace” on page 434.
• Merge the output from the different sublevels requested. See “Merging SYSJES information from sublevels” on page 434.

For SYSJES traces, use the IPCS MERGE subcommand to display traces that are not likehead in timestamp order.

Format SYSJES sublevel information

You must enter the CTRACE command separately for each SYSJES sublevel you wish to format. For example, to request formatting of SYSJES trace data for sublevels MSGTRC and USRXIT, you would enter the following two commands:

CTRACE COMP(SYSJES) SUB((USRXIT)) FULL
CTRACE COMP(SYSJES) SUB((MSGTRC)) FULL

These examples would yield tracing without any options requested.

OPTIONS parameter for formatting a SYSJES trace

IBM might request that you enter options for SYSJES tracing. You can specify options for SYSJES tracing on the OPTIONS parameter of the CTRACE command. The options include:

• Options valid for all sublevels:
  – MSGTOKEN=msgtoken
  – REQTOKEN=reqtoken
  – MSGBUF=msgbuf
  – CTCR=ctcr
• Options valid for the FLOW sublevel only:
  – MODID=id
  – MODFLOW
  – MSGFLOW
• Options valid for the MSGTRC sublevel only:
  – SEND
  – RECEIVE
• Options valid for the USRXIT sublevel only:
  – EXIT1
  – EXIT3
  – EXIT2

Merging SYSJES information from sublevels

Because SYSJES can run four sublevel traces simultaneously, you will need to merge the data for a complete chronological picture of SYSJES trace data. For example, to merge JESXCF trace data, from all four sublevels, enter the following command:

MERGE
CTRACE COMP(SYSJES) SUB((USRXIT)) FULL
CTRACE COMP(SYSJES) SUB((MSGTRC)) FULL
You can write an IPCS CLIST to issue the CTRACE command for the four sublevels and merge the output automatically. See [z/OS MVS IPCS Customization](https://www.ibm.com) for information on writing a CLIST.

**Output from a SYSJES trace**

“Example: merged output from four SYSJES sublevel traces with FULL parameter” on page 435 is an example of merged output from the four SYSJES sublevel traces with the FULL parameter specified.

**Example: merged output from four SYSJES sublevel traces with FULL parameter**

```

<table>
<thead>
<tr>
<th>Time Stamp</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:53:54.876999</td>
<td>XCF event message buffer</td>
</tr>
<tr>
<td>16:53:55.303610</td>
<td>SPELL prior to Exit 3 processing</td>
</tr>
</tbody>
</table>

```
**Component Trace**

02. POSTXIT3 00000008 16:53:55.306462 SPELL after Exit 3 processing
HOMEASID 0017 0BNAME. JES3 HOMETCB@ 007FD2B8
CPUD... FF719045 30900000 CTCR@... 03062460 MEMBER.. SY1

**SYNAME. SY1**
XPLBFU8. 03368000

**0000 00000000 00000000 00000000 00000000** | .... | .... | .... | .... | .... | .... |
**0000 00000008 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ..... | ..... | ..... | ..... | ..... | ..... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | .... | .... | .... | .... | .... | .... |

**02. EXIT1ERR 00000003 16:55:17.474658 SPELL error Exit 1 processing**
HOMEASID 0017 0BNAME. JES3 HOMETCB@ 007FD2B8
CPUD... FF719045 30900000 CTCR@... 03062460 MEMBER.. SY1

**SYNAME. SY1**
XPLBFU8. 03368000

**0000 00000000 00000000 00000000 00000000** | .... | .... | .... | .... | .... | .... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |

**03. SEND 000000010 16:55:17.568558 message queued to be sent**
HOMEASID 0013 0BNAME. JESXCF HOMETCB@ 007EA6F8
CPUD... FF719045 30900000 CTCR@... 03062460 MEMBER.. SY1

**SYNAME. SY1**
XPLBFU8. 03368000

**0000 00000000 00000000 00000000 00000000** | .... | .... | .... | .... | .... | .... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |
**0000 00000000 00000000 00000000 00000000** | ...... | ...... | ...... | ...... | ...... | ...... |

---

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Figure 135 on page 437 is an example of merged output from the four SYSJES sublevel traces with the TALLY parameter specified. Use the TALLY report to look at event identifiers in the trace output.

**COMPONENT TRACE TALLY REPORT**
**SYSNAME(SY1) COMP(SYSJES) SUBNAME((FLOW))**
**TRACE ENTRY COUNTS AND AVERAGE INTERVALS (IN MICROSECONDS)**

<table>
<thead>
<tr>
<th>FMTID</th>
<th>COUNT</th>
<th>INTERVAL</th>
<th>MNEMONIC</th>
<th>DESCRIBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000020</td>
<td>29</td>
<td>6,902,084</td>
<td>MSGFLOW</td>
<td>module flow for this message</td>
</tr>
<tr>
<td>00000021</td>
<td>114</td>
<td>1,755,686</td>
<td>MODFLOW</td>
<td>module flow</td>
</tr>
<tr>
<td>0000002E</td>
<td>3</td>
<td>2,631,973</td>
<td>MSGERR</td>
<td>module error flow</td>
</tr>
<tr>
<td>0000002F</td>
<td>7</td>
<td>27,207,632</td>
<td>MODERR</td>
<td>module error flow</td>
</tr>
</tbody>
</table>

Total trace entries: 153

**COMPONENT TRACE TALLY REPORT**
**SYSNAME(SY1) COMP(SYSJES) SUBNAME((MSGTRC))**
**TRACE ENTRY COUNTS AND AVERAGE INTERVALS (IN MICROSECONDS)**

<table>
<thead>
<tr>
<th>FMTID</th>
<th>COUNT</th>
<th>INTERVAL</th>
<th>MNEMONIC</th>
<th>DESCRIBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000010</td>
<td>13</td>
<td>17,076,718</td>
<td>SEND</td>
<td>message queued to be sent</td>
</tr>
<tr>
<td>00000011</td>
<td>17</td>
<td>12,821,783</td>
<td>INDATA</td>
<td>input message data</td>
</tr>
<tr>
<td>00000012</td>
<td>0</td>
<td>0</td>
<td>SENDBUF</td>
<td>buffer sent by XCF</td>
</tr>
<tr>
<td>00000013</td>
<td>0</td>
<td>0</td>
<td>SENDQERR</td>
<td>Sendq queueing error</td>
</tr>
<tr>
<td>00000014</td>
<td>0</td>
<td>0</td>
<td>SBUFERR</td>
<td>Send error from XCF</td>
</tr>
<tr>
<td>00000018</td>
<td>13</td>
<td>17,061,037</td>
<td>RECEIVE</td>
<td>msg dequeued from receive</td>
</tr>
<tr>
<td>00000019</td>
<td>10</td>
<td>30,944,882</td>
<td>OUTDATA</td>
<td>output message data</td>
</tr>
<tr>
<td>0000001A</td>
<td>26</td>
<td>8,192,076</td>
<td>RECVBUF</td>
<td>buffer received from XCF</td>
</tr>
<tr>
<td>0000001B</td>
<td>0</td>
<td>0</td>
<td>RBUFERR</td>
<td>Receive error from XCF</td>
</tr>
<tr>
<td>0000001C</td>
<td>0</td>
<td>0</td>
<td>RECVQERR</td>
<td>Received queueing error</td>
</tr>
</tbody>
</table>

Total trace entries: 79

**COMPONENT TRACE TALLY REPORT**
**SYSNAME(SY1) COMP(SYSJES) SUBNAME((XCFEVT))**
**TRACE ENTRY COUNTS AND AVERAGE INTERVALS (IN MICROSECONDS)**

<table>
<thead>
<tr>
<th>FMTID</th>
<th>COUNT</th>
<th>INTERVAL</th>
<th>MNEMONIC</th>
<th>DESCRIBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000030</td>
<td>27</td>
<td>35,794,857</td>
<td>XCFEVT</td>
<td>XCF event message buffer</td>
</tr>
<tr>
<td>00000031</td>
<td>0</td>
<td>0</td>
<td>XCFERR</td>
<td>XCF event message error</td>
</tr>
</tbody>
</table>

Total trace entries: 27

**COMPONENT TRACE TALLY REPORT**
**SYSNAME(SY1) COMP(SYSJES) SUBNAME((USRXIT))**
**TRACE ENTRY COUNTS AND AVERAGE INTERVALS (IN MICROSECONDS)**

<table>
<thead>
<tr>
<th>FMTID</th>
<th>COUNT</th>
<th>INTERVAL</th>
<th>MNEMONIC</th>
<th>DESCRIBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000001</td>
<td>1</td>
<td></td>
<td>PREXIT1</td>
<td>SPELL prior to Exit 1 processing</td>
</tr>
<tr>
<td>00000002</td>
<td>0</td>
<td></td>
<td>POSTXIT1</td>
<td>SPELL after Exit 1 processing</td>
</tr>
<tr>
<td>00000003</td>
<td>1</td>
<td></td>
<td>EXIT1ERR</td>
<td>SPELL error Exit 1 processing</td>
</tr>
<tr>
<td>00000004</td>
<td>1</td>
<td></td>
<td>PREXIT2</td>
<td>SPELL prior to Exit 2 processing</td>
</tr>
<tr>
<td>00000005</td>
<td>0</td>
<td></td>
<td>POSTXIT2</td>
<td>SPELL after Exit 2 processing</td>
</tr>
<tr>
<td>00000006</td>
<td>1</td>
<td></td>
<td>EXIT2ERR</td>
<td>SPELL error Exit 2 processing</td>
</tr>
<tr>
<td>00000007</td>
<td>14</td>
<td>60,329,405</td>
<td>PREXIT3</td>
<td>SPELL prior to Exit 3 processing</td>
</tr>
<tr>
<td>00000008</td>
<td>14</td>
<td>60,374,425</td>
<td>POSTXIT3</td>
<td>SPELL after Exit 3 processing</td>
</tr>
<tr>
<td>00000009</td>
<td>0</td>
<td></td>
<td>EXIT3ERR</td>
<td>SPELL error Exit 3 processing</td>
</tr>
</tbody>
</table>

Total trace entries: 32

Figure 135. Example: merged output from the four SYSJES sublevel traces with the TALLY parameter

**SYSjes2 component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374
The following summarizes information for requesting a SYSjes2 component trace for the JES2 subsystem. For ease of explanation here, this component trace is referred to as SYSjes2 although you might need to replace jes2 with the name you assigned to your JES2 subsystem (primary or secondary). For example, to obtain trace information for JESA, a name you might have used to name your secondary JES2 in a poly-JES environment, use SYSJESA as the component name.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSjes2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>n/a</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; full tracing for sublevels JQE and JOE</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>
| Buffer | • Default: N/A  
• Range: N/A  
• Size set by: JES2  
• Change size after IPL: No  
• Location: In the component address space |
| Trace records location | Address-space buffer |
| Request of SVC dump | By the component, or DUMP or SLIP |
| Trace formatting by IPCS | CTRACE COMP(SYSjes2) |
| Trace format OPTIONS parameter | Yes |

SYSjes2 tracing is started automatically during initialization. SYSjes2 contains 2 sublevel traces, which run continuously and concurrently. The sublevels are:

- **JQE service tracing**: JQE records all job queue service calls (to include: $QADD, $QPUT, $QREM, $QMOD, $QJIX, $GETJLOK, $QRBDCHECK, $QBUSY, $GETJOLK, $REJLJ, and $REJLACK).
- **JOE service tracing**: JOE records all job output element service calls (to include: $#ADD, $#PUT, $#REM, $#MOD, $#RBDCHECK, $#BUSY, $#GET, and $#CAN).

**Requesting a SYSjes2 trace**

You need not take any action to request a SYSjes2 trace. The trace is active whenever your JES2 subsystem is in control.

**Formatting SYSjes2 sublevel trace Information**

You must enter the CTRACE command separately for each SYSJES sublevel you wish to format. For example, to request formatting of SYSJES trace data for sublevels JQE and JOE, you would enter the following two commands:

```
CTRACE COMP(SYSjes2) SUB((JQE)) FULL  
CTRACE COMP(SYSjes2) SUB((JOE)) FULL
```

**Merging SYSjes2 information from sublevels**

Because SYSjes2 runs two sublevel traces simultaneously, you will need to merge the data for a complete chronological picture of SYSjes2 trace data. To merge SYSjes2 trace data, enter the following command string:

```
MERGE  
CTRACE COMP(SYSjes2) SUB((JQE)) FULL  
CTRACE COMP(SYSjes2) SUB((JOE)) FULL  
MERGEEND
```

You can write an IPCS CLIST to issue the CTRACE command for both sublevels and merge the output automatically. See z/OS MVS IPCS Customization for information on writing a CLIST.
Output from a SYSjes2 trace

The output from the SYSjes2 trace contains a maximum of 500 trace entries presented in a wrapping (or rolling) trace format. That is, once the trace table is filled with 500 entries, the next entries (501, 502, 503,...) overwrite entries 1, 2, 3... in a continuous wrapping manner.

Figure 136 on page 439 is an example of merged output from both SYSjes2 sublevel traces with the FULL parameter specified.

Figure 136. Example: merged output from both SYSjes2 sublevel traces with FULL parameter

Figure 137 on page 439 is an example of merged output from both SYSjes2 sublevel traces with the SHORT parameter specified:

Figure 137. Example: merged output from both SYSjes2 sublevel traces with SHORT parameter

The following is an example of merged output from both SYSjes2 sublevel traces with the FULL parameter specified. Use mapping macro, $ROTT (rolling trace table), to map the fields presented in this trace.

Figure 138. Example: merged output from both SYSjes2 sublevel traces with FULL parameter
The following is an example of merged output from both SYSjes2 sublevel traces with the TALLY parameter specified:

```
.EVENTS (COMP(SYSjes2) SUBNAME((JQE)))

COMPONENT TRACE TALLY REPORT

TRACE ENTRY COUNTS AND AVERAGE INTERVALS (IN MICROSECONDS)

<table>
<thead>
<tr>
<th>FMTID</th>
<th>COUNT</th>
<th>INTERVAL</th>
<th>MNEMONIC</th>
<th>DESCRIBE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>96,278,898</td>
<td>JQE</td>
<td>$QADD</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td></td>
<td>JQE</td>
<td>$QPUT</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td></td>
<td>JQE</td>
<td>$QREM</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>36,473,953</td>
<td>JQE</td>
<td>$QMOD</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>96,278,898</td>
<td>JQE</td>
<td>$QJIX (ALLOC new number)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>273,117,249</td>
<td>JQE</td>
<td>$GETJLOK</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>274,068,170</td>
<td>JQE</td>
<td>$FREJLOK</td>
</tr>
</tbody>
</table>

Total trace entries: 89
```

### SYSLLA component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSLLA component trace for library lookaside (LLA) of contents supervision.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSLLA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; always on when LLA is running</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>None</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: N/A</td>
</tr>
<tr>
<td></td>
<td>• Range: N/A</td>
</tr>
<tr>
<td></td>
<td>• Size set by: MVS system</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: No</td>
</tr>
<tr>
<td></td>
<td>• Location: In the component address space</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By the component</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSLLA)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>

### Requesting a SYSLLA trace

The trace runs whenever LLA is in control. No actions are needed to request it.

### Formatting a SYSLLA trace

Format the trace with an IPCS CTRACE COMP(SYSLLA) subcommand. The subcommand has no OPTIONS values.
SYSLOGR component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

Table 68 on page 441 summarizes information for requesting a SYSLOGR component trace for the system logger component. SYSLOGR tracing is started during initialization.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSLOGR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnLOGxx</td>
</tr>
<tr>
<td></td>
<td>Default member: CTILOG00, is required and provided as a component trace option in GRSCNFxx parmlib member.</td>
</tr>
<tr>
<td></td>
<td>1. IXGCNFxx member CTRACE field specified at IPL or SET IXGCNF command</td>
</tr>
<tr>
<td></td>
<td>2. SETLOGR CTRACE command</td>
</tr>
<tr>
<td></td>
<td>3. TRACE command</td>
</tr>
<tr>
<td>Parmlib default tracing options</td>
<td>CONNECT, LOGSTRM, DATASET, SERIAL, MISC, LOCBUFF, RECOVERY</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; activated during System Logger (IXGLOGR) address space initialization</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnLOGxx and REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Parmlib default: 16MB</td>
</tr>
<tr>
<td></td>
<td>• Default: 2MB</td>
</tr>
<tr>
<td></td>
<td>• Range: 2MB - 2047MB</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnLOGxx parmlib member or REPLY for TRACE CT command.</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes</td>
</tr>
<tr>
<td></td>
<td>• Location: system logger trace data space</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer; system logger trace data space, trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSLOGR)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Obtaining a dump of system logger information

Use the following examples to obtain the appropriate diagnostic information for system logger. The amount of information requested in the dumps may be very large. You may need to set your MAXSPACE on the CHNGDUMP setting to 999 mb before obtaining the logger dumps.

CD SET, SDUMP, MAXSPACE=999M
For structure dumps, verify that the coupling facility has dump space defined by issuing the following command:

```
D CF,CFNAME=xxxx
```

**Note:** There are several sample Logger dump parmlib members that can be used as models for automating the procedures listed below. The samples parmlib members are shipped in 'SYS1.SAMPLIB(IEADMCLx)'. Refer to the IEADMCLx members for more information, or see Table 7 on page 18.

1. For all types of logstreams, always include the following:

   a. The IXGLOGR (Logger) asid and the data spaces associated with the IXGLOGR asid through the DSPNAME parm. These will be dumped using the JOBNAME= parm.

   b. The trace data space SYSLOGR0, will be included in the dump if DSNAME=('IXGLOGR'.*) is specified in the reply for the dump command.

   **Note:** If you are running OS/390® Release 2 or lower, Logger will not have a SYSLOGR* data space for tracing, in which case the DSPNAME=('IXGLOGR'.*) option can be omitted.

   ```
   DUMP COMM=(dump system logger with component trace)
   * rr IEE094D SPECIFY OPERAND(S) FOR DUMP COMMAND
   rr, JOBNAME=(IXGLOGR), CONT
   ss, DSPNAME=('IXGLOGR'.SYSLOGR*), CONT
   tt, SDATA=(COUPLE, ALLNUC, LPA, LSQA, PSA, RGN, SQA, SUM, TRT, CSA, GRSQ, XESDATA), END
   ```

2. When using CF list structure based log streams, include the following:

   a. The XCF asid and trace data spaces. These will be dumped using the JOBNAME= parm and DSPNAME parm.

   b. The XES STRUCTURE data. This is dumped using the STRLIST= parameter and by specifying the structure name. structure_name is the affected STRUCTURE name.

   **Note:** Be sure to allocate adequate DUMPSPACE() as defined in your CF definition in the CFRM policy. If you do not allocate adequate space, all or part of the STRUCTURE will NOT be dumped.

   c. In the case of “loss of data” or “block not found”, dumping the OFFLOAD data sets using IDCAMS is a good idea.

   ```
   DUMP COMM=(dump system logger with xes and structure data)
   * rr IEE094D SPECIFY OPERAND(S) FOR DUMP COMMAND
   rr, JOBNAME=(IXGLOGR,XCFAS), CONT
   ss, DSPNAME=('XCFAS'.*', IXGLOGR'.SYSLOGR*), CONT
   tt, SDATA=(COUPLE, ALLNUC, LPA, LSQA, PSA, RGN, SQA, SUM, TRT, CSA, GRSQ, XESDATA), CONT
   uu, STRLIST=(STRNAME=structure_name, LOCKENTRIES, ACC=NOLIM, (LISTNUM=ALL, ADJUNCT=DIRECTIO, ENTRYDATA=UNSERIALIZE)), END
   ```

3. When system logger dumps are needed on multiple systems in the sysplex, include the REMOTE parameter.

   ```
   DUMP COMM=(dumps for system logger around the sysplex)
   * rr IEE094D SPECIFY OPERAND(S) FOR DUMP COMMAND
   rr, JOBNAME=(IXGLOGR,XCFAS), CONT
   ss, DSPNAME=('XCFAS'.*', IXGLOGR'.SYSLOGR*), CONT
   tt, SDATA=(COUPLE, ALLNUC, LPA, LSQA, PSA, RGN, SQA, SUM, TRT, CSA, GRSQ, XESDATA), CONT
   uu, STRLIST=(STRNAME=structure_name, LOCKENTRIES, ACC=NOLIM, (LISTNUM=ALL, ADJUNCT=DIRECTIO, ENTRYDATA=UNSERIALIZE)), CONT
   vv, REMOTE=(SYSLIST=*)'XCFAS','IXGLOGR'), DSPNAME, SDATA), END
   ```

4. Other diagnostic considerations

   The CTILOG00 buffer size is 16MB. It is strongly recommended that this value not be lowered. See the CTnLOGxx member, described in Table 68 on page 441.

   Remember that much of the data that system logger uses is persistent across an IPL. That means that if this data is corrupted and adversely affects system logger, an IPL will not correct the problem. In the
case of a persistent system logger failure, you can FORCE the IXGLOGR address space. Prior to doing this you should bring down all of the applications connected. Then issue the FORCE command (FORCE IXGLOGR, ARM) and restart system logger using the supplied procedure in SYS1.PROCLIB (IXGLOGRS).

If FORCE IXGLOGR, ARM does not resolve the situation, an IPL is not likely to either. This is the time to take a dump if one was not already taken by system logger.

**Note:**

a. A CICS dump will not dump the IXGLOGR address space. Connect to a new (non-corrupted) LOGSTREAM. This will result in a LOSS OF DATA for some applications such as CICS, forcing them to INITIAL START. However, this may be the only way to get the application restarted. Connecting to a new logstream (of a different name) will allow the corrupted data to remain in the structure for diagnostic review later.

b. In preparation for connecting to this new LOGSTREAM, you may want to define an unused LOGSTREAM to each STRUCTURE during setup.

If running CICS, always run with the following SLIP:

```plaintext
SLIP SET,COMP=1C5,REASON=804, STRLIST=(STRNAME=string1,LOCKE,ACC=NOLIM, (LNUM=ALL,EDATA=SER,ADJ=CAP)), JL=(XCFAS,IXGLOGR),DN=("XCFAS".*,"IXGLOGR".*), SD=(COUPLE,ALLNUC,LP,A,LSQA,PSA,RGN,SQA,TRT,CSA,GRSQ, XESDATA,SUM), sumlist=(13R?7FFF,13R?7FFF),END
```

**Note:** You might add a JOBNAME=DFH* to limit SLIP to CICS. A RSN804 is a “block not found”, which is always bad for CICS but not necessarily so for other applications. Setting this SLIP will cause system logger to dump on all RSN804s in CICS.

5. Frequent stumbling blocks

a. OFFLOAD data sets must be VSAM SHAREOPTIONS(3,3) unless you are in a MONOPLEX.

b. After OW33261, system logger recommends for performance reasons using 24K CI size for OFFLOAD data sets. Staging data sets must remain at 4K CI size. Code your ACS routines appropriately.

c. Size of XES structures. “Bigger is not always better.” Follow exploiting application recommendations.


e. System logger uses HSM services to recall (ARCHRCAL) and to delete (ARCHDEL) offload data sets. HSM contention or a wait for a WTOR such as ARC0055A can hang all of the log streams that require the system logger allocation task.

### Requesting a SYSLOGR trace

Specify options for requesting a SYSLOGR component trace in a CTnLOGxx parmlib member or on the reply for a TRACE CT command.

Also, refer to the following as alternatives for specifying the CTnLOGxx parmlib member to be used:

- IXGCNFxx SYS1.PARMLIB member (see IXGCNFXX SYS1.PARMLIB member).
- SET IXGCNF=xx command.
- SETLOGR CTRACE command.

Specify options for requesting a SYSLOGR component trace in a CTnLOGxx parmlib member or on the reply for a TRACE CT command.

You can change the options and the trace data space buffer size for SYSLOG trace while the trace is running. However, if the SYSLOGR trace has not been connected to an external writer and you are reducing the size of the trace data space buffer, you must dump the contents of the buffer (see “Obtaining
a dump of system logger information on page 441) before reducing the buffer size if this data is important for debugging. Trace data in the trace data space is discarded when the buffer size is reduced.

Note that if the trace is being turned off (either through a TRACE CT,OFF command or a CTnLOGxx parmlib member) and if the SYSLOGR trace is not connected to an external writer, the trace data must be dumped before turning the trace off to avoid loss of data.

CTnLOGxx parmlib member

The following table indicates the parameters you can specify in a CTnLOGxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnLOGxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

IBM supplies the CTILOG00 parmlib member, which specifies the System Logger tracing activated at initialization. The contents of CTILOG00 as of V1.4 with OA07611 applied are:

```
TRACEOPTS ON
   BUFSIZE(16M)
   OPTIONS('CONNECT, LOGSTRM, DATASET, SERIAL, MISC, LOCBUFF, RECOVERY')
```

These parameters turn on the default system logger tracing to ensure that specific trace options are included and to establish a default trace buffer of 16MB. These trace options are activated at System Logger initialization.

If the PARMLIB trace options specify OFF or when the operator turns the trace off, logger uses minimal tracing which consists only of unexpected events (i.e. COMPERR trace entries).

Example of CTnLOGxx parmlib member

The statements in the following CTnLOGxx parmlib member example specify a 24MB trace buffer. All system logger trace records will be included in the trace output:

```
TRACEOPTS ON
   BUFSIZE(24M)
   OPTIONS('ALL')
```

The statements in the following CTxLOGxx example specify a 32MB trace buffer, with tracing of logstream functional request processing for logstreams SYSPLEX.OPERLOG in ASID 09. In addition, an external writer, EXTWTR, will be started, and SYSLOGR will be connected to the external writer:

```
TRACEOPTS
   WTRSTART(EXTWTR)
   ON
   BUFSIZE(32M)
   ASID(09)
   WTR(EXTWTR)
   OPTIONS('LOGSTRM', 'STRMNAME=(SYSPLEX.OPERLOG) ')
```
TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnM, or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes, allowed only on REPLY</td>
</tr>
</tbody>
</table>

If you reduce the size of the trace data space buffer and the SYSLOG trace has not been connected to an external writer, you must dump the contents of the buffer (see “Obtaining a dump of system logger information” on page 441) before reducing the buffer size if this data is important for debugging. Trace data in the trace data space buffer is discarded when the buffer size is reduced.

If the trace is being turned off (either through a TRACE CT,OFF command or a CTnLOGxx parmlib member) and the trace is not connected to an external writer, the trace data must be dumped before turning the trace off to avoid loss of data.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

OPTIONS parameter

The values for the OPTIONS parameter for the CTnLOGxx parmlib member and reply for a TRACE command, in alphabetical order, are:

<table>
<thead>
<tr>
<th>Option</th>
<th>Default</th>
<th>Subparameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>CONNECT</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>DATASET</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>INVENTORY</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>locbuff</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>logstrm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Misc</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>recovery</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>serial</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>strmname</td>
<td>No</td>
<td>Logstream</td>
</tr>
<tr>
<td>storage</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

ALL
Traces all system logger events.

ASID
Traces events for only the specified address space identifiers (ASID).
COMPERR
Traces internal system logger errors or unexpected events. This option is not specifiable and is always traced, as it is considered the minimal tracing.

CONNECT
Traces list structure connections, disconnections, rebuild and event exit processing.

DATASET
Traces log stream data set allocation and management.

INVENTRY
Traces log stream and structure definition and deletion processing as well as all LOGR CDS accesses. Do not specify this option unless requested by the IBM Support Center as this generate a large amount of records and may cause the buffer to wrap frequently.

LOCBUFF
Traces system logger local buffer management.

LOGSTRM
Traces log stream functional request processing.

MISC
Traces system logger internal miscellaneous services.

RECOVERY
Traces system logger component recovery, detecting abnormal conditions during processing.

SERIAL
Traces system logger serialization services.

STORAGE
Traces system logger storage management. Do not specify this option unless requested by the IBM Support Center as this will generate a large amount of records and may cause the buffer to wrap frequently.

STRMNAME
Traces events for only the specified log streams. If you specify STRMNAME, the specified log streams filter the CONNECT, LOGSTRM, INVENTRY, and DATASET options. The STRMNAME parameter must be specified STRMNAME=(strmname1). If you specify more than one log stream, STRMNAME must be specified STRMNAME=(strmname1, strmname2). A maximum of eight log stream names can be specified.

Note that the system does not verify the log stream names specified.

Formatting a SYSLOGR trace
Format the trace with an IPCS CTRACE COMP(SYSLOGR) subcommand. IBM might request that you enter options for SYSLOGR formatting. You can specify options for SYSLOGR tracing on the OPTIONS parameter of the CTRACE command. The options include:

COMPERR
Displays internal system logger component errors.

CONNECT
Displays list structure connections, disconnections, rebuild and event exit processing.

DATASET
Displays log stream data set allocation and management.

INVENTRY
Displays log stream and structure definition and deletion processing as well as LOGR policy processing.

LOCBUFF
Displays system logger local buffer management.

LOGSTRM
Displays log stream functional request processing.
MISC
Displays system logger internal miscellaneous services.

RECOVERY
Displays system logger component recovery, detecting abnormal conditions during processing.

RQE(REQUEST_ADDRESS)
Specify an 8-byte hexadecimal RQE address. Displays the specified RQE control block.

SERIAL
Displays system logger serialization services.

STACK(REQUEST_ADDRESS)
Specify an 8-byte hexadecimal stack address. Displays the stack at the specified address.

STORAGE
Displays system logger storage management.

Output from a SYSLOGR trace

Figure 138 on page 447 is an example of system logger component trace records formatted with the CTRACE COMP(SYSLOGR) subcommand:

```
COMPONENT TRACE FULL FORMAT
COMP(SYSLOGR)
**** 09/12/1994
CONNECT  03190001  13:03:28.955894   System Logger Services
C9E7C3E2  C07FC9F3  40404040  40404040  | IXCSIG03       |
E203C3E3  C9E2E2F1  0100                | SLCTEST1.      |
RECOVERY  07040001  13:03:58.055519   System Logger Services
C9E7C3E2  F4D9C9C3  80404040  00000001  | IXCG4RFCd......|
B3171D80  0000                ........... |
RECOVERY  07040001  13:09:55.907719   System Logger Services
C9E7C7C3  F4D9C9C3  80404040  00000001  | IXCG4RFCd......|
B31700A0  0000                ........... |
COMPERR  01070007  13:30:58.322696   System Logger Services
E2C3D6E3  E3F34BC1  F0F0F0F0  F0F0F0F0  | SCOTT3.A0000001|
E2E8E2F0  F0F0F0F1  C9E7C7D3  D6C7D94B  | SYS0000011XLOGR|
E2CE2E90  0000                ........... |
```

Figure 138. Example: system logger component trace records formatted with CTRACE COMP(SYSLOGR) subcommand

SYSOMVS component trace

Before using this component trace, ensure that you have read:

• “Planning for component tracing” on page 354
• “Obtaining a component trace” on page 362
• “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSOMVS component trace for z/OS UNIX.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSOMVS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CtnBPXxx. Default member: CTIBPX00 specified in BPXPRM00 member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CtnBPXxx and REPLY for TRACE command</td>
</tr>
</tbody>
</table>
**Component Trace**

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSOMVS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer</td>
<td>• Default: 4MB.</td>
</tr>
<tr>
<td></td>
<td>• Range: 4MB - 64MB.</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnBPXxx member.</td>
</tr>
<tr>
<td></td>
<td>• Location: Data space. In the REPLY for the DUMP command, specify DSPNAME=(asid.SYSZBPX2) where asid is the ASID for z/OS UNIX.</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Data space buffer, trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSOMVS)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Requesting a SYSOMVS trace**

Specify options for requesting a SYSOMVS component trace on a CTnBPXxx parmlib member or on the reply for a TRACE CT command.

You can change options for SYSOMVS tracing while the trace is running.

**CTnBPXxx parmlib member**

The following table indicates the parameters you can specify on a CTnBPXxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnBPXxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes – see note</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes – see note</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Note:**

- Specify the new buffer size in the BUFSIZE parameter on the CTnBPXxx member being used.
- The JOBNAME= parameter can be used for the SYSOMVS Ctrace to trace data just for jobs that run with the specific user ID(s) specified in the JOBNAME list. This filtering is based on the user ID of a job, not its jobname.
- The OMVS kernel is traced with jobname OMVS.

IBM supplies the CTIBPX00 parmlib member, which specifies the z/OS UNIX tracing begun at ipl. The contents of CTIBPX00 are:

```
TRACEOPTS
ON
BUFSIZE(128K)
```

The parameters turn on the minimal SYSOMVS tracing. These parameters request the unexpected or important z/OS UNIX System Services events. The trace buffer size is 128KB. This member activates the
minimal trace at IPL. In the IBM-supplied BPXPRM00 parmlib member, the CTRACE parameter specifies CTIBPX00 as the default.

**TRACE and REPLY commands**
The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

You can change options while a SYSOMVS trace is running.

**OPTIONS parameter**
The values for the OPTIONS parameter for the CTnBPXxx parmlib member and reply for a TRACE command, in alphabetical order, are:

**ALL**
- Traces all events.

**CBTR(cbid,offset,length)**
- Traces a field or fields of a control block to be traced. The contents of the trace will be included in the trace record for all SYSCALL trace records.
  - `cbid` specifies the name of any of the supported z/OS UNIX control blocks in 1–4 characters.
  - `offset` specifies the offset of the desired field in the control block in range X'0'-X'FFFF'.
  - `length` specifies the length of the data, in bytes, to be traced in the control block. `length` is an integer hexadecimal value with a range of X'1'-X'8'.

**CHARS**
- Traces character special events.

**DEVPTY**
- Traces pseudoterminal events.

**DEVRTY**
- Traces outboard communication server (OCS) remote terminal events.

**FILE**
- Traces file system events. In a shared file system configuration, selecting the FILE option also activates the XCF option.

**IPC**
- Traces interprocess communication activity for shared memory, message queues and semaphores.
**LOCK**
Traces locking services events.

**PIPE**
Traces pipe events.

**PROCESS**
Traces process events.

**PTRACE**
Traces PTRACE events.

**SIGNAL**
Traces signaling events.

**STORAGE**
Traces storage management events.

**SYSCALL**
Traces callable service layer events.

**XCF**
Traces file sharing events when using a shared file system configuration.

**Examples of requesting SYSOMVS traces**

- **Example 1:** CTnBPXxx member
  The member requests DEVPTY, FILE, and SIGNAL options.

  ```
  TRACEOPTS
  ON
  OPTIONS('DEVPTY','FILE','SIGNAL')
  ```

- **Example 2:** TRACE command
  The example requests a trace of DEVPTY and FILE trace events.

  ```
  TRACE CT,ON,COMP=SYSOMVS
  * 18 ITT006A ...
  REPLY 18,OPTIONS(DEVPTY,FILE),END
  ```

- **Example 3:** TRACE command
  The example requests a trace of four bytes at offset zero of control block PPRP.

  ```
  TRACE CT,ON,COMP=SYSOMVS
  * 18 ITT006A ...
  REPLY 18,OPTIONS(=(CBTR(PPRP,0,4))),END
  ```

**Formatting a SYSOMVS trace**

Format the trace with an IPCS CTRACE COMP(SYSOMVS) subcommand. The OPTIONS parameter specifies the options that select trace records to be formatted. Your formatting options depend to a great extent on the tracing options you requested. Use the options to narrow down the records displayed so that you can more easily locate any errors. If the CTRACE subcommand specifies no options, IPCS displays all the trace records.

- **ALL**
  Formats all events.

- **CHARS**
  Formats character special events.

- **DEVPTY**
  Formats pseudoterminal events.

- **DEVRTY**
  Formats OCS remote terminal events.
EXCEPTION
Formats exceptional events, such as recovery records or error records.

FILE
Formats file system events.

IPC
Formats events for shared memory, message queues and semaphores.

KERNINFO
Formats the output to include a header for each record that includes descriptive information regarding the system call, process ID, and the module that requests the trace.

LOCK
Formats locking services events.

PIPE
Formats pipe events.

PROCESS
Formats process events.

PTRACE
Formats PTRACE events.

SACCOUNTS
Counts the number of syscalls that occur in the trace. Also counts the number of function codes that occur in a trace. The outputs are displayed in tables. Formatting is suppressed. The function codes refer to the types of messages that are crossing between systems in a sysplexed environment. In a non-sysplex dump, the functions code table will be empty. You could run an application while collecting CTRACE data, and then use this option to determine the frequency of syscalls and function codes being made by the application.

SEARCH
Starting at the specified offset, searches trace entries for a specific value and displays the matches. A CLIST called BPXMSCER is provided to allow the search to be performed against specific entity ids that will identify syscall exits that have failed.

SIGNAL
Formats signaling events.

STORAGE
Formats storage management events.

SYSCALL
Formats callable service layer events.

SYSID(nnn)
Formats sysplex system events. When this is requested by the user, only those trace records that contain a sysplex system id will be formatted and displayed. (nnn) is the sysplex number or name of the system in the sysplex whose records will be displayed. See “Example of CTRACE DISPLAY PARAMETERS panel” on page 452 for an example of a CTRACE DISPLAY PARAMETERS panel and the SYSID option on that panel.

XCF
Formats XCF events.
Example of CTRACE DISPLAY PARAMETERS panel

The CTRACE DISPLAY PARAMETERS panel has the following format. When SYSID is specified, only those trace records that contain a sysplex system ID will be formatted and displayed. If SYSID is not specified, data from all the systems will be displayed.

--------- CTRACE DISPLAY PARAMETERS ---------
Enter option
COMMAND ===>
System ===> (System name or blank)
Component ===> SYSOMVS (Component name (required))
Subnames ===> 
GMT/LOCAL ===> G (G or L, GMT is default)
Start/time ===> (mm/dd/yy, hh:mm:ss:dddddd or mm/dd/yy, hh:mm:ss.dotddd)
Stop time ===> 
Limit ===> 0 (Exception ===>)
Report type ===> SHORT (SHORT, Summary, Full, Tally)
User exit ===> (Exit program name)
Override source ===> 
Options ===> SYSID(1)

To enter/verify required values, type any character
Entry IDs ===> Jobnames ===> ASIDs ===> OPTIONS ===> SUBS====>
CTRACE COMP(SYSOMVS) SHORT OPTIONS((SYSID(1)))

ENTER = update CTRACE definition.  END/PF3 = return to previous panel.
S = start CTRACE.  R = reset all fields.

Examples of subcommands to format a SYSOMVS trace

• Example 1: CTRACE subcommand requesting SEARCH option
The example requests the SEARCH option to search every CTRACE entry, starting at the offset specified by offset, for the value specified by value.

CTRACE COMP(SYSOMVS) FULL OPTIONS((SEARCH(x'offset',x'value'))

• Example 2: CTRACE subcommand requesting SCCOUNTS option
The example requests the SCCOUNTS option to count the number of syscalls from within the trace.

CTRACE COMP(SYSOMVS) FULL OPTIONS((SCCOUNTS))

Output from a SYSOMVS trace

“SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) FULL” on page 452 is an example of SYSOMVS component trace records formatted with the CTRACE COMP(SYSOMVS) FULL subcommand.

SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) FULL

@Component Trace Full Format
COMP(SYSOMVS)
**** 05/25/1999

<table>
<thead>
<tr>
<th>SYNAME</th>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>00890407</td>
<td>18:14:14.551107</td>
<td>XCF BUFFER I/O TRACE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| SY1    | XCF      | 00890407 | 18:14:14.551325 | NXMSO-->XCF MESSAGE OUT |
|        |          |          |            |             |
|        |          |          |            |             |

| SY1    | XCF      | 00890407 | 18:14:14.553125 | NXMSO-->XCF MESSAGE OUT |
|        |          |          |            |             |
|        |          |          |            |             |

| ASID...0025 | USERID....WELLIE1 | STACK@....2566DF18 |
| ASID...0025 | USERID....WELLIE1 | STACK@....2566DF18 |
| ASID...0025 | USERID....WELLIE1 | STACK@....2566DF18 |
| ASID...0025 | USERID....WELLIE1 | STACK@....2566DF18 |
| ASID...0025 | USERID....WELLIE1 | STACK@....2566DF18 |
| ASID...0025 | USERID....WELLIE1 | STACK@....2566DF18 |

| TCB...009E04A0 | EUID.......0000000B | SYSCALL....00000036 |
| TCB...009E04A0 | EUID.......0000000B | SYSCALL....00000036 |
| TCB...009E04A0 | EUID.......0000000B | SYSCALL....00000036 |
| TCB...009E04A0 | EUID.......0000000B | SYSCALL....00000036 |
| TCB...009E04A0 | EUID.......0000000B | SYSCALL....00000036 |
| TCB...009E04A0 | EUID.......0000000B | SYSCALL....00000036 |

+0000 E2C5D5C4 00890101 02000001 000A0002 | SEND............. |
+0010 B2DBC852 285F5AC7 7B070500 403E3000 | ..H..¬!G#x.. ...
+0020 01FF0006 00008178 C6000000 | ......a.F... |

452 z/OS: MVS Diagnosis: Tools and Service Aids
SY1 trace flow

Figure 139 on page 454 and Figure 140 on page 454 contain the SY1 trace information found in "SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) FULL" on page 452.

Figure 139 on page 454 describes the CTRACE entries generated by the BPXNXMSO processing on the client side. The ASID / TCB highlighted describe the client making the request. The most important information is the Unique Request-ID (as noted with an asterisk (*)). This is used to track a request from the client to through the server, and back again.

Two separate trace entries are provided. One states that a message has been entered into a block of messages, and the other states that the block has been written. The buffer address (as noted with an @) is used to cross reference these two trace entries.
## SY1 Trace Flow: Part 1

Figure 139 on page 454 describes the response arriving on the client system. First, the XCF SRB (BPXNXMSG) processes the incoming response to cause the client task to be activated. And then, the target task (no longer remapped) wakes up, and, in this example, explicitly frees the resources that were allocated to it as part of the XCF message processing.

### Figure 140. SY1 Trace Flow: Part 2

Figure 140 on page 455 contains the SY2 trace information found in “SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) FULL” on page 452.

Figure 141 on page 455 describes the server side XCF SRB processing by first queuing the request (BPXNXMSG), and then having a worker task pick up that piece of work for subsequent processing (BPXNXWRK).

As noted with an *, the Request-ID is used to cross reference the individual trace entries.

### SY2 Trace Flow

Figure 141 on page 455 contains the SY2 trace information found in “SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) FULL” on page 452.

Figure 141 on page 455 describes the server side XCF SRB processing by first queuing the request (BPXNXMSG), and then having a worker task pick up that piece of work for subsequent processing (BPXNXWRK).

As noted with an *, the Request-ID is used to cross reference the individual trace entries.
When a SYSNAME field is included in a trace entry, the ASID / TCB information actually describes the client side requester information. The SYSNAME field describes the originating system. The highlighted field with an & is the TCB address of the worker task resident in the server system.

<table>
<thead>
<tr>
<th>SYSNAME</th>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY2</td>
<td>XCF</td>
<td>006090402</td>
<td>18:14:14.553698</td>
<td>NXMSO--&gt;XCF MESSAGE SRB EXIT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASID..000E</th>
<th>USERID..OMVS</th>
<th>STACK@..25389F28</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCB..000E000000000</td>
<td>EURID..000000000</td>
<td>SYSCALL..000000000</td>
</tr>
<tr>
<td>+0000 09C5C835</td>
<td>+0000 0025D80E</td>
<td>RECVM..-----------</td>
</tr>
<tr>
<td>+0010 00030000</td>
<td>10A010014 +01170B04 $0013C000</td>
<td>..........................</td>
</tr>
<tr>
<td>+0020 01000001</td>
<td>006A0001</td>
<td>00068178</td>
</tr>
<tr>
<td>+0030 006D0000</td>
<td>00000009</td>
<td>00000000</td>
</tr>
<tr>
<td>+0040 00000000</td>
<td>00000000</td>
<td>00000000</td>
</tr>
</tbody>
</table>

SY2 | XCF | 006090402 | 18:14:14.553715 | NXWRK-->XCF WORKER TASK TRACE |

| #ASID..0025 | USERID..OMVS | STACK@..25CF0000 |
| #TCB..009E04A0 | EURID..00000000B |
| FCODE..0003 | #SYSNAME..SY1 |
| +0000 666D902D | 3000022C | 609D96C68 | 10A010014 |  WORK.....%...|
| +0010 +01170B04 $0013C02C | 01000001 | 00000001 | ..m.[].....|
| +0020 01FF0006 | 80000000 | 00000000 | 006A0001 | ..........................|
| +0030 0025D80E | 00000000 | 00000000 | 00000000 | 00000000 | | Q/...|
| +0040 00000000 | 00000000 | 00000000 | 4F4F4F4F | | ......|||

# - ASID / TCB of requester & - Real OMVS resident worker TCB $ - Block #, Index into NXRQ ! - HFS function being requested * - Unique Request-ID % - Indicates ASID/TCB remapped to requester

Figure 141. SY2 Trace Flow: Part 1

Figure 142 on page 455 describes the response arriving on the client system. First the XCF SRB (BPXNXMSG) processes the incoming response to cause the client task to be activated. And then the target task (no longer remapped) wakes up, and in this case explicitly frees the resources that were allocated to it as part of the XCF message processing.

<table>
<thead>
<tr>
<th>SYSNAME</th>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY2</td>
<td>XCF</td>
<td>006090402</td>
<td>18:14:14.553881</td>
<td>XCF BUFFER I/O TRACE</td>
</tr>
</tbody>
</table>

| #ASID..0025 | USERID..OMVS | STACK@..25CF0000 |
| #TCB..009E04A0 | EURID..00000000B |
| FCODE..0003 | %SYSNAME..SY1 |
| +0000 E2C5D5C4 | 01000001 | 000A0001 | SEND............ |
| +0010 B2DBC852 | 29114142 | !7F636AD8 | ..H....."Q ...|
| +0020 01FF0006 | 00000118 | C6000000 | ........F...     |

SY2 | XCF | 006090402 | 18:14:14.554039 | NXMSO-->XCF MESSAGE OUT |

| #ASID..0025 | USERID..OMVS | STACK@..25CF0000 |
| #TCB..009E04A0 | EURID..00000000B |
| FCODE..0003 | %SYSNAME..SY1 |
| +0000 09C5C835 | 00030000 | 001E6D69 | RECVM..-----------|
| +0010 +01170B04 $0013C02C | 01000001 | 00000001 | ..m.[].....|
| +0020 01FF0006 | 29114142 | 07F636AD8 | 401FB000 | .. .........|
| +0030 0025D80E | 00000000 | 00000000 | 00000000 | 00000000 | | Q/...|
| +0040 253A4088 | 00000000 | 00000000 | 00000000 | 00000000 | | .. h/...|

# - ASID / TCB of requester @ - Buffer address containing request $ - Block #, Index into NXRQ ! - HFS function being requested * - Unique Request-ID % - Indicates ASID/TCB remapped to requester

Figure 142. SY2 Trace Flow: Part 2

Control block trace

Figure 143 on page 456 is an example of SYSOMVS component trace records requested with OPTIONS(CBTR(PPRP,0,4)) to trace a four byte field at offset zero in the PPRP control block. The trace data was then formatted with the CTRACE COMP(SYSOMVS) subcommand:
Figure 143. Control block trace output

Figure 144 on page 456 is an example of SYSOMVS component trace records formatted with the CTRACE COMP(SYSOMVS) SHORT subcommand.

The output from a SYSOMVS trace using the SCCOUNTS option has 2 formats, shown in Figure 145 on page 456 and Figure 146 on page 457.

Figure 145. SCCOUNT Function Displaying SYSCALL Frequency

Figure 145 on page 456 is sorted by frequency, with the highest values appearing at the top of the list. SYSCALL# is the hexadecimal number of the syscall. FREQUENCY/SEC is the number of times the syscall has been invoked within the interval.
Figure 146. SCCOUNT Function Displaying Function Code Frequency

Figure 146 on page 457 is sorted by frequency, with the highest values appearing at the top of the list. FuncCode is the hexadecimal number of the function code. Functions/Sec is the number of times the function code has been invoked within the interval.

The output from a SYSOMVS trace using the KERNINFO option is shown in Figure 147 on page 457. The syscall function name (FCN) and the process ID (PID) are shown on the first line of the trace entry.

**Figure 147. CTRACE COMP(SYSOMVS) FULL OPTIONS((KERNINFO))**

**SYSOPS component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSOPS component trace for the operations services component (OPS).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSOPS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CtnOPSxx. Default member: CTIOPS00 specified in CONSOLxx member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CtnOPSxx or REPLY for TRACE command</td>
</tr>
</tbody>
</table>
Component Trace

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSOPS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer</td>
<td>• Default: 2MB</td>
</tr>
<tr>
<td></td>
<td>• Range: 64KB - 16MB</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnOPSxx member or REPLY for TRACE CT command</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes, when restarting a trace after stopping it</td>
</tr>
<tr>
<td></td>
<td>• Location: Console address space (private)</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer, trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSOPS)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Note:** To get a complete dump for OPS, request also the NUC, CSA, and SQA.

Requested a SYSOPS trace

Specify options for requesting a SYSOPS component trace in a CTnOPSxx parmlib member or in the reply for a TRACE CT command.

**CTnOPSxx parmlib member**

The following table indicates the parameters you can specify on a CTnOPSxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnOPSxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

IBM supplies the CTIOPS00 parmlib member, which defines the component trace to the system and establishes a trace buffer of 2M. The contents of CTIOPS00 are:

```
TRACEOPTS
  ON
  BUFSIZE (2M)
```

IBM does not supply a sample CONSOL00 parmlib member. Create a CONSOLxx parmlib member and specify CON=xx in the IEASYSxx parmlib member. Specify CTIOPS00 as the default on the CTRACE parameter of the INIT statement of CONSOLxx.

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnnnM, or OFF</td>
<td>One is required. The buffer size can be changed only when the trace is OFF or the trace is ON.</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTnOPSxx parmlib member and reply for a TRACE command, in alphabetical order, are:

**COMMAND**
Traces events related to command processing.

**CONSDATA**
Traces events related to console state changes.

**LOGGING**
Traces events related to Operlog and Syslog processing.

**MCACHE**
Traces events related to the message cache.

**MESSAGES**
This option includes the WTO, MSGDLVRY, MCACHE and LOGGING options.

**MSG=msgid**
Traces processing of a specific message. It REQUIRES either one of the following OPTIONS: MESSAGES, WTO, MSGDLVRY, MCACHE or LOGGING. *msgid* is 1-10 alphanumeric characters in length indicating the message id that will be traced.

**MSGDLVRY**
Traces events for WQE processing, MCS console message queueing, and extended MCS console message processing.

**RECOVERY**
Traces recovery events.

**SERIALIZ**
Traces latch serialization events.

**SYSPLEX**
Traces events for XCF signalling, sysplex serialization services, sysplex clean-up processing, and the manipulation of various queues.

**WTO**
Traces the effects of MPFLSTxx, the user exits, and the SSI on message content and attributes.

These additional options increase the number of trace records the system collects and can slow system performance. Each time you change the trace options, you must respecify any options you want to keep in effect from the last trace.
Note: Before you use the MESSAGES, WTO, MSGDLVRY, MCACHE or LOGGING options, you should do the following:

- Increase the buffer size
- Start and connect the external writer.

This is especially important if you are starting tracing at IPL. This might not be necessary if you are tracing a message ID since you would only be cutting records for the particular message.

Examples of requesting SYSOPS traces

- Example 1: Activating trace options while system is running

Create parmlib member CTIOPS01, specifying the following parameters. Assume that procedure OPSWTR is in SYS1.PROCLIB.

```
TRACEOPTS
  WTRSTART(OPSWTR)
  ON
  WTR(OPSWTR)
  OPTIONS('MESSAGES','MSG=IEE136I')
  ASID(1,2,3)
  JOBNAME(PAYROLL)
  BUFSIZE(2M)
```

- Example 2: Specifying trace options on a REPLY command

The example requests the same trace as Example 1, but specifies all options on the REPLY.

```
trace ct,wtrstart=opswtr,2m,comp=sysops
```

When the system prompts you for the trace options, enter the following command, replacing id with the reply identifier:

```
reply 27,wtr=opswtr,options=(messages,msg=IEE136I),asid=(1,2,3),
                      jobname=(payroll),end
```

- Example 3: CTnOPSxx member used at IPL

The member requests the SYSPLEX option, doubles the default buffer size, and limits the tracing to ASID 1 and JOBNAME JOB1.

```
TRACEOPTS
  ON
  OPTIONS('SYSPLEX')
  BUFSIZE(4M)
  ASID(1)
  JOBNAME(JOB1)
```

Formatting a SYSOPS trace

Format the trace with an IPCS CTRACE COMP(SYSOPS) subcommand. The OPTIONS parameter specifies the options that select trace records to be formatted. Your formatting options depend to a great extent on the tracing options you requested. Use the options to narrow down the records displayed so that you can more easily locate any errors. If the CTRACE subcommand specifies no options, IPCS displays all the trace records. The options for formatting a SYSOPS trace are:

- COMMAND
  Traces events related to command processing.

- CONSDATA
  Traces events related to console state changes.

- LOGGING
  Traces events related to Operlog and Syslog processing.

- MCACHE
  Traces events related to the message cache.
MESSAGES
This option includes the WTO, MSGDLVRY, MCACHE and LOGGING options.

MSG=msgid
Traces processing of a specific message. It REQUIRES either one of the following OPTIONS: MESSAGES, WTO, MSGDLVRY. MCACHE or LOGGING. msgid is 1-10 alphanumeric characters in length indicating the message id that will be traced.

MSGDLVRY
Traces events for WQE processing, MCS console message queueing, and extended MCS console message processing.

RECOVERY
Traces recovery events.

SERIALIZ
Traces latch serialization events.

SYSPLEX
Traces events for XCF signalling, sysplex serialization services, sysplex clean-up processing, and the manipulation of various queues.

WTO
Traces the effects of MPFLSTxx, the user exits, and the SSI on message content and attributes.

Output from a SYSOPS trace
Figure 148 on page 461 is an example of OPS component trace records formatted with the CTRACE COMP(SYSOPS) SHORT subcommand.

<table>
<thead>
<tr>
<th>COMPONENT TRACE SHORT FORMAT</th>
<th>COMPONENT trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP(SYSOPS)</td>
<td>**** 05/20/93</td>
</tr>
<tr>
<td>MNEMONIC</td>
<td>ENTRY ID</td>
</tr>
<tr>
<td>INITMSG</td>
<td>00000001</td>
</tr>
<tr>
<td>POSTMPF</td>
<td>00000002</td>
</tr>
<tr>
<td>POSTEXIT</td>
<td>00000003</td>
</tr>
<tr>
<td>POSTSSI</td>
<td>00000004</td>
</tr>
<tr>
<td>INITMSG</td>
<td>00000001</td>
</tr>
<tr>
<td>POSTMPF</td>
<td>00000002</td>
</tr>
<tr>
<td>POSTEXIT</td>
<td>00000003</td>
</tr>
<tr>
<td>POSTSSI</td>
<td>00000004</td>
</tr>
<tr>
<td>INITMSG</td>
<td>00000001</td>
</tr>
<tr>
<td>POSTMPF</td>
<td>00000002</td>
</tr>
</tbody>
</table>

Figure 148. Example: OPS component trace records formatted with CTRACE COMP(SYSOPS) SHORT subcommand

Figure 149 on page 462 is an example of OPS component trace records formatted with the CTRACE COMP(SYSOPS) FULL subcommand.
Figure 149. Example: OPS component trace records formatted with CTRACE COMP(SYSOPS) FULL subcommand

SYSRRS component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSRRS component trace for RRS.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSRRS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnRRSxx. No default member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events; general UR services</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnRRSxx and REPLY for TRACE command</td>
</tr>
</tbody>
</table>
| Buffer                       | • Default: 1MB  
|                              | • Range: 1MB - 2045MB                                                      |
|                              | • Size set by: CTnRRSxx member or REPLY for TRACE CT command               |
|                              | • Change size after IPL: Yes, when restarting a trace after stopping it    |
|                              | • Location: Data space and component address space. In the REPLY for the DUMP command, specify DSPNAME=('RRS'.ATRTRACE) and SDATA=RGN. |
### Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>For SYSRRS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace records location</td>
<td>Data space buffer, trace data set, trace buffers in the RRS address space</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSRRS)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Requesting a SYSRRS trace

Specify options for requesting a SYSRRS component trace on a CTnRRSxx parmlib member or on the reply for a TRACE CT command.

To change options or the buffer size, you have to stop the trace and restart it with the new options, buffer size, or both.

#### CTnRRSxx parmlib member

The following table indicates the parameters you can specify on a CTnRRSxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnRRSxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

A CTnRRSxx parmlib member is optional. If not specified, the SYSRRS component trace runs a minimal trace beginning when the RRS component is started and ending when the component is stopped.

#### TRACE and REPLY commands

The following tables indicate the parameters you can specify on a TRACE CT command and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnnnM, or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
</tbody>
</table>
OPTIONS parameter

The OPTIONS parameter for the CTnRRSxx parmlib member or reply for a TRACE command contains keyword subparameters. These subparameters allow you to control the information that RRS component trace collects. The first subparameter, EVENTS, specifies the events to be traced; the other subparameters act as filters to screen the events with up to three checks. An event must pass all checks for component trace to generate a trace record. The order for the checks is:

1. That the event is specified.
2. That the event matches, in an OR check, one of the following filters:
   - The address space ID (ASID) in the REPLY command or CTnRRSxx TRACEOPTS statement
   - The job name (JOBNAME) in the REPLY command or CTnRRSxx TRACEOPTS statement
   - The user ID (USERID) in the OPTIONS parameter
   - The logical work unit ID (LUWID) in the OPTIONS parameter
3. That the event matches a resource manager name (RMNAME) in the OPTIONS parameter.

**EVENTS(event[,event]...)**

Indicates the events to be traced. An EVENTS parameter is required if any other options are specified. The events, in alphabetical order, are:

- **ALL**
  Traces all events. Component trace ignores other events, if specified.

- **CONTEXT**
  Traces calls to context services.

- **EXITS**
  Traces events related to running the RRS exit routines provided by the resource managers.

- **FLOW**
  Traces entry into and exit from RRS entry points.

- **LOGGING**
  Traces events related to logging data by RRS.

- **RESTART**
  Traces events related to RRS initialization and restart.

- **RRSAPI**
  Traces events related to the application programming interface, which consists of calls to the Application_Commit_UR service and the Application_Backout_UR service.

- **STATECHG**
  Traces events involving changes in the state of units of recovery (URs).

- **URSERVS**
  Traces general events related to services for a UR (traced by default).
USERID(userid,,userid,...)
   Specifies 1 to 16 user IDs as filters for specified events. The system traces only events relating to the user IDs.

RMNAME(rmname,,rmname,...)
   Specifies 1 to 16 resource manager names as filters for specified events. For trace events sensitive to the resource manager name, the system traces only events relating to the resource managers.

LUWID(luwid,,(luwid)...)  
   Specifies 1 to 16 logical unit of work identifiers (LUWIDs) as filters for specified events. The system traces only events relating to the LUWIDs. Each luwid consists of:

   \[\text{netid.luname[,instnum][,seqnum]}\]

   Component trace ignores leading and trailing blanks.

   **netid.luname**  
   Specifies the network ID and the local logical unit name. These portions of the LUWID are required.
   - You can use an asterisk (*) as a wildcard character as:
     - The last character in the netid, the luname, or both
     - The only character in the either the netid or the luname, but not as the only character in both

   **instnum**  
   Specifies the instance number as a 1 - 12 hexadecimal integer. You can omit leading zeros.

   **seqnum**  
   Specifies the sequence number as a 1 - 4 hexadecimal integer. You can omit leading zeros.

   Examples of LUWIDs are:

   \[(A.B,5,1)\]
   \[(A.B,5)\]
   \[(A.B,,1)\]
   \[(A.B)\]
   \[(A.*,5,1)\]
   \[(A*.B*)\]

EID(eid[, eid]...)
   Specifies 1 to 16 Enterprise identifiers (EIDs) as filters for specified events. The system traces only events relating to the EIDs. Each eid consists of:

   \[[tid][,gtid]\]

   You can omit leading zeros. Component trace ignores leading and trailing blanks.

   **tid**  
   Specifies the 4-byte hexadecimal transaction identifier (TID).

   **gtid**  
   Specifies the 8-40 byte hexadecimal global transaction identifier (GTID).

   You can obtain the EID for a UR by using the RRS ISPF panels to browse the RRS log streams. The Retrieve_Work_Identifier service can also return an EID.

   Examples of EIDs are:

   \[(1,C)\]
   \[(,C)\]
   \[(1)\]

Component trace
Examples of requesting SYSRRS traces

In Figure 150 on page 466, the member requests context services events filtered by the user ID JONES and requests a 1024KB buffer.

```
TRACEOPTS
ON
OPTIONS('EVENTS(CONTEXT) USERID(JONES)')
BUFSIZE(1024K)
```

*Figure 150. Example: CTnRRSxx member requests context services events*

Figure 151 on page 466 is an example of using the TRACE command to request the same trace shown in Figure 150 on page 466.

```
trace ct,off,comp=sysrrs
trace ct,1024K,comp=sysrrs
* 17 ITT006A ...
reply 17,options=('events(context) userid(jones)'),end
```

*Figure 151. Example: TRACE command requests context services events*

Formatting a SYSRRS trace

Format the trace with an IPCS CTRACE COMP(SYSRRS) subcommand. Its OPTIONS parameter specifies the options that select trace records to be formatted. Your formatting options depend to a great extent on the tracing options you requested. Use the formatting options to narrow down the records displayed so that you can more easily locate any errors. If you specify no options on the CTRACE subcommand, IPCS displays all the trace records.

You can specify one or more OPTIONS subparameters. If you specify no OPTIONS subparameters, all trace records are formatted. A trace record must match all specified OPTIONS subparameters to be formatted.

```
OPTIONS=((option[,option]...))
```

**option** is one of the following:

- **LUWID(luwid)**
  - Specifies one of the logical unit of work identifiers (LUWIDs) specified when the trace was generated.

- **EID(eid)**
  - Specifies one of the Enterprise identifiers (EIDs) specified when the trace was generated. Specify **eid** as:
    - **tid**
    - **tid,gtid**

  Or, if you omitted **tid** when you specified the identifier: *,gtid

- **RMNAME(rmname)**
  - Specifies one of the resource manager names specified when the trace was generated.

- **URID(urid)**
  - Specifies a UR identifier. The URID is a 16-byte character string returned to the resource manager by one of the following callable services: Change_Interest_Type, Express.UR_Interest, Retain_Interest,
Retrieve UR_Interest, or Retrieve UR_Data. The URID is saved in the resource manager log; you can obtain it through an RRS panel.

**USERID(userid)**

Specifies one of the user IDs specified when the trace was generated. Note that USERID does not filter out trace records in which the user ID is blank.

The following is an example of how to specify an IPCS CTRACE OPTIONS parameter:

```
OPTIONS=((RMNAME(datamgr),USERID(jjones)))
```

**Output from a SYSRRS trace**

Fields that do not contain printable characters are filled with asterisks (*). The value is shown in hexadecimal on a separate line.

**Note:** RRS provides the same report for the SUMMARY and FULL parameters on the CTRACE subcommand.

"CTRACE COMP(SYSRRS) SHORT subcommand output" on page 467 is an example of SYSRRS component trace records formatted with the CTRACE COMP(SYSRRS) SHORT subcommand.

**CTRACE COMP(SYSRRS) SHORT subcommand output**

```
COMPONENT TRACE SHORT FORMAT
COMP(SYSRRS)
**** 01/20/1997

SYSTYPE   MNEMONIC ENTRY ID      TIME STAMP      DESCRIPTION
--------   -------- --------  ---------------  ---------------
SY1       COMPERR  00000000  07:53:43.615114  Resource Recovery Services
SY1       FLOW     0801FFFE  07:53:43.615114  ATRB1PCT EXIT
SY1       FLOW     0801FFFF  07:53:43.619823  ATRB1PCT ENTRY
SY1       FLOW     0201FFFF  07:53:43.619867  ATRU1EIN ENTRY
SY1       CONTEXT  02010002  07:53:43.620027  CTXMEINT call
SY1       URSERVS  02010001  07:53:43.620699  ATREINT invoked
SY1       FLOW     0201FFFE  07:53:43.620887  ATRU1EIN EXIT
```

"CTRACE COMP(SYSRRS) SUMMARY or FULL output" on page 467 is an example of SYSRRS component trace records formatted with the CTRACE COMP(SYSRRS) SUMMARY or FULL subcommands.

**CTRACE COMP(SYSRRS) SUMMARY or FULL output**

```
COMPONENT TRACE FULL FORMAT
COMP(SYSRRS)
**** 01/20/1997

SYSTYPE   MNEMONIC ENTRY ID      TIME STAMP      DESCRIPTION
--------   -------- --------  ---------------  ---------------
SY1       COMPERR  00000000  07:53:43.615114  Resource Recovery Services
SY1       FLOW     0801FFFE  07:53:43.615114  ATRB1PCT EXIT
```

Component trace 467
“CTRACE COMP(SYSRRS) TALLY output” on page 468 is an example of SYSRRS component trace records formatted with the CTRACE COMP(SYSRRS) TALLY subcommands.

### CTRACE COMP(SYSRRS) TALLY output

<table>
<thead>
<tr>
<th>FMTID</th>
<th>COUNT</th>
<th>INTERVAL</th>
<th>Mnemonic</th>
<th>Describe</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000000</td>
<td>7</td>
<td>23,774,056</td>
<td>COMPERR</td>
<td>Resource Recovery Services</td>
</tr>
<tr>
<td>02010001</td>
<td>46</td>
<td>2,398,672</td>
<td>URSERVS</td>
<td>ATREINT invoked</td>
</tr>
<tr>
<td>02010002</td>
<td>46</td>
<td>2,398,670</td>
<td>CONTEXT</td>
<td>CTXMEINT call</td>
</tr>
<tr>
<td>02018001</td>
<td>6</td>
<td>18,803,430</td>
<td>STATECHG</td>
<td>UR State Change</td>
</tr>
<tr>
<td>02018008</td>
<td>3</td>
<td>47,008,505</td>
<td>STATECHG</td>
<td>UR being created</td>
</tr>
<tr>
<td>0201FFFE</td>
<td>46</td>
<td>2,398,670</td>
<td>FLOW</td>
<td>ATRU1EIN EXIT</td>
</tr>
<tr>
<td>02030001</td>
<td>0</td>
<td>2,398,670</td>
<td>FLOW</td>
<td>ATRU1EIN ENTRY</td>
</tr>
<tr>
<td>02030009</td>
<td>0</td>
<td>2,398,670</td>
<td>FLOW</td>
<td>ATRU1DIN EXIT</td>
</tr>
<tr>
<td>0203FFFE</td>
<td>0</td>
<td>2,398,670</td>
<td>FLOW</td>
<td>ATRU1DIN ENTRY</td>
</tr>
<tr>
<td>02050001</td>
<td>0</td>
<td>2,398,670</td>
<td>FLOW</td>
<td>ATRU1PDU invoked</td>
</tr>
<tr>
<td>0205FFFE</td>
<td>0</td>
<td>2,398,670</td>
<td>FLOW</td>
<td>ATRU1PDU EXIT</td>
</tr>
</tbody>
</table>

### SYSRSM component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSRSM component trace for the real storage manager (RSM).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSRSM:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnRSMxx. No default member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>No</td>
</tr>
</tbody>
</table>
Information

For SYSRSM:

Trace request OPTIONS parameter
In CTnRSMxx or REPLY for TRACE command

Buffer
• Default: 3 buffers of 32 pages
• 2 - 7 page-fixed primary buffers, 4 - 262,144 pages per buffer
• 1 - 2047 MB for secondary buffers
• Size set by: CTnRSMxx member or REPLY for TRACE CT command
• Change size after IPL: Yes, when starting a trace
• Common service area (LIKECSA) and, if specified in CTnRSMxx, high virtual private storage of the RASP address space.

Trace records location
In the trace data set, trace buffers in high common memory, and the RASP address space.

Request of SVC dump
• By DUMP or SLIP command
• Through the DMPREC option on the CTnRSMxx parmlib member or on the REPLY for the TRACE CT command when RSM enters recovery processing (default)
• Through the DMPOFF option of CTnRSMxx or the TRACE CT reply when SYSRSM tracing is turned off

Trace formatting by IPCS
CTTRACE COMP(SYSRSM)

Trace format OPTIONS parameter
None

Requesting a SYSRSM trace

Specify options for requesting a SYSRSM component trace in a CTnRSMxx parmlib member or in the reply for a TRACE CT command.

CTnRSMxx parmlib member

The following table indicates the parameters you can specify on a CTnRSMxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnRSMxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes. To trace all batch jobs, specify 'INIT' in the list of job names.</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

IBM provides two sample CTIRSMxx parmlib members in SYS1.PARMLIB. These are not default members.

- **CTIRSM01**: Shows how to request tracing of all RSM functions and events using the options DMPOFF, NOCOMASID, and NODMPREC.
- **CTIRSMSP**: Shows how to request address space, job name filtering, and trace request options to limit the tracing.
RSM trace data in high virtual private storage: RSM supports collecting trace data into high private memory. This storage is used as a secondary buffer data, which is first collected into buffers in fixed high common storage, and later moves out into high private memory. Having a secondary buffer is another way, besides trace data sets, to handle a large number of RSM trace records. Note that the paging activity for the secondary buffer can appear in the RSM trace records.

If you suspect that your system has a paging problem, collect the RSM trace records in page-fixed primary buffers to keep from losing records while paging. A record can be lost as the system reuses a full secondary buffer.

For RSM, use BUFF in the CTnRSMxx OPTIONS parameter to specify the number of page-fixed buffers and their page sizes. In Figure 152 on page 470, the statements in CTWRSM05 specify four page-fixed buffers that are 64 pages and a secondary buffer in high private memory of 640 KB.

```
TRACEOPTS
   ON
   BUFSIZE(640K)
   OPTIONS('BUFF(4,64)')
```

*Figure 152. Example: Using the CTWRSM05 parmlib member*

For RSM, the BUFSIZE parameter in the CTnRSMxx parmlib member specifies the total size of the high virtual private buffers located in the RASP address space. The space in the buffer is divided evenly between the amount of installed processors.

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, nnnnM, or OFF</td>
<td>One is required. nnnnK and nnnnM specify the size of the buffer in the RASP address space (high virtual private).</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes. To trace all batch jobs, specify ‘INIT’ in the list of job names.</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Automatic Dump:** The component requests an SVC dump when the operator stops the trace or when RSM enters recovery processing. To prevent these automatic dumps when the trace is written to a trace data set or when the operator is to request the dump, specify NODMPREC and NODMPOFF in the OPTIONS parameter in the TRACE CT command or the CTnRSMxx parmlib member.

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTnRSMxx parmlib member and reply for a TRACE command follow.
If you turn on the SYSRSM trace without specifying any filters or options, the component trace records every RSM function and event in all address spaces and jobs. This trace collects an enormous amount of data and degrades system performance. Use the SYSRSM filters and options to limit the amount of data recorded by the component trace. Specify tracing of specific address spaces, jobs, RSM events, and RSM functions.

The RSM trace options are divided into three groups:

- Special trace options
- RSM function trace options
- RSM event trace options

**Special trace options:** These options set the size of the fixed RSM trace buffers, tell the trace to record common area activity, and tell the system when to dump the trace data. The options are:

- **BUFF=(x,y)**
  This specifies the number and size of the SYSRSM trace buffers, which reside in fixed high virtual common service area (LIKECSA) storage:
  - **x** The number of buffers, from 2 to 7. The default is 3.
  - **y** The number of pages per buffer, from 4 to 262,144. The default is 32.

The storage for each buffer is distributed between the installed processors in the system. For that reason, it is recommended to increase the buffer size on systems with a large amount of processors. The more buffers that are specified, the more often the SRB, which empties out the fixed buffers, is called (if there is a high virtual private buffer or an external writer). The larger the buffer, the greater the burst of events it can contain without losing any trace entries.

For example, if you specify BUFF=(5,10), the component trace uses five fixed trace buffers. Each buffer contains 10 pages. The total amount of fixed storage used is 200 kilobytes.

Note: When choosing the amount of fixed storage to use for trace buffers, consider the amount of central storage available.

- **COMASID**
  Traces activity in the common area page. This is the default.

- **NOCOMASID**
  Prevents tracing of activity in the common area page.

- **DMPREC**
  Includes trace data in the SVC dump requested when RSM enters recovery processing. The SYSRSM trace is suspended while the dump is in progress. The dump contains the most recent trace data recorded prior to the problem. With this dump option, which is a default:
  - The trace tables are not dumped when RSM enters recovery processing.
  - Tracing continues on other processors during recovery processing.

- **NODMPREC**
  Prevents trace data from being dumped if RSM enters recovery processing.

- **DMPOFF**
  Causes trace data to be dumped when tracing for RSM is turned off with a TRACE CT,OFF,COMP(SYSRSM command or with an OFF parameter in a CTnRSMxx parmlib member.

- **NODMPOFF**
  Prevents writing of a dump when the TRACE operator command is entered to stop the trace. This is the default.

**Function Trace Options:** Function trace options identify the RSM functions and services to be traced. The options are:

- **ALLOC2G**
  Traces events for allocating 2G pages.
ASPCREAT
Traces events for the address space create function.

BLOCKMGR
Traces RSM SCM block manager events.

COPYSRVG
Traces RSM copy services group. The group options, which can be specified separately, are:
  COPYSERV
  Traces copy services.
  COPYSRVH
  Traces high virtual copy service.

DFSTEAL
Traces events for the double frame steal function.

DIV
Traces all events in the data-in-virtual services group. The group options, which can be specified separately, are:
  DIVACCUN
  Trace the DIV ACCESS and DIV UNACCESS services.
  DIVMAP
  Traces the data-in-virtual MAP service.
  DIVMAPLV
  Traces the data-in-virtual MAP service (with LOCVIEW=MAP on previous ACCESS).
  DIVRES
  Traces the data-in-virtual RESET service.
  DIVRESLV
  Traces the data-in-virtual RESET service (with LOCVIEW=MAP on previous ACCESS).
  DIVRTR
  Traces the data-in-virtual services router.
  DIVSAVE
  Traces the data-in-virtual SAVE service.
  DIVSLIST
  Traces the data-in-virtual SAVELIST service.
  DIVUNMAP
  Traces the data-in-virtual UNMAP service.

DSPCONV
Traces events in the data space convert interface function.

DSPLIMIT
Traces events in the data space limit interface function.

DATASPAC
Traces all events in the data space and hiperspace group. The group options, which can be specified separately, are:
  DSPSERV
  Traces all events in the data space services group. The group options, which can be specified separately, are:
    DSPCREAT
    Traces events in the DSPSERV CREATE service.
    DSPDELET
    Traces events in the DSPSERV DELETE service.
    DSPDRFOF
    Traces events in DSPSERV define DREF off.
**DSPSERV**
Traces events in the DSPSERV service group.

**DSPSERV define**
Traces events in DSPSERV define DREF on.

**DSPSERV EXTEND**
Traces events in the DSPSERV EXTEND service.

**DSPSERV LOAD**
Traces events in the DSPSERV LOAD service.

**DSPSERV IOOFF**
Traces events in the DSPSERV IOOFF service.

**DSPSERV IOON**
Traces events in the DSPSERV IOON service.

**DSPSERV OUT**
Traces events in the DSPSERV OUT service.

**DSPSERV RELEASE**
Traces events in the DSPSERV RELEASE service.

**DSPSERV router**
Traces events in the DSPSERV router service.

**DSPSERV disabled**
Traces events in the DSPSERV disabled RTR service.

---

**HSPSERV**
Traces all events in the hiperspace services group. The group options, which can be specified separately, are:

**HSPSERV cache**
Traces events in the HSPSERV cache services.

**HSPSERV scroll**
Traces events in the HSPSERV scroll services.

---

**DUMPSERV**
Traces the dumping function.

---

**FAULTS**
Traces all events in the fault services group. The group options, which can be specified separately, are:

**FAULTS address space**
Traces all events in the address space faults group. The group options, which can be specified separately, are:

**FAULTS address page**
Traces disabled address space page faults.

**FAULTS enabled**
Traces enabled address space page faults.

**FAULTS enabled segment**
Traces enabled address space segment faults.

**FAULTS address above**
Traces address space page faults for address above the 2 gigabytes bar.

**FAULTS address above**
Traces address space segment faults for address above the 2 gigabytes bar.

**FAULTS address region**
Traces address space region faults.

**FAULTS address type**
Traces address space type faults.

---

**FLTASP**
Traces all events in the address space faults group. The group options, which can be specified separately, are:

**FLTADPAG**
Traces disabled address space page faults.

**FLTAEPAG**
Traces enabled address space page faults.

**FLTAESEG**
Traces enabled address space segment faults.

**FLTADPAG**
Traces address space page faults for address above the 2 gigabytes bar.

**FLTAHSEG**
Traces address space segment faults for address above the 2 gigabytes bar.

**FLTAREGN**
Traces address space region faults.

**FLTATYPE**
Traces address space type faults.

---

**FLTASP**
Traces all events on the data space faults group. The group options, which can be specified separately, are:
Component Trace

**FLTDEN**
Traces enabled data space faults.

**FLTDDIS**
Traces disabled data space faults.

**FLTEPROT**
Traces protection faults.

**FREEFRAM**
Traces the free frame function.

**GEN**
Traces all events in the general function group. The group options, which can be specified separately, are:

- **GENDEFER**
  Traces general defers.

- **GENIOCMP**
  Trace general I/O completion.

- **GENTERM**
  Traces general abends.

**GLRUSTL**
Traces the global LRU Steal function.

**IARVSERV**
Traces all IARVSERV requests. The Virtual Services group options, which can be specified separately, are:

- **VSCHGACC**
  Traces IARVSERV CHANGEACCESS requests.

- **VSRROUTR**
  Traces IARVSERV service router.

- **VSSHARE**
  Traces IARVSERV SHARE requests.

- **VSSHSEG**
  Traces IARVSERV SHARESEG requests.

- **VSUNSHAR**
  Traces IARVSERV UNSHARE requests.

**IARV64**
Traces all IARV64 requests. The High Virtual services group options, which can be specified separately are:

- **V6CHACC**
  Traces IARV64 CHANGEACCESS requests.

- **V6CHGURD**
  Traces IARV64 CHANGEGUARD requests.

- **V6COUNT**
  IARV64 COUNTPAGES requests.

- **V6DETACH**
  Traces IARV64 DETACH requests.

- **V6DISCAR**
  Traces IARV64 DISCARDDATA requests.

- **V6GETCOM**
  Traces IARV64 GETCOMMON requests.

- **V6GETSHR**
  Traces IARV64 GETSHARED requests.
V6GETSTR
Traces IARV64 GETSTOR requests.

V6LIST
Traces IARV64 LIST requests.

V6PAGFIX
Traces IARV64 PAGEFIX requests.

V6PAGIN
Traces IARV64 PAGEIN requests.

V6PAGOUT
Traces IARV64 PAGEOUT requests.

V6PAGUNF
Traces IARV64 PAGEUNFIX requests.

V6PROTEC
Traces IARV64 PROTECT/UNPROTECT requests.

V6ROUTR
Traces IARV64 service router.

V6SHMOMB
Traces IARV64 SHAREMEMOBJ requests.

LPGALLOC
Traces the Large Page Frame Allocation function.

MACHCHK
Traces the machine check function.

PGSER
Traces all events in the paging services group. The group options, which can be specified separately, are:

PGANY
Traces events in the page anywhere service.

PGFIX
Traces events in the page fix service.

PGFREE
Traces events in the page free service.

PGLOAD
Traces events in the page load service.

PGOUT
Traces events in the page out service.

PGPROT
Traces events in the page protect service.

PGREL
Traces events in the page release service.

PGSRTR
Traces events in the paging service routers.

PGUNPROT
Traces events in the page unprotect service.

QFSTEAL
Traces events for the quad frame steal function.

RECONFIG
Traces the reconfiguration function.

RPBPMGMT
Traces the RSM cell pool management function.
Component Trace

RSMPIN
Traces the RSMPIN services.

SUBSPACE
Traces all events in the subspace group. The group options, which can be specified separately, are:

SSPCONV
Traces the subspace conversion services.

IARSUBSP
Traces the subspace services group. The group options, which can be specified separately, are:

SSPIDENT
Traces the IARSUBSP IDENTIFY service.

SSPCREAT
Traces the IARSUBSP CREATE service.

SSPASSIG
Traces the IARSUBSP ASSIGN service.

SSPUNAS
Traces the IARSUBSP UNASSIGN service.

SSPDELET
Traces the IARSUBSP DELETE service.

SSPSHARE
Traces the IARSUBSP SHARE service.

SSPUNID
Traces the IARSUBSP UNIDENTIFY service.

SSPSRTR
Traces the IARSUBSP router.

SWAP
Traces all events in the swap services group. The group options, which can be specified separately, are:

REALSWAP
Traces events during in-real swap processing.

SWAPIN
Traces events in the swap-in service.

SWAPOUT
Traces events in the swap-out service.

TRACE*
Traces the trace function. This function is always traced.

UIC
Traces the unreferenced interval count function.

UMCPU
Traces the free CPU related frames function.

VIO
Traces the virtual I/O function.

VR
Traces the V=R allocation function.

VSM
Traces all events in the VSM services group. The group options, which can be specified separately are:

VSMFRMN
Traces events in the FREEMAIN service.

VSMGTMN
Traces events in the GETMAIN service.
WAITSER
Traces RSM Wait function.

XCHUP
Traces the exchange up function.

XMPOST
Traces the cross memory posting function.

Event Trace Options: Event trace options identify the events for RSM to collect trace data. The options are:

ESTOR
Traces all events in the expanded storage management group. The group options, which can be specified separately, are:

ESGET
Traces get expanded storage.

ESENQ
Traces enqueue expanded storage.

ESDEQ
Traces dequeue expanded storage.

ESFREE
Traces free expanded storage.

FUNCREQ
Traces the function request event.

PAGEREQ
Traces all events in the page request group. The group options, which can be specified separately, are:

PAGEA2R
Traces requests to move a page from auxiliary to central storage.

PAGEDEF
Traces requests to move a page to central storage was deferred for lack of a frame

PAGEIPTE
Traces requests to invalidate a page table entry.

PAGEP2R
Traces requests to move a page from permanent to central storage.

PAGEREL
Traces requests related to I/O in-progress or related to a defer event.

PAGER2A
Traces requests to move a page from central storage to auxiliary storage.

PAGER2P
Traces requests to move a page from central storage to permanent storage.

PAGER2R
Traces requests to move a page from central storage to central storage.

PGEVENTS
Traces all events in the page fix/free group. The group options, which can be specified separately, are:

FIX
Traces a page being fixed.

FREE
Traces a page being freed.

REGIONGR
Traces all events in the region table group. The group options, which can be specified separately, are:

CREG1ST
Traces the creation of a region 1st table.
CREG2ND
Traces the creation of a region 2nd table.

CREG3RD
Traces the creation of a region 3rd table.

RSTOR
Traces all events in the frame management group. The group options, which can be specified separately, are:

HVFGRP
Traces events for frame management of high virtual frames. The group options, which can be specified separately, are:

HVFRDEQ
Traces when a frame is dequeued from the high virtual frame queue.

HVFRENQ
Traces when a frame is enqueued onto the high virtual frame queue.

HVPGTDEQ
Traces when a frame is dequeued from the high virtual page table frame queue.

HVPGTENQ
Traces when a frame is enqueued onto the high virtual page table frame queue.

RSDEQ
Traces all events in the dequeue frame group. The group options, which can be specified separately, are:

RSDDEFER
Traces when a frame is dequeued from the deferred FREEMAIN frame queue or the orphan frame queue.

RSDFIX
Traces when a frame is dequeued from the fixed frame queue or the local quad frame queue.

RSGDFER
Traces when a frame is dequeued from the general defer frame queue.

RSDPAG
Traces when a frame is dequeued from the pageable frame queue.

RSDSBUF
Traces when a frame is dequeued from the central storage buffer frame queue.

RSDSQA
Traces when a frame is dequeued from the SQA frame queue.

RSDVRW
Traces when a frame is dequeued from the V=R waiting frame queue.

RSENQ
Traces all events in the enqueue frame group. The group options, which can be specified separately, are:

RSEDEFER
Traces when a frame is enqueued onto the deferred or orphan frame queue.

RSEFIX
Traces when a frame is enqueued onto the fixed frame queue or the local quad frame queue.

RSEPAG
Traces when a frame is enqueued onto the pageable frame queue.

RSESBUF
Traces when a frame is enqueued onto the central storage buffer frame queue.

RSEGDFER
Traces when a frame is enqueued on the general defer frame queue.
RSESQA
Traces when a frame is enqueued onto to the SQA frame queue.

RSEVRW
Traces when a frame is enqueued onto to the V=R waiting frame queue.

RSFREE
Traces all events in the free frame group. The group options, which can be specified separately, are:

FREE2G
Traces when a 2G frame group is freed.

PLFREE
Traces when a pageable large (1 MB) frame is freed.

PSFREE
Traces when a single pageable large (1 MB) frame is freed.

QFFREE
Traces when a quad group is freed.

QHFREE
Traces when a quad holding frame is freed.

QSFREE
Traces when a single quad frame is freed.

RSFDBL
Traces when a double frame is freed.

RSFSNG
Traces when a single frame is freed.

RSGET
Traces all events in the get frame group. The group options, which can be specified separately, are:

GET2G
Traces when a 2G frame group is gotten.

LSGET
Traces when a single large frame is gotten.

PLGET
Traces when a pageable large frame (1 MB) group is obtained.

PSGET
Traces when a single pageable large (1 MB) frame group is obtained.

QFGET
Traces when a quad group is gotten.

QHGET
Traces when a quad holding frame is gotten.

QSGET
Traces when a single quad frame is gotten.

RSGDBL
Traces when a double frame is gotten.

RSGSNG
Traces when a single frame is gotten.

SCMBLKMGP
Traces SCM Block Manager events. The group options, which can be specified separately, are:

SCMEVACA
Traces SCM Evacuation Add to Table.
SCMFREE
Traces the SCM Block Manager Free Block.

SCMICHNG
Traces SCM Block Manager Increment Change.

SCMOBT
Traces the SCM Block Manager Obtain Block.

SCMOFLIN
Traces SCM Block Manager Offline Event.

SCMTRANS
Traces SCM Transfer Block ID Event

SCMSTART
Start of SCM Evacuation

SCMEND
End of SCM Evacuation

SCMSTASP
Start SCM Evacuation Address Space

SCMENDAS
End SCM Evacuation Address Space

SCMSTDSP
Start SCM Evacuation Data Space

SCMENDSP
End SCM Evacuation Data Space

SCMPOOLG
Get a blockid from a pool

SCMPOOLF
Free a blockid to a pool

SCMEVACR
Evacuate SCM from stg range

SCMDFGST
Start SCM Defragmentation

SCMADDIN
Add SCM increment

SCMADDEX
Add SCM extent

SHRDATA
Traces all events in the IARVSERV services group. The group options, which can be specified separately, are:

GRPCREAT
Traces the creation of new sharing groups.

GRPDEL
Traces the deletion of existing sharing groups.

GRPPART
Traces the partitioning of existing sharing groups.

VIEWADD
Traces the addition of views to sharing groups.

VIEWCHG
Traces the changing of storage attributes of the view.

VIEWDEL
Traces the deletion of views from sharing groups.
**VIEWMOVE**
Traces the move of existing views from one sharing group to another.

**SHRINT**
Traces High Virtual Shared Interest events. The group options, which can be specified separately, are:

- **SHRADD**
  Traces adding shared interest.

- **SHRDEL**
  Traces removing shared interest.

**STORMOD**
Traces all events in the storage state modification group. The group options, which can be specified separately, are:

- **CLONEPAG**
  Traces the page table entry copied to a subspace.

- **CLONESEG**
  Traces the segment table entry copied to a subspace.

**TRACEB**
Traces the trace buffer event. This event is always traced.

**WORKUNIT**
Traces all events in the net event trace group. The group options, which can be specified separately, are:

- **ENABLE**
  Traces requests to enable a unit of work.

- **SUSPEND**
  Traces requests to suspend a unit of work.

- **RESUME**
  Traces requests to resume a unit of work.

**XEPLINK**
Traces all events in the external entry point linkage group. The group options, which can be specified separately, are:

- **XEPENTRY**
  Traces entry to the entry point.

- **XEPEXIT**
  Traces exit from the entry point.

**Examples of requesting SYSRSM traces**

- **Example 1:** CTnRSMxx member
  The member requests tracing of the FAULTS services group, the PGANY service, and the VIO function, but only for address spaces X'11' and X'41' and for job PGM1.

  ```plaintext
  TRACEOPTS
  ON
  ASID(11,41)
  JOBNAME(PGM1)
  OPTIONS('FAULTS','PGANY','VIO')
  ```

- **Example 2:** TRACE command
  The example specifies that options are to be obtained from the parmlib member CTWRSM17.

  ```plaintext
  trace ct,on,comp=sysrsm,parm=ctwrsm17
  ```

- **Example 3:** TRACE command
The example requests the same trace as Example 2, but specifies all options in the REPLY.

| trace ct,on,comp=sysrsm | * 78 ITT006A ... |
| reply 78,options=(faults,pgany,vio),asid=(11,41),jobname=(pgm1),end |

**Formatting a SYSRSM trace**

Format the trace with an IPCS CTRACE COMP(SYSRSM) subcommand. The subcommand has no OPTIONS values.

**Output from a SYSRSM trace**

“Example: RSM component trace records formatted with CTRACE COMP(SYSRSM) FULL subcommand” on page 482 is an example of RSM component trace records formatted with the CTRACE COMP(SYSRSM) FULL subcommand.

**Example: RSM component trace records formatted with CTRACE COMP(SYSRSM) FULL subcommand**

<table>
<thead>
<tr>
<th>XEPENTRY</th>
<th>00000001</th>
<th>18:10:06.441411</th>
<th>External Entry Point Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNC1...</td>
<td>PGFIX</td>
<td>Page Fix</td>
<td></td>
</tr>
<tr>
<td>JOB1...</td>
<td>ASNB</td>
<td>ASID1... 000D</td>
<td>PLOCKS... 80000001</td>
</tr>
<tr>
<td>JOB2...</td>
<td>ASNB</td>
<td>ASID2... 000D</td>
<td>RLOCKS... 80000000</td>
</tr>
<tr>
<td>KEY......</td>
<td>0036</td>
<td>ADDR... 015FF008 ALET... 00000000</td>
<td></td>
</tr>
</tbody>
</table>

| 7D00      | KEY...... | 005D     | ADDR... 005EF000 ALET... 00000000 |
| KEY...... | 0001     | ADDR... 011F8220 ALET... 00000000 |

| 0151182C | 012D2E60 | 81C00000 | 03000001 | 0000000D | 005EF000 | 00000000 | 00000000 |

| FIX       | 00000003 | 18:10:06.441921 | Page Being Fixed |
| FUNC1... | PGFIX    | Page Fix       |                      |
| JOB1...  | ASNB     | ASID1... 000D  | PLOCKS... 88004001 |
| JOB2...  | ASNB     | ASID2... 000D  | RLOCKS... 88004000  |
| KEY...... | 0036     | ADDR... 015FF008 ALET... 00000000 |

| 7D003500 | KEY...... | 005D     | ADDR... 005EF000 ALET... 00000000 |
| KEY...... | 0001     | ADDR... 011F8220 ALET... 00000000 |

| 0151182C | 012D2E60 | 81C00000 | 03000001 | 0000000D | 005EF000 | 00000000 | 00000000 |

<table>
<thead>
<tr>
<th>XEPENTRY</th>
<th>00000001</th>
<th>18:10:06.441716</th>
<th>External Entry Point Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUNC1...</td>
<td>PGFREE</td>
<td>Page Free</td>
<td></td>
</tr>
<tr>
<td>JOB1...</td>
<td>ASNB</td>
<td>ASID1... 000D</td>
<td>PLOCKS... 88004001</td>
</tr>
<tr>
<td>JOB2...</td>
<td>ASNB</td>
<td>ASID2... 000D</td>
<td>RLOCKS... 88004000</td>
</tr>
<tr>
<td>KEY......</td>
<td>0036</td>
<td>ADDR... 015FF008 ALET... 00000000</td>
<td></td>
</tr>
</tbody>
</table>

| 8100      | KEY...... | 005D     | ADDR... 005F5000 ALET... 00000000 |
| KEY...... | 0001     | ADDR... 01210660 ALET... 00000000 |

| 0151182C | 012D2E60 | 81C00000 | 03000001 | 0000000D | 005F5000 | 00000000 | 00000000 |

| FREE      | 00000004 | 18:10:06.461766 | Page Being Freed |
| FUNC1...  | PGFREE   | Page Free      |                          |
| JOB1...  | ASNB     | ASID1... 000D  | PLOCKS... 88004001      |
| JOB2...  | ASNB     | ASID2... 000D  | RLOCKS... 88004000       |
| KEY...... | 0036     | ADDR... 015FF008 ALET... 00000000 |

| 8100      | KEY...... | 005D     | ADDR... 005F5000 ALET... 00000000 |
| KEY...... | 0001     | ADDR... 01210660 ALET... 00000000 |

| 0151182C | 012D2E60 | 81C00000 | 03000001 | 0000000D | 005F5000 | 00000000 | 00000000 |

The fields that you may need in the report are:

**FUNC1**

The function in control at the time the trace event was recorded.
**JOBN1**
The job name identifying the address space that contains the unit of work requesting the RSM service.

**JOBN2**
The job name that matched a name in the job name list provided with the TRACE operator command.

**ASID1**
The ASID identifying the address space that contains the unit of work requesting the RSM service.

**ASID2**
The ASID that matched an identifier in the ASID list provided with the TRACE operator command.

**CPU**
The central processor identifier for the processor the trace is running on.

---

**SYSSPI component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSSPI component trace for the service processor interface (SPI).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSSPI:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTISPI00</td>
</tr>
<tr>
<td></td>
<td>If there is an CTISPI00 member in the parmlib concatenation, it will be used during IPL to control the initial state of the trace.</td>
</tr>
<tr>
<td></td>
<td>If there is no CTISPI00 member in parmlib, the initial state will be OFF.</td>
</tr>
<tr>
<td>Default tracing</td>
<td>No</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTISPI00 and REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 64KB</td>
</tr>
<tr>
<td></td>
<td>• Range: 32KB to 1216KB</td>
</tr>
<tr>
<td></td>
<td>• Size set by: TRACE CT, nnnK, COMP=SYSSPI command or the BUFSIZE specified in parmlib member CTISPIxx.</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes, by turning the trace off, changing the size and then turning the trace back on.</td>
</tr>
<tr>
<td></td>
<td>• Location: In the component area</td>
</tr>
<tr>
<td>Trace records location</td>
<td>ECSA</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By the component</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSSPI)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>

---

**Requesting a SYSSPI trace**

Request a SYSSPI trace at the direction of the IBM Support Center. Do the following:

1. Start the trace with the command:

   ```plaintext
   TRACE CT,ON,COMP=SYSSPI
   ```
2. After the interval specified by IBM, stop the trace with the command:

   TRACE CT,OFF,COMP=SYSSPI

When the buffer fills up, the component requests an SVC dump, which includes the contents of the buffer. Optionally, the operator could enter a DUMP command.

CTISPI00 parmlib member

The following table indicates the parameters you can specify on a CTISPI00 parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTISPI00?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>No</td>
</tr>
</tbody>
</table>

TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTIONS</td>
<td>No</td>
</tr>
</tbody>
</table>

OPTIONS parameter

The values for the OPTIONS parameter for the CTISPI00 parmlib member and reply for a TRACE command, in an alphabetical order, are:

DMPOFF
  Take a SVC dump when the trace is turned off. This is the default.

NODMPOFF
  Do not take an SVC dump when the trace is turned off.

NOWRAP
  When the buffer becomes full, take an SVC dump and discard all trace data. This is the default.

WRAP
  When the buffer becomes full, do not take an SVC dump, and discard some of the oldest trace data to make room for new trace data.

Formatting a SYSSPI trace

1. On z/OS V2R3 or earlier systems, use SPZAP to change a module. IBM supplies the change.
2. Format the trace with an IPCS CTRACE COMP(SYSSPI) subcommand. The subcommand has no options values.

SYSTTRC transaction trace

Transaction trace does not participate in component trace-controlled processing. It is a standalone tracing facility. Do not use trace CT commands for transaction trace. Do not attempt to add a component trace parmlib member for transaction trace. For information on transaction trace, see Chapter 13, “Transaction trace,” on page 501.
SYSVLF component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSVLF component trace for the virtual lookaside facility (VLF).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSVLF:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>None</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: N/A</td>
</tr>
<tr>
<td></td>
<td>• Range: N/A</td>
</tr>
<tr>
<td></td>
<td>• Size set by: MVS system</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: No</td>
</tr>
<tr>
<td></td>
<td>• Location: Data space. Enter DISPLAY J,VLF to identify the VLF data spaces. In the REPLY for the DUMP command, specify DSPNAME=('VLF'.Dclsname,'VLF'.Cclsname), where clsname is a VLF class name.</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Address-space buffer, data-space buffer</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command or when SYSVLF full tracing is turned off</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSVLF)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>

Requesting a SYSVLF trace

A minimal trace runs whenever VLF is in control. No actions are needed to request the minimal trace.

To record more than the minimal trace, request full tracing with the TRACE operator command. Note that full tracing can slow system performance. The following table indicates the parameters you can specify on a TRACE CT command. In response to the command, the system does not prompt the operator for a reply.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>No</td>
</tr>
</tbody>
</table>

When you turn the full tracing off, the system writes a dump containing the trace records, then resumes minimal tracing.

Examples of requesting and stopping SYSVLF full traces

• Example 1: Requesting a SYSVLF full trace
The command requests a full trace.

```
TRACE CT, ON, COMP=SYSVLF
```

**Example 2: Stopping a SYSVLF full trace**

The command turns off full tracing. In response, the system writes a dump and resumes minimal SYSVLF tracing.

```
TRACE CT, OFF, COMP=SYSVLF
```

**Example 3: Command for SYSVLF tracing in a sysplex**

The following command turns on tracing for a SYSVLF trace in the systems of a sysplex. Because SYSVLF has no parmlib member, the CTTIT00 member is used to prevent prompts.

```
route *all, trace ct, on, comp=sysvlf, parm=ctiitt00
```

### Formatting a SYSVLF trace

Format the trace with an IPCS CTRACE COMP(SYSVLF) subcommand. The subcommand has no OPTIONS values.

### Output from a SYSVLF trace

Figure 153 on page 486 is an example of VLF component trace records formatted with the CTRACE COMP(SYSVLF) FULL subcommand. It shows formatted exception records from the trace buffers.

```
*** *01/27/90
COFRCVRY 00000000 16:03:02.181262 VLF RECOVERY ENTRY
HASID... 000E SASID... 000E CPUID... FF170284 30900000
MODNAME. COFMPURG ABEND... 840C4000 REASON.. 00000011
EPTABLE. PURG ESTA ...... ...... ...... ...... ......
COFRCVRY 00000001 16:03:02.181324 VLF RECOVERY EXIT
HASID... 000E SASID... 000E CPUID... FF170284 30900000
MODNAME. COFMPURG ABEND... 840C4000 REASON.. 00000011
RETCODE. 00000000 RSNCODE. 00000000 FTPRTS.. 80300000 DATA.... 00000000.
.
```

*Figure 153. Example: VLF component trace records formatted with CTRACE COMP(SYSVLF) FULL subcommand*

The following explains fields in the report. Additional fields that are not shown in the example can be in a report. These additional fields are explained below in the Other Fields section.

- **COFRCVRY**
  - The name or identifier of the trace record.

- **00000000**
  - The identifier in hexadecimal

- **16:03:02.181262**
  - The time stamp indicating when the record was placed in the trace table

- **HASID... 000E**
  - The home address space identifier

- **SASID... 000E**
  - The secondary address space identifier

- **CPUID... FF170284 30900000**
  - The identifier of the processor that placed the record in the trace table
CALLER
The address of the routine that issued a VLF service request, such as DEFINE, CREATE, NOTIFY, PURGE, etc..

MODNAME. COFMPURG
The name of the module that was running

ABEND... 840C4000
The abend that occurred and caused VLF to enter recovery is 0C4

REASON.. 00000011
The reason code associated with the abend

EPTABLE. PURG ESTA
Information used for diagnosis by IBM

RETCODE. 00000000
The return code that was issued by the module that is exiting

RSCODE. 00000000
The reason code that was issued by the module that is exiting

FTPRTS.. 80300000
Information used for diagnosis by IBM

DATA.... 00000000
Information used for diagnosis by IBM

Other Fields: Fields that are not shown in the example CTRACE output but that may appear in a report are:

CINDX
The concatenation index of the major name for which an object has been created or retrieved

CLASS... NPDS3
The name of a VLF class

DDNAME
The DDNAME of the concatenated data set list

FUNC=xxxx
Indication of the function for which a NOTIFY occurred

FUNCCODE
The hexadecimal value of the NOTIFY function code when it cannot be interpreted

MAJOR
The major name

MINADDR
Address of a field containing a minor name

MINALET
Access list entry token (ALET) associated with the address used to locate the minor name

MINOR
The minor name

OBJSIZE
The total size, in bytes, of the object returned by a COFRETRI macro

PARMS
Hexadecimal dump of the COFNOTIF macro parameter list

TLSTADDR
Address of a target list for a COFRETRI macro

TLSTALET
Access list entry token (ALET) of a target list for a COFRETRI macro

TLSTSIZE
The length, in bytes, of the target list
**UTOKEN**
User token returned by a COFIDENT macro and required as input for COFREMOV, COFCREAT, and COFRETRI macros

**VOLSER**
The volume serial

---

**SYSWLMD component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSWLMD component trace for the workload manager (WLM).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSWLMD:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>
| Buffer | • Default: 64KB  
• Range: 64KB - 16M  
• Size set by: MVS system  
• Change size after IPL: Yes, when starting a trace  
• Location: Extended common service area (ECSA) |
| Trace records location | Address-space buffer, trace data set |
| Request of SVC dump | By DUMP or SLIP command |
| Trace formatting by IPCS | CTRACE COMP(SYSWLM) |
| Trace format OPTIONS parameter | None |

---

**Requesting a SYSWLMD trace**

Request a SYSWLMD component trace by a TRACE CT command.

**TRACE and REPLY commands**

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON, nnnnK, OFF</td>
<td>One is required. nnnnK specifies the size of the buffer.</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Writer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>
Examples of requesting SYSWLM traces

Figure 154 on page 489 shows an example of how to request a SYSWLM component trace.

```
trace ct, on, comp=syswlm  
* ITT006A ...  
reply 17,end
```

*Figure 154. Example: requesting a SYSWLM component trace*

Formatting a SYSWLM trace

Format the trace with an IPCS CTRACE COMP(SYSWLM) subcommand. The subcommand has no OPTIONS values.

Output from a SYSWLM trace

Figure 155 on page 489 is an example of SYSWLM component trace records formatted with the CTRACE COMP(SYSWLM) SHORT subcommand.

```
<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLMEPEXT</td>
<td>00005004</td>
<td>14:07:42.807618</td>
<td>Entry Point Exited</td>
</tr>
<tr>
<td>WLMEPENT</td>
<td>00005003</td>
<td>14:07:46.335663</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td>WLMEPEXT</td>
<td>00005004</td>
<td>14:07:46.336376</td>
<td>Entry Point Exited</td>
</tr>
<tr>
<td>WLMEPENX</td>
<td>00005005</td>
<td>14:07:46.336480</td>
<td>Entry Point Entered Exception</td>
</tr>
<tr>
<td>WLMEPENT</td>
<td>00005003</td>
<td>14:07:46.336557</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td>WLMEPENT</td>
<td>00005003</td>
<td>14:07:46.336583</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td>SMSYNMEM</td>
<td>00000921</td>
<td>14:07:46.512824</td>
<td>SM Synch XCF Member</td>
</tr>
<tr>
<td>WLMEPEXT</td>
<td>00005004</td>
<td>14:07:46.513274</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td>WLMEPEXT</td>
<td>00005004</td>
<td>14:07:46.513286</td>
<td>Entry Point Exited</td>
</tr>
<tr>
<td>SMSYNMEM</td>
<td>00000921</td>
<td>14:07:46.594886</td>
<td>SM Synch XCF Member</td>
</tr>
</tbody>
</table>
```

*Figure 155. Example: SYSWLM component trace records formatted with CTRACE COMP(SYSWLM) SHORT subcommand*

Figure 156 on page 490 shows an example of SYSWLM component trace records formatted with the CTRACE COMP(SYSWLM) FULL subcommand.
The following explains fields in the report.

**FUNCID**
The module table entry for the module that wrote the trace record.

**CPU**
The CPU that the module was running on.

**HOMEASID**
ASID from PSAAOLD.

**REQASID**
ASID that was explicitly coded on trace invocation.

**HJOBNAME**
JOBNAME of home address space.

**RJOBNAME**
JOBNAME that was explicitly coded on trace invocation.

**KEY**
Identifies the type of data that follows. The data is formatted in both HEX and EBCDIC.

## SYSXCF component trace

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSXCF component trace for the cross-system coupling facility (XCF).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSXCF:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnXCFxx. Default member: CTIXCF00 specified in COUPLE00 member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnXCFxx or REPLY for TRACE command</td>
</tr>
</tbody>
</table>
For SYSXCF:

<table>
<thead>
<tr>
<th>Information</th>
<th>Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Default:</td>
<td>4MB</td>
</tr>
<tr>
<td>• Range: 16KB - 16MB (System rounds size up to a multiple of 72 bytes.)</td>
<td></td>
</tr>
<tr>
<td>• Size set by: CTnXCFxx member</td>
<td></td>
</tr>
<tr>
<td>• Change size after IPL: No</td>
<td></td>
</tr>
<tr>
<td>• Location: Extended local system queue area (ELSQA) of XCFAS</td>
<td></td>
</tr>
</tbody>
</table>

| Trace records location                  | Address-space buffer, trace data set                                   |
| Request of SVC dump                     | By DUMP or SLIP command                                               |
| Trace formatting by IPCS                | CTRACE COMP(SYSXCF)                                                   |
| Trace format OPTIONS parameter          | Yes                                                                    |

### Requesting a SYSXCF trace

Specify options for requesting a SYSXCF component trace on a CTnXCFxx parmlib member or on the reply for a TRACE CT command.

If you specify additional tracing options while the system is running, place the trace records in a trace data set or sets, because the trace buffer size specified at initialization cannot be changed while the system is running. Specify NOWRAP to keep from losing trace records.

**Note:** NOWRAP prevents trace records written to the data set or sets from being overwritten. Once the data set or sets are filled, no more records are written to them. The system still writes trace records to the address-space buffers. The system wraps the address-space buffers, so that trace records may be lost. Be sure to allocate enough space on the data set or sets to hold all the records needed for diagnosis.

### CTnXCFxx parmlib member

The following table indicates the parameters you can specify on a CTnXCFxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnXCFxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes, at IPL or when reinitializing XCF</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PRESET</td>
<td>No</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Note:** You can change the buffer size only at IPL or when reinitializing XCF. Specify the new buffer size in the BUFSIZE parameter on the CTnXCFxx member being used.

IBM supplies a CTIXCF00 parmlib member, which specifies that component tracing for XCF be initialized with the component default buffer size and minimal component tracing active. The content of CTIXCF00 is:

```
TRACEOPTS  ON
```
TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>No</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>No</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Write?</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>One is required, if a writer is being used</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

OPTIONS parameter

The values for the OPTIONS parameter for the CTnXCFxx parmlib member and reply for a TRACE command, in alphabetical order, are:

ARM
Traces events for automatic restart management services.

CFRM
Traces events for coupling facility resource management services.

GROUP
Traces events for group services, such as XCF groups joining or disassociating from XCF services.

GRPNAME=(groupname[,groupname]...)
Reduces tracing to events for only the specified XCF groups. If GRPNAME is specified, the GROUP, SERIAL, SIGNAL, and STATUS options are filtered by the specified XCF group or groups; the STORAGE option is not filtered by GRPNAME. You can specify up to 8 XCF groups.

MODID=(modid [ ,modid]...)
Reduces tracing of all events to only the specified XCF module IDs. You can specify up to eight XCF Module IDs. Use XCF Module ID tracing only when requested by IBM Support.

NOTE PAD
Traces events for XCF note pad services processing.

NPNAME=(npname[,npname]...)
Reduces tracing of NOTE PAD events related to XCF note pad services processing to only the specified note pad names or note pad names that match the specified note pad name patterns. If NPNAME is specified, the NOTE PAD option trace events are filtered by the specified note pad names. You can specify up to four note pad names or note pad name patterns. To be valid, each npname must meet the following conditions:

- A note pad name can consist of two to four sections separated by periods.
- If a section is not specified, it is defaulted to all blanks.
- The first and the second sections must not be blank.
SERIAL
Traces events for serialization services.

SERVER
Traces events for client/server services processing.

SFM
Traces events for sysplex failure management services.

SIGNAL
Traces events for signalling services processing.

STATUS
Traces events for XCF monitoring services and sysplex partitioning services.

STORAGE
Traces events for storage management services.

SRVNAME=(servername [,servername]...)
Reduces tracing of SERVER events related to XCF client/server processing to only the specified server names or server names that match the specified server name patterns. If SRVNAME is specified, the SERVER option trace events are filtered by the specified server names. You can specify up to 4 server names/server name patterns. To be valid, the server name must meet the following conditions:

• Server names consist of one to four 8 byte sections separated by a period.
• If a section is not specified, it is defaulted to all blanks.
• Each section can contain any alphanumeric (A-Z,a-z,0-9), national (@,#,$), or underscore (_) character.
• Any section but the first can be entirely blank.
• Any section can contain the asterisk (*) wild card character which is used to match zero (0) or more characters (for example, SYS*.*)
• The server name can be enclosed within single quotes to preserve case sensitivity (for example, 'sysxcf.*')

VECTOR
Traces all events related to list notification or local cache vector processing. One of the other trace options might also trace these events.

Examples of requesting SYSXCF traces
In Figure 157 on page 493, the CTnXCFxx member requests STORAGE and SIGNAL options. To minimize lost trace data, the member also starts external writer WTRDASD1 with the NOWRAP option specified and connects the trace to the writer.

```
TRACEOPTS
WTRSTART(WTDASD1) NOWRAP ON
WTR(WTDASD1) OPTIONS('STORAGE','SIGNAL')
```

Figure 157. Example: CTnXESxx member requesting a SYSXCF trace
The example shown in Figure 158 on page 494 uses the TRACE command to request the same type of trace that is shown in Figure 157 on page 493.

```
trace ct, wrtstart=wtdasdl
trace ct, on, comp=sysxcf
  * 62 ITT066A ...
  r 62, wtr=wtdasdl, options=(storage, signal), end
```

*Figure 158. Example: TRACE command for SYSXCF trace*

## Formatting a SYSXCF trace

Format the trace with an IPCS CTRACE COMP(SYSXCF) subcommand. The OPTIONS parameter specifies the options that select trace records to be formatted. Your formatting options depend to a great extent on the tracing options you requested. Use the options to narrow down the records displayed so that you can more easily locate any errors. If the CTRACE subcommand specifies no options, IPCS displays all the trace records.

The options are:

- **ARM**
  Formats trace records for automatic restart management services.

- **CFRM**
  Formats trace records for coupling facility resource management services.

- **CLUSTER**
  Formats trace records for XCF z/OS cluster manageable resource services.

- **GROUP**
  Formats trace records for XCF group services, such as groups joining or disassociating from XCF services.

- **NOTEPAD**
  Formats trace records for XCF Note Pad Services.

- **SERIAL**
  Formats trace records for serialization services.

- **SERVER -**
  Formats trace records for XCF client/server services.

- **SFM**
  Formats trace records for sysplex failure management services.

- **SIGNAL**
  Formats trace records for signalling services processing.

- **STATUS**
  Formats trace records for XCF monitoring services and sysplex partitioning services.

- **STORAGE**
  Formats trace records for storage management services.

- **THREAD=(thread, [, thread]...)**
  Formats trace records filtered by one or more specific trace threads. The XCF component trace thread filter option provides the capability to limit the presentation of trace entries to specified trace threads. XCF uses trace threads to correlate processing of units of work between the subcomponents of the XCF component. You can enter trace threads entered in hexadecimal notation using x’ttttttt’ or tttttttt notation (for example, x’01001768’ or 01001768) with or without the leading x and surrounding quotes (’).

## Output from a SYSXCF trace

Figure 159 on page 495 shows an example of SYSXCF component trace records formatted with the CTRACE COMP(SYSXCF) FULL subcommand.
**SYSXES component trace**

Before using this component trace, ensure that you have read:

- “Planning for component tracing” on page 354
- “Obtaining a component trace” on page 362
- “Viewing the component trace data” on page 374

The following summarizes information for requesting a SYSXES component trace for cross-system extended services (XES).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSXES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTnXESxx; default member: CTIXES00 specified in COUPLE00 member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnXESxx or REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default:</td>
</tr>
<tr>
<td></td>
<td>- 336KB for connector-related SUB trace buffers. There are multiple instances of these trace buffers in use on the system</td>
</tr>
<tr>
<td></td>
<td>- 32MB for the GLOBAL SUB trace buffer</td>
</tr>
<tr>
<td></td>
<td>• Range:</td>
</tr>
<tr>
<td></td>
<td>- 16KB - 16MB for connector-related SUB trace buffers</td>
</tr>
<tr>
<td></td>
<td>- The size for the GLOBAL SUB trace buffer cannot be changed.</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnXESxx member or TRACE CT command</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes</td>
</tr>
<tr>
<td></td>
<td>• Location: 64-bit common storage above the 2GB bar. In the REPLY for the DUMP command, specify SDATA=XESDATA.</td>
</tr>
<tr>
<td>Trace records location</td>
<td>64-bit common storage above the 2GB bar, trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By DUMP or SLIP command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSXES)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Ensure that the HVCOMMON system parameter which specifies the size of the 64-bit common area reflects a size adequate to allow for the allocation of 4GB of 64-bit common storage by XES for SYSXES trace buffers plus additional system requirements for 64-bit common storage. The system default for HVCOMMON is 64GB.

SYSXES supports sublevel tracing. Tracing options are inherited through a hierarchy of trace levels. If you set trace options without specifying a sublevel, the options apply at the highest level, or head, of the hierarchy. A sublevel inherits its trace options from the next higher level, unless options are specified explicitly for the sublevel. If you set trace options for a sublevel, the options are inherited by any sublevels lower in the hierarchy. Figure 160 on page 496 shows the hierarchical structure of SYSXES traces.

Two classes of sublevel traces inherit the head trace options:

- The global sublevel trace has its own trace buffer and controls tracing that is not related to any particular connection. Request GLOBAL tracing by specifying SUB=(GLOBAL).
- Connection sublevels control tracing for a particular connection. Each connection has its own trace buffer. Connection sublevels are filtered hierarchically based on:

  1. Structure name (STRNAME) of the coupling facility structure to which the system is connected
  2. Address space identifier (ASID) of the address space from which the connection was made
  3. Connection name (CONNAME) of the particular connector for which tracing is requested

Therefore, options specified for a particular structure name are inherited only by address spaces connected to that structure. Options specified for a particular address space are inherited only by connections that are connected through that address space.

Specify SUB=(strname), SUB=(strname.asid), or SUB=(strname.asid.conname), depending on the degree of specificity you need. Do not specify conname without specifying asid. Also, do not specify asid without specifying strname. When specifying a structure name or connector name on the SUB option, if the name contains special characters, it must be in quotation marks. If it is in quotation marks, upper and lower case characters are not the same. Therefore the case information is important and must identically match the name used by the system. Once the name is enclosed in quotation marks it becomes case sensitive.
Requesting a SYSXES trace

Specify options for requesting a SYSXES component trace on a CTnXESxx parmlib member or on the reply for a TRACE CT command.

CTnXESxx parmlib member

The following table indicates the parameters you can specify on a CTnXESxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnXESxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>Yes</td>
</tr>
<tr>
<td>ASID</td>
<td>No</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>No</td>
</tr>
<tr>
<td>BUFSIZE</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
<tr>
<td>SUB</td>
<td>Yes, but only for a sublevel trace</td>
</tr>
<tr>
<td>PRESET</td>
<td>Yes, but only for a sublevel trace</td>
</tr>
<tr>
<td>LIKEHEAD</td>
<td>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
<tr>
<td>WTRSTART or WTRSTOP</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Setting buffer size: To select a size for your trace buffers, consider the following:

- The trace buffers can be smaller if you are using an external writer, because buffer wrapping is not a concern.
- When re-creating a problem, you might first want to make the buffer size larger.
- SYSXES has one trace buffer of the specified size per connector, plus one for the global trace. The amount of storage used can be significant if the system is going to have many connectors. The SYSXES trace buffers are allocated in 64-bit common storage. If the range of 64-bit common storage allocated by XES is used up (4GB), subsequent connections will not be traced because buffer space is not available.
- When the BUFSIZE parameter is not specified, SYSXES will allocate a buffer at the default size per connector.
- The SYSXES trace buffers are in disabled reference (DREF) 64-bit common storage, so storage constraints may limit buffer size.

Changing buffer size: To change the size of your trace buffers while a trace is running, either issue a TRACE CT command or activate a different CTnXESxx parmlib member. You can use these methods to change SUB levels in the hierarchy so that different SUB traces can have different sized buffers. The SYSXES GLOBAL sub buffer size is set by the system to 32MB. You cannot override this default value.

TRACE and REPLY commands

The following tables indicate the parameters you can specify on TRACE CT commands and a REPLY.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>One is required</td>
</tr>
<tr>
<td>nnnnK or nnnnM</td>
<td>Yes</td>
</tr>
<tr>
<td>COMP</td>
<td>Required</td>
</tr>
<tr>
<td>SUB</td>
<td>Yes</td>
</tr>
<tr>
<td>PARM</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Parameters | Allowed on TRACE CT for Writer?
--- | ---
WTRSTART or WTRSTOP | One is required, if a writer is being used

Parameters | Allowed on REPLY for trace?
--- | ---
ASID | No
JOBNAME | No
OPTIONS | Yes
WTR | Yes

**OPTIONS parameter**

The values for the OPTIONS parameter for the CTnXESxx parmlib member and reply for a TRACE command, in alphabetical order, are:

- **ALL**
  - Traces events listed for all of the options.
- **CONFIG**
  - Traces changes in the state of connectivity to the coupling facility, such as addition or removal of paths.
- **CONNECT**
  - Traces events for system and subsystem components that connect to or disconnect from XES resources and for exit processing.
- **HWLAYER**
  - Traces events for the XES services that handle communications with the coupling facility.
- **LOCKMGR**
  - Traces events related to global management of resources and to global management-related exits.
- **RECOVERY**
  - Traces events within the modules that handle XES resource access failures, for both resource allocation and mainline command processing. This option provides more details than is provided by default.
- **REQUEST**
  - Traces events related to requests to access data through XES mainline services.
- **SIGNAL**
  - Traces events related to XES internal signalling.
- **STORAGE**
  - Traces events related to management of XES control blocks.
- **VECTOR**
  - Traces all events related to list notification or local cache vector processing. One of the other trace options might also trace these events. The VECTOR option also traces usage of the IXLVECTR API. This trace is distinct from component trace and is formatted by the IPCS XESDATA CONNECT report rather than through the IPCS CTRACE command. Activating the VECTOR option might impact performance, so enable it at the connector or structure subtrace level rather than for all SYSXES traces.
Examples of requesting SYSXES traces

In Figure 161 on page 499, the CTnXESxx member requests a trace of HWLAYER, LOCKMGR, CONNECT, and REQUEST trace events and a buffer size of 100KB.

```
TRACEOPTS
ON
OPTIONS('HWLAYER','LOCKMGR','CONNECT','REQUEST')
BUFSIZE(100K)
```

*Figure 161. Example: CTnXESxx member requesting a SYSXES trace*

The example shown in Figure 162 on page 499 requests a trace of CONNECT, CONFIG, and STORAGE trace events for connection CON3 in ASID 5 for structure STR3.

```
trace ct,on,comp=sysxes,sub=(str3.asid(5).con3)
  * 17 ITT006A ...
reply 17,options=(connect,config,storage),end
```

*Figure 162. Example: TRACE command for SYSXES trace*

Formatting a SYSXES trace

Format the trace with an IPCS CTRACE COMP(SYSXES) subcommand. The OPTIONS parameter specifies the options that select trace records to be formatted. Your formatting options depend to a great extent on the tracing options you requested. Use the options to narrow down the records displayed so that you can more easily locate any errors. If the CTRACE subcommand specifies no options, IPCS displays all the trace records.

- **ALL**
  Formats all trace records.

- **CONFIG**
  Formats changes in the state of connectivity to the coupling facility.

- **CONNECT**
  Formats events for system and subsystem components that connect to or disconnect from XES resources and for exit processing.

- **HWLAYER**
  Formats events for the XES services that handle communications with the coupling facility.

- **LOCKMGR**
  Formats events related to global management of resources and to global management-related exits.

- **RECOVERY**
  Formats events within the modules that handle XES resource access failures.

- **REQUEST**
  Formats events related to requests to access data through XES mainline services.

- **SIGNAL**
  Formats events related to XES internal signalling.

- **STORAGE**
  Formats events related to management of XES control blocks.

In the CTRACE subcommand, the SUB((subname.subname.subname)) parameter specifies the sublevel traces. A subname is:

- **GLOBAL** for an event not related to a particular connection.
- **strname.asid.conname** for an event related to the specified connector. The subname for a connection-related sublevel can contain up to three parts:
  - **strname** for the structure
- asid for the address space identifier (ASID)
- conname for the connection name, if asid is also specified

Any sublevel specification is valid for the QUERY option; for example:

- SUB(STR3)
- SUB(STR3.ASID(5))

Only the GLOBAL and fully qualified connection sublevel specifiers are valid with a COMP parameter; for example:

- SUB(GLOBAL)
- SUB(STR3.ASID(5).CON3)

Output from a SYSXES trace

Figure 163 on page 500 is an example of SYSXES component trace records formatted with the following subcommand:

CTRACE COMP(SYSXES) SUB((GLOBAL)) SHORT OPTIONS((CONNECT,HWLAYER))

<table>
<thead>
<tr>
<th>COMPONENT TRACE SHORT FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP(SYSXES) SUBNAME((GLOBAL))</td>
</tr>
<tr>
<td>**** 10/20/93</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWLAYER</td>
<td>090C0002</td>
<td>20:47:22.096016</td>
<td>EXIT FROM IXLMLTAM</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>07140002</td>
<td>20:47:22.096296</td>
<td>ENTRY TO IXLERTRR</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>07140003</td>
<td>20:47:22.096429</td>
<td>EXIT FROM IXLERTRR</td>
</tr>
<tr>
<td>CONNECT</td>
<td>08190001</td>
<td>20:47:30.171676</td>
<td>CONNECTOR DIE ROUTINE</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>090C0001</td>
<td>20:47:30.171718</td>
<td>ENTRY TO IXLMLTAM</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>09080001</td>
<td>20:47:30.171758</td>
<td>EXIT TO IXLMLXRB</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>09080002</td>
<td>20:47:30.171799</td>
<td>ENTRY TO IXLMLXRB</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>09080003</td>
<td>20:47:30.171804</td>
<td>ISSUING A SMSG COMMAND</td>
</tr>
<tr>
<td>CONNECT</td>
<td>08110001</td>
<td>20:47:30.172316</td>
<td>MAINLINE TIMER EXIT ENTERED</td>
</tr>
<tr>
<td>CONNECT</td>
<td>08110002</td>
<td>20:47:30.172516</td>
<td>MAINLINE TIMER EXITED</td>
</tr>
<tr>
<td>HWLAYER</td>
<td>09080004</td>
<td>20:47:30.180754</td>
<td>COMPLETION OF A SMSG COMMAND</td>
</tr>
</tbody>
</table>

Figure 163. Example: formatted SYSXES component trace records
Chapter 13. Transaction trace

Transaction trace provides a consolidated trace of key events for the execution path of application or transaction type work units running in a multi-system application environment. By tracing the path of a work unit running in a single system, or (more importantly) across systems in a sysplex environment, that is being processed by multi-system transaction servers, subsystem interfaces, and resource managers, transaction trace enables a system programmer to debug problems in those environments.

The essential task of transaction trace is to aggregate data showing the flow of work between components in the sysplex that combine to service a transaction. Transaction trace traces events such as component entry, exit, exceptions and major events such as COMMIT, and ROLLBACK. Do not use transaction trace as a component tracing facility.

How transaction trace works

Transaction trace (TTrace) is attached as a daughter task in the system trace address space, after master scheduler initialization completes. Once initialization has completed, and the first transaction trace command is entered with a filter that specifies the attributes of the work unit(s) to be traced, transaction trace is activated. Additional information, such as the use of an external writer, is also allowable for transaction trace processing.

Once transaction trace is activated, WLM Classify invokes a filter exit to determine whether the current work unit is traced. The work unit's attributes are compared with the command filter attributes to determine if tracing should occur. If tracing is required, a non-zero token is built and returned to the Classify caller. If no tracing is performed for that work unit, set the transaction trace token to zero. The caller (CICS or IMS, for example) propagates the token in a manner similar to the propagation of the service class token.

Next, transaction trace macros:

- determine if tracing can be performed (ITZQUERY)
- initiate the writing of a transaction trace record (ITZEVENT).

Transaction trace writes trace data in a transaction trace data space in the trace address space. When an external writer is defined, the record is also written to the external writer. Use interactive problem control system (IPCS) to view the transaction trace records.

Transaction trace commands

Use the following commands with transaction trace. For information about using the TRACE or DISPLAY TRACE commands with transaction trace, see z/OS MVS System Commands.

- TRACE TT
- DISPLAY TRACE,TT

The TRACE TT command

Transaction trace uses the MVS TRACE command with the TT keyword to:

- Start transaction trace.
- Add additional trace filter sets.
- Remove an active trace filter set.
- Stop transaction trace.
- Start a CTRACE external writer.
• Stop a CTRACE external writer.
• Change the transaction trace buffer size.
• Specify a level indicator.
• Specify whether or not latent transactions is traced.

Starting transaction trace

Transaction trace is started when a TRACE TT command is issued with filter information. Following is an example of defining a transaction trace filter set with a user ID of TESTERP1 and transaction name of TRAN1.

```
trace tt,user=testerp1,tran=tran1
ITZ002I 'BUFSIZ' IS SET TO 0001M
ITZ001I TRANSACTION TRACE IS NOW ACTIVE WITH FILTER SET 01
```

When multiple filter keywords are specified, as in the preceding example, a 'logical AND' is used to determine if the transaction should be traced or not traced.

Adding additional trace filter sets

Up to five transaction trace filter sets can be concurrently active. They are activated when the TRACE TT command is issued with filter information. The command in the following example defines an additional transaction trace filter set with a user ID of DONNA*. The use of an asterisk (*) in the last character position indicates a wildcard is being defined. When determining if a transaction trace token is to be created, any user ID with a prefix of DONNA will result in a match.

```
trace tt,user=donna*
ITZ001I TRANSACTION TRACE IS NOW ACTIVE WITH FILTER SET 02
```

If multiple filter sets are specified a 'logical OR' is used among the filter sets to determine if the transaction should be traced or not traced.

Removing an active trace filter set

A transaction trace filter set is removed when the OFF=x keyword is used. For example, the following command indicates that the transaction trace filter set 02 has been turned off.

```
trace tt,off=2
ITZ016I TRANSACTION TRACE FILTER SET TURNED OFF
```

Stopping transaction trace

Use the OFF=ALL keyword to stop transaction trace. For example:

```
trace tt,off=all
ITZ007I TRANSACTION TRACE IS NO LONGER ACTIVE.
A DUMP COMMAND MAY BE ISSUED TO DUMP THE TRANSACTION TRACE DATA SPACE.
```

Use the DUMP command to dump the transaction trace data space. For example:

```
DUMP COMM=(TTrace for TRAN=ATM1)
R x,DSPNAME='TRACE'.SYSTTRC
```

Starting a CTRACE external writer

Transaction trace supports the use of an external writer for processing transaction trace records. An external writer is specified on the initial command that activates transaction trace or is specified standalone while transaction trace is active. For example:

```
trace tt,wtr=abcdefg
```
Component trace messages are issued in response to this command.

**Stopping a CTRACE external writer**

Transaction trace external writer processing can be stopped with the use of the WTR=OFF keyword. For example:

```
trace tt,wtr=off
```

Component trace messages are issued in response to this command.

**Changing the data space size**

The transaction trace TTRACE TT command allows a change in the transaction trace data space size. The data space is from 16K to 999K or 1M to 32M. For example:

```
trace tt,bufsz=2m
ITZ002I 'BUFSIZ' IS SET TO 0020M
```

**Specifying a level indicator**

The transaction trace TTRACE TT command allows definition of a level indicator for each filter set.

- 1 pertains to component entry, exit, exceptions, and major events.
- 2 pertains to detail, controlled by component external; the default is 2

```
trace tt,bufsz=2m,user=testerp1,tran=tran1,lvl=01
ITZ002I 'BUFSIZ' IS SET TO 0020M
ITZ001I TRANSACTION TRACE IS NOW ACTIVE WITH FILTER SET 01
```

**Tracing latent transactions**

Use the transaction trace TTRACE TT command to specify whether or not latent transactions are traced. The default is to trace latent processing. Consider the following when deciding what to specify:

- The transaction is currently active in the system.
- The transaction is marked for tracing.
- The filter set used to mark the transaction eligible for tracing is no longer active.

```
trace tt,latent=no
ITZ002I 'LATENT' IS SET TO NO
```

**DISPLAY TRACE,TT**

Use the TT keyword on the DISPLAY TRACE command to determine the status of transaction trace. Do not use the component trace display command to inquire on the status of transaction trace. In addition to displaying information specified on the TRACE TT command, the DISPLAY TRACE,TT response also displays a list of the systems participating in transaction trace sysplex processing. Figure 164 on page 504 is an example of a DISPLAY TRACE,TT command response.
Using IPCS to view transaction trace output

Use the IPCS subcommand CTRACE COMP(SYSTTRC) to view transaction trace records. To obtain a sysplex TTrace stream, use the IPCS MERGE subcommand to format TTrace records from multiple input data sets. Any generalized trace facility (GTF) records imbedded in the TTrace records are processed without having to specify additional keywords to the above command. Figure 165 on page 504 is an example of a short IPCS CTRACE COMP(SYSTTRC) SHORT command response.

```plaintext
ctrace comp(systtrc) short
COMPONENT TRACE SHORT FORMAT
COMP(SYSTTRC)
**** 09/23/1999
SYSTYPE   MIFICATION  ENTRY ID TIME STAMP DESCRIPTION
----------- -------- -------- --------------- ----------
SY1 TTCMD     00000002  14:17:20.83847  TRACE TT Command
SY1 TTCMD     00000002  14:18:11.61175  TRACE TT Command
SY1 EVENT     00000003  14:31:55.81312  TRACE EVENT
SY1 EVENT     00000003  14:31:55.89921  TRACE EVENT
SY1 EVENTU    00000005  14:31:56.37848  TRACE EVENT with User Data
SY1 EVENTG    00000004  14:31:56.81836  TRACE EVENT with GTF Data
```

Figure 165. Example: IPCS CTRACE COMP(SYSTTRC) SHORT response
Figure 166 on page 505 is an example of a IPCS CTRACE COMP(SYSTTRC) LONG command response.

```plaintext
ctrace comp(systtrc) full
COMPONENT TRACE FULL FORMAT
COMP(SYSTTRC)
**** 09/23/1999
SYSTYPE   MNEMONIC ENTRY ID TIME STAMP DESCRIPTION
-------   --------  --------  ---------------  ----------
SY1       TTCMD     00000002  14:17:20.838477  TRACE TT Command
           CMDID.....0501
           COMMAND...TRACE TT,BUFSIZ=2M,USER=TESTERP1,TRAN=TRAN1,
           LVL=01
SY1       TTCMD     00000002  14:18:11.611755  TRACE TT Command
           CMDID.....0502
           COMMAND...TRACE TT,USER=DONNA*
SY1       EVENT     00000003  14:31:55.813125  TRACE EVENT
           COMPONENT..COMP      EVENTDESC..TTVAPIEA008       CMDID.....0501
           FUNCTION...TEST_ITZEVENT_WITH_FUNCTIONNAME.  TCB...007ED9C8
           ASID..0022
           TRACETOKEN..SY1       B2E447A3  F32E4048  05010100  00000000
SY1       EVENT     00000003  14:31:55.899216  TRACE EVENT
           COMPONENT..COMP      EVENTDESC..TTVAPIEA009       CMDID.....0000
           FUNCTION...................................  TCB...007ED7A8
           ASID..0022
           TRACETOKEN..          40404040  40404040  40404040  40404040
           LATENT workunit traced.
SY1       EVENTU    00000005  14:31:56.378480  TRACE EVENT with User
           DATA
           COMPONENT..COMP      EVENTDESC..TTVAPIEA003       CMDID.....0501
           FUNCTION...................................  TCB...007ED148
           ASID..0022
           TRACETOKEN..SY1       B2E447A3  F566F584  03030300  00000000
           HEXFORMAT AID FF FID 00 EID 00000000
           +0000  E3C8C9E2  40C6D6D9  C7E3C640  C4C1C3E3  THIS IS GTF DATA
           +0000  40C6D6D9  40C140E3  D9C1D5E2  C1C3E3C9  THIS IS GTF DATA
           +0000  D6D9C44B  D9C1C3C5  40D9C5C3  D6D9C44B ON TRACE RECORD.
           +0000  D6D9C44B  D9C1C3C5  40D9C5C3  D6D9C44B ON TRACE RECORD.
```

Figure 166. Example: IPCS CTRACE COMP(SYSTTRC) LONG response
Chapter 14. GETMAIN, FREEMAIN, STORAGE (GFS) trace

GFS trace is a diagnostic tool that collects information about the use of the GETMAIN, FREEMAIN, or STORAGE macro. You can use GFS trace to analyze the allocation of virtual storage and identify users of large amounts of virtual storage. You must use the generalized trace facility (GTF) to get the GFS trace data output.

The following topics describe GFS trace:

- “Starting and stopping GFS trace” on page 507
- “Receiving GFS trace data” on page 508
- “Formatted GFS trace output” on page 508
- “Unformatted GFS trace output” on page 510

Starting and stopping GFS trace

The following procedure explains how to request a GFS trace.

1. In the DIAGxx parmlib member, set the VSM TRACE GETFREE parameter to ON and define the GFS trace control data.

   Example: DIAGxx parmlib member for starting GFS tracing: The following DIAGxx parmlib member starts GFS trace and limits the trace output to requests to obtain or release virtual storage that is 24 bytes long and resides in address spaces 3, 5, 6, 7, 8 and 9:

   ```
   VSM TRACE GETFREE (ON)
   ASID (3, 5-9)
   LENGTH (24)
   DATA (ALL)
   ```

   You will need another DIAGxx parmlib member defined to stop GFS tracing. See “5” on page 508.

2. Ask the operator to enter the SET DIAG=xx command to activate GFS trace using the definitions in the DIAGxx parmlib member.

3. Start a GTF trace (ask the operator to enter a START membername command on the operator console). membername is the name of the member that contains the source JCL (either a cataloged procedure or a job). Tell the operator to specify a user event identifier X’F65’ to trace GTF user trace records.

   Example: Starting a GTF trace for GFS data: In the following example, the operator starts GTF tracing with cataloged procedure GTFPROC to get GFS data in the GTF trace output. The contents of cataloged procedure GTFPROC are as follows:

   ```
   //GTF PROC MEMBER=GTFPROC
   // * Starts GTF
   //IEFPROC EXEC PGM=AHLGTF,REGION=32M,
   //      PARM='MODE=EXT,DEBUG=NO,TIME=YES,BLOK=40K,SD=0K,SA=40K'
   //IEFRDER DD DSN=D31POOL.PJREDGTF.TRACE,
   //      DISP=SHR,UNIT=3380,VOL=SER=CTDSO1
   ```

   The operator then replies to messages AHL100A with the USRP option. When message AHL101A prompts the operator for the keywords for option USRP, the operator replies with USR=(F65) to get the GFS user trace records in the GTF trace output.

   ```
   START GTFPROC
   00 AHL100A SPECIFY TRACE OPTIONS
   REPLY 00,TRACE=USRP
   ```
4. To stop the GTF trace, ask the operator to enter a STOP procname command on the operator console.
5. To stop GFS trace, create a DIAGxx parmlib member with VSM TRACE GETFREE(OFF) and have the operator enter a SET DIAG=xx command.

**Example: DIAGxx parmlib member for stopping GFS tracing:** The following DIAGxx parmlib member stops GFS trace:

```
VSM TRACE GETFREE (OFF)
```

For additional information, see the following references:

- See [z/OS MVS Initialization and Tuning Reference](https://www.ibm.com) for the syntax of the DIAGxx parmlib member.
- See [z/OS MVS System Commands](https://www.ibm.com) for the syntax of the SET and START commands.
- See Chapter 10, “The Generalized Trace Facility (GTF),” on page 213 for information about how to specify GTF EIDs.

### Receiving GFS trace data

GTF places the GFS trace data in a user trace record with event identifier X'F65'. To obtain GFS trace data, do one of the following:

- When GTF writes trace data in a data set, format and print the trace data with the IPCS GTFTRACE subcommand.
- When GTF writes trace data only in the GTF address space, use a dump to see the data. Request the GTF trace data in the dump through the SDATA=TRT dump option.
- Issue the IPCS GTFTRACE subcommand to format and see the trace in an unformatted dump.

See [z/OS MVS IPCS Commands](https://www.ibm.com) for the GTFTRACE subcommand.

### Formatted GFS trace output

Figure 167 on page 509 shows an example of formatted GFS trace output.
GETMAIN, FREEMAIN, STORAGE (GFS) trace

Figure 167. Example of formatted GFS trace output

The GETMAIN / FREEMAIN / STORAGE trace produces a second type of record with a slightly different format. Following is an example of this record type:

This type of record is unique because it does not trace a return address. It writes whenever an individual area of storage is FREEMAINed as part of a subpool FREEMAIN request. There may be many of these records in a row. The last record of the sequence is followed by a record that indicates a subpool FREEMAIN request. This record includes the return address of the issuer of the subpool FREEMAIN.
Unformatted GFS trace output

“Layout of the GFS trace output” on page 510 shows unformatted GFS trace output as it would appear in the trace data set where GTF puts the output. You can use this information to write your own formatting or analysis routines.

## Layout of the GFS trace output

### Unformatted GFS Trace Output

#### Part 1 - This part is in every GFS trace entry.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Flags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'80' - Common storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'40' - Caller's registers are traced</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'20' - This is a subpool release range entry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'10' - Copy of VSWKOWNINFO</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Actual subpool after translation</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>ASID which owns the storage</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Address of storage area</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Actual length of storage area</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>Address of TCB</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Copy of VSWKSKEY</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Copy of VSWKRC</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Modification level number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'01' - HBB6606</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'02' - HBB7703</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X'03' - HBB7730</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Reserved</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>Offset of Part 2</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>Offset of Part 3</td>
</tr>
</tbody>
</table>

#### Part 2 - This part is in every GRS trace entry except for subpool release range entries.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>Caller's return address</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Minimum length for a variable request</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>Maximum length for a variable request</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>Name of job which owns the storage</td>
</tr>
<tr>
<td>14</td>
<td>8</td>
<td>Name of job which contained the program which requested the storage</td>
</tr>
<tr>
<td>1C</td>
<td>2</td>
<td>ASID which contained the program which requested the storage</td>
</tr>
<tr>
<td>1E</td>
<td>1</td>
<td>Copy of VSWKESPL</td>
</tr>
<tr>
<td>1F</td>
<td>1</td>
<td>Copy of VSWKESC</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>Copy of VSWKFLG</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>Copy of VSWKPFLG</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>Copy of VSWKFLGS</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>Copy of VSWKFLG2</td>
</tr>
<tr>
<td>Offset</td>
<td>Length</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>24</td>
<td>4</td>
<td>Copy of VswkRetAddrHigh</td>
</tr>
<tr>
<td>28</td>
<td>4</td>
<td>Copy of VswkAR15Value</td>
</tr>
<tr>
<td>2C</td>
<td>4</td>
<td>Copy of VswkAR1Value</td>
</tr>
</tbody>
</table>

Part 3 - This part is in the GFS trace record if the caller's registers are traced.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>X'40'</td>
<td>Caller's registers 0-15</td>
</tr>
</tbody>
</table>

**Note:** The IGVVSMWK macro contains field names beginning with VSWK. For more information, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).
GETMAIN, FREEMAIN, STORAGE trace
Chapter 15. Recording logrec error records

When an error occurs, the system records information about the error in the logrec data set or the logrec log stream. The information provides you with a history of all hardware failures, selected software errors, and selected system conditions. Use the Environmental Record, Editing, and Printing program (EREP):

- To print reports about the system records
- To determine the history of the system
- To learn about a particular error

Collection of software and hardware information

Use the records in the logrec data set or the logrec log stream as additional information when a dump is produced. The information in the records will point you in the right direction while supplying you with symptom data about the failure. Figure 168 on page 513 shows the error processing for a logrec data set, named SYS1.LOGREC, which is the default name for the logrec data set.

![Figure 168. Logrec Error Recording Overview](image)

You can set your system up to record errors on either a logrec data set or in a logrec log stream. This topic tells you what you need to know about each medium before deciding how to collect error records. To use the logrec data set or a logrec log stream, you need to know how to initialize each of them, how to record system events on each of them, how to collect the data when it is available, and how to interpret the output through EREP.

This topic describes each of these tasks:

- “Choosing the correct logrec recording medium” on page 514
- “Initializing and reinitializing the logrec data set” on page 514
- “Defining a logrec log stream” on page 516
Choosing the correct logrec recording medium

You can choose where the system will record logrec error records. When a system is not in a sysplex, an installation can use a logrec data set, associated with an individual system, to record error records. An installation can choose to continue this type of recording by initializing the logrec data set before IPLing the system that will use it.

In a sysplex, however, because each system requires its own logrec data set, you might need to look at each logrec data set when an error occurs.

To eliminate the problem of having to manage up to 32 logrec data sets, an installation can choose to define one coupling facility logrec log stream. Using a coupling facility logrec log stream eliminates the following:

- Running IFCDIP00 to initialize multiple logrec data sets
- Handling full or emergency data set conditions
- Scheduling the daily offload of logrec data sets
- Concatenating multiple history data sets
- Archiving logrec records

For more information, see the following references:

- See “Initializing and reinitializing the logrec data set” on page 514 if you want to initialize a logrec data set for your system.
- See “Defining a logrec log stream” on page 516 if you want to define a logrec log stream for your installation.
- See “Changing the logrec recording medium” on page 518 for more information about changing the logrec recording medium after you start the system.

Initializing and reinitializing the logrec data set

You must initialize the logrec data set before starting the system that will use it. You reinitialize the logrec data set when an uncorrectable error occurs. You clear the logrec data set when it is full or near full. You must also initialize a logrec data set before using the SETLOGRC command to switch to it.

To initialize or reinitialize the logrec data set, use the service aid program IFCDIP00. To clear a full logrec data set, use EREP. IFCDIP00 creates a header record and a time stamp record for the logrec data set.

**Attention:** The logrec data set is an unmovable data set. If you attempt to move it using a program, such as a defragmentation program, your system will experience difficulty both reading from and writing to the data set. Logrec records physical addresses into the logrec data set rather than to relative address, and this prevents the ability to move the data set. You can use the SETLOGRC command to switch to IGNORE, LOGSTREAM, or a different data set to free the data set and allow use of maintenance programs for the volume that contains the logrec data set. However, the data set itself remains unmovable.

Initializing the logrec data set

If the logrec data set does not exist, you must first allocate it and then initialize it.
Note: Whenever you allocate or reallocate the logrec data set, the newly allocated data set is not used until you either initialize it and restart the system on which it is to be used or use the SETLOGRC command to change to it.

Figure 169 on page 515 is an example of a job that scratches and uncatalogs an existing logrec data set and allocates, catalogs, and initializes a new one. (If you do not currently have a logrec data set, start with the second step of the job.) Use the JCL statements below to do the following:

- Rename the logrec data set. For example, rename SYS1.LOGREC to SYS1.LOGREC.OLD.
- Allocate and initialize a new logrec data set with new space specifications using IFCDIP00.

```
//KATHYLR JOB (9999), 'CREATE NEW LOGREC DS', CLASS=A, MSGCLASS=X,
// MSGLEVEL=(1,1), NOTIFY=KATHY
// ** RENAME THE CURRENT LOGREC DATASET
// ** UNCATLG SYS1.LOGREC SO THE NEW LOGREC CAN BE ALLOCATED ON
// ** ANOTHER VOLUME, IF DESIRED
// **------------------------------------------------------------------
//RENAME EXEC PGM=IEHPROGM
//M43RES DD VOL=SER=M43RES,UNIT=3390,DISP=SHR
//SYSPRINT DD SYSOUT=* 
//SYSIN DD *
RENAME DSNAME=SYS1.LOGREC,VOL=3390=M43RES, NEWNAME=SYS1.LOGREC.OLD
UNCATLG DSNAME=SYS1.LOGREC
// **------------------------------------------------------------------
// IFCDIP00 EXEC PGM=IFCDIP00,COND=(0,LT)
//SERERDS DD DSN=SYS1.LOGREC,DISP=(,CATLG),
// VOL=SER=M43RES,UNIT=SYSDA,SPACE=(CYL,3,,CONTIG)
// **------------------------------------------------------------------
```

Figure 169. Example: Changing the space allocation

Note: If you run the JCL in Figure 169 on page 515 and an error occurs after the logrec data set has been scratched but before it has been reallocated, you will be unable to use this logrec data set dynamically or at the next system restart. To solve this problem, do one of the following:

- Use the DFSMSdss stand-alone restore program to restore your old logrec data set.
- Run the reallocate job on the data set while running under another system.

See z/OS DFSMSdss Storage Administration for information about the DFSMSdss stand-alone restore program.

Reinitializing the logrec data set

You need to reinitialize the logrec data set either when the data set is full or when an uncorrectable error occurs.

If the data set is full, use EREP to record the data in a history data set and reinitialize logrec.

In the case of an error, invoke IFCDIP00 with JCL statements to reinitialize your existing logrec data set. IFCDIP00 resets the logrec data set header record field to indicate that the entire data set can be used and clears the time stamp record to hexadecimal zeros.

For information on using EREP, see the EREP User’s Guide.

Figure 170 on page 516 is an example of using the IFCDIP00 service aid to reinitialize the logrec data set. It use the following JCL statements:

- The JOB statement initiates the job; the job name INSERLOG has no significance.
- The EXEC statement specifies the program name (PGM=IFCDIP00).
The SERERDS DD statement specifies the reinitialized logrec data set (in this case SYS1.LOGREC), which must be on a permanently mounted volume (VOL=SER=111111 in this example); the DDNAME must be SERERDS.

//INSERLOG JOB
//STEP1 EXEC PGM=IFCDIP00
//SERERDS DD DSNAME=SYS1.LOGREC,UNIT=3380,
//     VOL=SER=111111,DISP=SHR

Figure 170. Example: Reinitializing the logrec data set

Defining a logrec log stream

To use a logrec log stream, you must first prepare your installation to use system logger functions. IBM recommends that you use a coupling facility log stream for LOGREC so that you can merge data from multiple systems in a sysplex.

To obtain logrec records for a single system sysplex, you can also use a DASD-only log stream, which is single system in scope. Note that this is not recommended for a multi-system sysplex, because you can only have one system connect to a DASD-only log stream per sysplex. This means that if you make your logrec log stream DASD-only, only one system will be able to write and read from it. See the system logger chapter of z/OS MVS Setting Up a Sysplex for information on DASD-only log streams.

If you use the SETLOGRC command and specify a log stream name, you can additionally set up other DASD-only and coupling facility log streams to record logrec data.

See z/OS MVS Setting Up a Sysplex for more information about system logger setup.

The following steps describe how to use a coupling facility logrec log stream in place of a logrec data set:

1. Define a log stream using the system logger log stream definition utility, IXCMIAPI.

   IFBLSJCL (see Figure 171 on page 517) is available in SYS1.SAMPLIB as an example of using the administrative data utility, IXCMIAPI, to define the coupling facility logrec log stream to a sysplex.

   There are no restrictions on naming the log stream, however, when naming your log stream, consider making 'LOGREC' a part of the log stream name so as to differentiate it from other log streams.
Note: MAXBUFSIZE must be at least 4068 because logrec writes records in one page blocks. Specify SMS storage group, storage, data and management classes such that when one data set is full, another is allocated. Allocate as much space as is allocated for all the logrec data sets on the systems in the sysplex before migrating to a logrec log stream.

The most effective way to manage all logrec records is to specify the automatic migration of log data sets to HSM. This automatic migration eliminates the need to create and maintain archival history data sets, with one exception. If the log stream data set directory is full, you can, using SUBSYS-options2 of the LOGR subsystem, copy data from a log stream to a history data set and then delete the copied data from the log stream.

2. Either specify LOGREC=LOGSTREAM in the IEASYSxx parmlib member, or use the SETLOGRC command to change the logrec recording medium to a logrec log stream. In general, any records written to any logrec data sets before changing to a logrec log stream must be read by a separate EREP job. However, the MERGE option can be used to combine logrec output from the log stream with a logrec data set in a single EREP job.

3. Change the EREP job stream as follows:

   a. Change the SERLOG DD DSN= statement pointing to a logrec data set to an ACCIN DD DSN= statement pointing to a logrec log stream name, with corresponding SUBSYS parameters, to associate EREP with the logrec log stream. The SUBSYS parameters are described in “Obtaining records from the logrec log stream” on page 523.

   b. Identify the input as a history data set. Leave the output to a history data set as currently recommended, because all subsequent steps should already use the history data set as input.

   Note: Using a logrec log stream as input for multiple steps is not recommended because each subsequent step processes more records than the prior, causing numbers and data in successive reports not to match.
Subsequent EREP report steps that normally process history data sets no longer need to concatenate one history data set per system.

For more information, see the following documentation:

- See z/OS MVS Setting Up a Sysplex for information about preparing an installation to use system logger functions.
- See EREP User's Guide for more information about running an EREP job to obtain a history data set.
- See z/OS MVS System Commands for more information about the SETLOGRC command.
- See z/OS MVS Initialization and Tuning Reference for more information about the IEASYSxx parmlib member.

**Changing the logrec recording medium**

You can use the SETLOGRC command to dynamically change your logrec recording medium regardless of the setting with which you started the system. Additionally, you can change to different logrec data sets or log streams. For more information, see z/OS MVS System Commands.

**Error recording contents**

The system creates records for every hardware or software failure and system condition that occurs and stores these records in the logrec data set or the logrec log stream. The records can contain two types of data that document failures and system conditions:

- **Error statistics**, which include the number of times that channels, machine models, and I/O devices have failed
- **Environmental data**, which include time and circumstances for each failure or system condition

**Note:** A programmer can also build symptom records using the SYMRBLD macro and have those records written into the logrec data set or the logrec log stream using the SYMREC macro.

See z/OS MVS Programming: Assembler Services Reference IAR-XCT for information about the macros.

Each record is recorded in hexadecimal format as an undefined length record. Each record provides:

- Relevant system information at the time of the failure
- Device hardware status at the time of the failure
- Results of any device/control unit recovery attempt
- Results of any software system recovery attempt
- Statistical data

When taken as a whole, these records create a history of the system, which begins early in system initialization and ends when the system stops. These records contain:

- **Full Abend History:** The system writes a logrec record for every abend, regardless of whether the dump is requested or suppressed. The logrec data set or the logrec log stream contains a full record of abnormal ends.
- **System Initialization Errors:** The system writes errors during system initialization, before other diagnostic services are completely functioning.
- **Lost Record Counts:** The system writes a logrec record to summarize lost error records. Sometimes hardware-detected or software-detected errors occur close together. When errors are too close together, the system cannot write an individual record for each error; instead, the system counts the errors and writes a summary record.
These sections describe what is in the logrec data set:

- “Logrec data set header record” on page 519
- “Logrec data set time stamp record” on page 519

This section describes what is in the logrec data set or the logrec log stream:

- “Types of logrec error records” on page 519

See z/OS MVS Diagnosis: Reference for the format of the header record, time stamp record, and logrec error records.

**Logrec data set header record**

IFCDIP00 creates a header record on the logrec data set. The logrec data set header record includes:

- Information that the system recording routines can use to determine where to write new record entries onto the logrec data set
- Information that EREP can use to find existing record entries on the logrec data set. This information is valuable when you run an EREP report to find a particular error.
- Information that the system recording routines can use to issue a warning message when the logrec data set is 90% full.

**Note:** The logrec log stream does not have a header record generated.

**Logrec data set time stamp record**

IFCDIP00 creates a time stamp record on the logrec data set in the first record space following the header record. The time stamp record provides current date and time information for the IPL record. This allows you to measure the approximate time interval, recorded in the IPL records, between the ending and reinitialization of the operating system.

At preset time intervals, the system obtains the current date and time and writes this information on the time stamp record, overlaying the previous date and time.

During a subsequent initialization of the system, the system obtains the date and time from the time stamp record and adds it to the IPL record.

If IFCDIP00 is used to reinitialize the logrec data set, the information in the time stamp record is overlaid with hexadecimal zeros until the system writes the current date and time.

**Note:** The logrec log stream does not have a time stamp record generated.

**Types of logrec error records**

When the logrec data set or the logrec log stream is initialized, the system begins recording events. The system records the following types of error records, containing device-dependent or incident-dependent information:

- **Asynchronous notification record (ANR) records** for:
  - External timer reference (ETR) records for information related to Sysplex Timer incidents.
  - Direct access storage device (DASD)-service information message (SIM) records for information concerning servicing needs.
  - Link maintenance information (LMI) records for information for a particular link incident.
- **Channel report word (CRW) records** for:
  - Channel path error
  - Subchannel error
  - Configuration alert error
  - Monitoring facility error
- **Dynamic device reconfiguration (DDR) records** for:
Operator and system swaps between direct access and magnetic tape devices
Operator swaps on unit record devices

- **End-of-day (EOD) records** for information related to end-of-day and system ending conditions whenever the RDE option has been included in the system.
- **Input/output supervisor (IOS) records** for information related to IOS recovery actions.
  - Dynamic pathing services validation (DPSV) records for recovery actions.
- **Initial program load (IPL) records** for information related to system initializations whenever the RDE option has been included in the system.
- **Machine check handler (MCH) records** for:
  - Central processor failure
  - Storage failure
  - Storage key failure
  - Timer failure
- **Miscellaneous data (MDR) records** for:
  - Buffer overflow and device failures on buffered log devices
  - Demounts on DASD with buffered logs
  - Demounts by the DFSMSdss program between DASD having buffered logs and removable disk packs
  - Device failures on teleprocessing devices connected to an IBM communication controller
  - Statistical recording by EREP on DASD with buffered logs
- **Missing interruption handler (MIH) records** for:
  - Missing I/O interruptions
  - Specified time intervals
  - Recovery actions required
  - Recovery actions performed
- **Outboard (OBR) records** for:
  - Counter overflow statistics and device failures on devices supported by the teleprocessing access methods
  - End-of-day (EOD) requests
  - Paging I/O errors
  - Permanent channel and I/O device failures
  - Statistic counter overflow
  - Temporary or intermittent I/O device failures
  - Demounts on IBM magnetic tape drives
  - Devices that have their own diagnostic buffers
  - Statistical recording by EREP on DASD with buffered logs
- **Subchannel logout handler (SLH) records** for channel errors.
- **Software records**, including:
  - Machine checks (hardware-detected hardware errors, such as software recovery attempts for hard machine failures)
  - Program checks (hardware-detected software errors)
  - Restart errors (operator-detected errors)
  - Lost record errors (count of the records that did not fit in the buffer to be written to the logrec data set)
  - Software-detected errors, such as:
Abnormal ends, which are also called *abends*; reported in software records or erroneous supervisor call (SVC) instructions. These are known as SDWA-type software records.

- Errors that are not abnormal ends; reported in symptom records.
- Errors generated by application programs or system components; reported in symptom records.

As you can see, the system records a comprehensive list of error records that can help you when you need to diagnose a system failure.

**Obtaining information from the logrec data set**

You can obtain the information recorded in the logrec data set using EREP, which formats error records. EREP can perform the following functions:

- Create an accumulation data set from the logrec data set
- Clear the logrec data set
- Copy an input accumulation data set to an output accumulation data set
- Merge data from an accumulation data set and the logrec data set
- Print a detailed description of selected hardware and software error records
- Summarize and print statistics for device failures

EREP places the information from the logrec data set into reports. Using JCL, you determine the type of report you want EREP to produce.

**Using EREP**

EREP presents information from the logrec software error records in five reports.

**Detail Edit Report for an Abend**

The system obtains most of the information for an abend logrec error record from the system diagnostic work area (SDWA). The report contents are:

- Record header: report type (SOFTWARE RECORD), system, job name, error identifier (ERRORID), date, and time
- Search argument abstract
- Serviceability information
- Time of error information
- Status information from the request block
- Recovery environment
- Recovery routine action
- Hexadecimal dump of the SDWA, including the variable recording area (VRA)
Figure 172 on page 522 shows how to generate detail edits and summaries of all software and operational records:

```
//STEP7   EXEC  PGM=IFCEREP1,PARM='CARD'
//ACCIN     DD  DSN=EHISTORY,DISP=SHR
//DIRECTWK  DD  UNIT=SYSDA,
//              SPACE=(CYL,5,,CONTIG)
//EREPPIT    DD  SYSDOUT=A,DCB=BLKSIZE=133
//TOURIST   DD  SYSDOUT=A,DCB=BLKSIZE=133
//SYSIN     DD  *
PRINT=PS
TYPE=SIE
HIST
ACC=N
ENDPARM
```

Figure 172. Example: Printing a detail edit report

**Detail edit report for a symptom record**
The system obtains most of the information for a non-abend logrec error record from the symptom record identified in the SYMREC macro. A programmer can build the symptom record using the SYMRBLD macro. The report contents are:
- Record reader: report type (SYMPTOM RECORD), system, date, and time
- Search argument abstract
- System environment
- Component information
- Primary and secondary symptom strings
- Free-format component information
- Hexadecimal dump of the symptom record

**System summary report**
The report summarizes errors for each of your installation's principle parts, or subsystems: processors, channels, subchannels, storage, operating system control programs, and I/O subsystems. The report contents are:
- Record header: report type (SYSTEM SUMMARY), system, date, time
- Total errors and errors for each processor for the following types of errors:
  - IPL
  - Machine check
  - Program error
  - End of day
- Identifications for processors in the report

**Event history report**
The report shows the error history: the frequency, order, and pattern of errors. The report contents are:
- Record header: report type (EVENT HISTORY)
- Abstracts for abend and non-abend logrec error records in chronological order
- Totals of the types of logrec error records for the system and for each processor

The JCL shown in Figure 173 on page 523 defines a two-step job. The first step prints an event history report for all logrec data set records. The second step formats each software, IPL, and EOD record individually. The event history report is printed as a result of the EVENT=Y parameter on the EXEC statement of the first step. It can be a very useful tool to the problem solver because it prints
the records in the same sequence they were recorded and therefore shows an interaction between hardware error records and software error records.

```
//EREPO JOB MSGLEVEL=1
//EREPA EXEC PGM=IFCEREP1,PARM='EVENT=Y,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPE EXEC PGM=IFCEREP1,PARM='EVENT=Y,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPT EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
```

Figure 173. Example: Printing an event history report

**Detail summary report**

The report summarizes information about data in logrec error records. The report contents are:

- Record header: report type being summarized
- Summary information and counts

The example in Figure 174 on page 523 shows how to generate detail summaries of all I/O errors.

```
//STEP6 EXEC PGM=IFCEREP1,PARM='CARD'
//ACCIN DD DSN=Ehistory,DISP=(OLD,PASS)
//DIRECTWK DD UNIT=SYSDA,
//   SPACE=(CYL,5,,CONTIG)
//EREPP EXEC PGM=IFCEREP1,PARM='TYPE=DOTH,PRINT=SU,
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPP EXEC PGM=IFCEREP1,PARM='TYPE=DOTH,PRINT=SU,
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPP EXEC PGM=IFCEREP1,PARM='TYPE=DOTH,PRINT=SU,
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPP EXEC PGM=IFCEREP1,PARM='TYPE=DOTH,PRINT=SU,
//   REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
```

Figure 174. Example: Printing a detail summary report

**Obtaining records from the logrec log stream**

You can access records in the logrec log stream by either:

- Writing a program using IXGCONN and IXGBRWSE services, see "Using System Logger services to obtain records from the logrec log stream" on page 523.
- Using EREP. see “Using EREP to obtain records from the logrec log stream” on page 524.

**Using System Logger services to obtain records from the logrec log stream**

You can obtain records from the logrec log stream by writing a program that uses the IXGCONN and IXGBRWSE system logger services to return log data. The data returned by the IXGBRWSE service for the logrec log stream is mapped by the IFBLOGLB data area. (See z/OS MVS Programming: Assembler Services Guide for information on using system logger services.)

Note that the logrec log stream output from the IXGBRWSE service contains an individual log stream record. However, the log stream record actually contains a group of records. The logrec log stream record is mapped by the IFBLOGLB mapping macro. For information on the IFBLOGLB mapping macro, see z/OS
Using EREP to obtain records from the logrec log stream

You can use EREP to access the records in the logrec log stream for each system. The log stream subsystem allows existing programs to access error records from a log stream in the same way records were accessed from a logrec data set. See z/OS MVS Programming: Assembler Services Guide for information about using and starting the log stream subsystem.

JCL for the LOGR Subsystem

Use the SUBSYS parameter to call the log stream subsystem (LOGR) to access log stream data.

```jcl
//ddname DD DSNAME= log.stream.name,
//             SUBSYS=(LOGR[,exit_routine_name][,'SUBSYS-options1'][,'SUBSYS-options2'])
```

**Note:** Quotation marks around keywords are required when parentheses, commas, equal signs, or blank characters are used within the SUBSYS keyword.

Other DD keywords are validated, if specified, but are ignored in the LOGR subsystem processing.

**DSNAME=**`log.stream.name`

Specifies the name of the log stream to read. The name can be 1 to 26 characters in a data-set-name format.

**SUBSYS=**(LOGR[,exit_routine_name][,'SUBSYS-options1'][,'SUBSYS-options2'])

Specifies that processing of this DD is to be handled by the LOGR subsystem. The `exit_routine_name` is the second positional parameter and specifies the name of the exit routine to receive control from the LOGR subsystem.

- Specify or use the default value to IXGSEXIT to use the log stream subsystem exit routine.
- Specify IFBSEXIT to access records from the logrec log stream. See SUBSYS-options2 for logrec-specific parameters.
- Specify IFASEXIT to access records from SMF log streams. See SUBSYS-options2 for SMF-specific parameters.

**SUBSYS-options1**

Specifies options that are meaningful to all exit routines. See the documentation for a specific log stream exit for exceptions to these common options. The keywords are:

**FROM=**`starting_time`

Indicates the starting time of the first log stream block to be processed based on the log stream view that the VIEW keyword specifies. The first block is the one with a time stamp later than or equal to the specified time.

**OLDEST**

Indicates the first block read is the oldest block on the log stream. OLDEST is the default.

**yyyy/ddd**

Specifies the start date. If the date is omitted, the current date is assumed. `yyyy` is a 4-digit year number and `ddd` is a 3-digit day number from 001 through 366 (366 is valid only on leap years). For example, code February 20, 2000 as 2000/051, and code December 31, 1996 as 1996/366.

**hh:mm:ss**

Specifies the start time. If the time is omitted, the first block written after midnight is used. `hh` is a 2-digit hour number from 00 to 23, `mm` is a two digit minute number from 00 to 59, and `ss`...
is a 2–digit second number from 00 to 59. The seconds field and associated : delimiter can be omitted if it is not required by the log stream owner.

The FROM keyword is mutually exclusive with the DURATION keyword.

**TO=ending_time**
Indicates the ending time of the last log stream block to be processed based on the log stream view that the VIEW keyword specifies. The last block is the one with a time stamp earlier than or equal to the specified time.

**YOUNGEST**
Indicates the last block read will be the youngest block on the log stream at the time the allocation for the DD occurs. YOUNGEST is the default.

**yyyy/ddd**
Specifies the end date. If the date is omitted, the current date is assumed. yyyy is a 4-digit year number and ddd is a 3-digit day number from 001 through 366 (366 is valid only on leap years). For example, code March 7, 2001 as 2001/066, and code November 12, 2000 as 2000/317.

**hh:mm[:ss]**
Specifies the end time. If the time is omitted, the last block written before midnight will be used. If the end date is the same as the current day, then the youngest block on the log stream at the time the allocation for the DD occurs will be used. hh is a 2–digit hour number from 00 to 23, mm is a two digit minute number from 00 to 59, and ss is a 2–digit second number from 00 to 59. The seconds field and associated: delimiter can be omitted if it is not required by the log stream owner.

The TO keyword is mutually exclusive with the DURATION keyword.

**Note:** If the value specified for the FROM keyword is greater than the value specified for the TO keyword, the system ends the jobstep with a JCL error.

**DURATION=(nnnn,HOURS)**
Specifies which blocks are to be processed. Each n is a numeric from 0 to 9. Specifying (nnnn,HOURS) requests the blocks for the last nnnn hours up to the youngest block that is to be processed based on the log stream view that the VIEW keyword specifies. The last nnnn hours are calculated from the current time of the allocation for the DD.

The first block is the one with a time stamp greater than or equal to the calculated start time. The last block read is the youngest block on the log stream at the time the allocation for the DD occurs.

The DURATION keyword is mutually exclusive with the TO and the FROM keywords.

**VIEW=[ACTIVE|ALL|INACTIVE]**
Specifies the view or portion of log data to be used to obtain records from the log stream. System logger maintains two kinds of log stream data in a log stream: an active portion and an inactive portion. The active portion of the log stream is the log data that the log stream owner has not logically deleted through an IXGDELETE request. The inactive portion of the log stream is the log data that the log stream owner has logically deleted but that has not yet been physically deleted from the log stream because the retention period (RETPD) specified for the log stream has not yet expired.

The VIEW option designates the portion(s) of the log stream to be used to obtain log data from the log stream, in addition to applying the other parameters.

Because the other parameters also apply, the combination of the FROM, TO, or DURATION parameters and the VIEW parameter might mean that the log stream subsystem exit returns no log data or only a portion of the intended log data. For example, if FROM=starting_time and VIEW=INACTIVE are both specified, and the starting_time is later (younger) than the log data in the inactive portion of the log stream, then there is no log data to meet the access criteria. In the same way, if TO=ending_time and VIEW=ACTIVE are both specified, and the ending_time is earlier (older) than the log data in the active portion of the log stream, then there is no log data to meet the access criteria.
ACTIVE
The view of the log stream is to include only active log data, in addition to applying the other log stream access parameters. ACTIVE is the default.

ALL
The view of the log stream is to include both active and inactive log data, in addition to applying the other log stream access parameters.

INACTIVE
The view of the log stream is to include only the inactive log data, in addition to applying the other log stream access parameters.

GMT|LOCAL
Specifies whether the time is local time (based on the time zone offset at the time the log was written) or GMT time. GMT is the default.

Additional parameters for system logger

Along with the general parameters that can be specified for a log stream subsystem data set, system logger provides additional parameters in the SUBSYS-options2 specifications. The following values can be coded for a logrec log stream:

SUBSYS-options2
Specifies unique exit routine options. Refer to information provided by the specific log stream owner concerning these parameters.

LASTRUN
Indicates that the starting point of the records to be read from the logrec log stream will be from the last record read by a previous use of an application that used LASTRUN. The end point of the records will be to the youngest block in the logrec log stream.

LASTRUN is mutually exclusive with the FROM, TO and DURATION keywords in SUBSYS-options1 and with DELETE from SUBSYS-options2.

DELETE
Indicates that log stream records are to be deleted from the logrec log stream. The log stream itself is not deleted and remains available for use.

If the logrec log stream has been opened in the job step, all records up to but not including the last complete block read by the program will be deleted from the logrec log stream.

If the logrec log stream has not been opened in the job step, all records prior to the time indicated on the TO keyword will not be deleted from the logrec log stream.

DELETE is mutually exclusive with the FROM and DURATION keywords in SUBSYS-options1 and the LASTRUN and SYSTEM keywords from SUBSYS-options2.

DEVICESTATS
Requests that the device statistics kept on the system where this job is running are to be recorded in the logrec log stream before any records are read.

SYSTEM=system name
Indicates that only records originating from the specified system name are to be returned to the application reading the logrec log stream. The system name value should match the name specified in the SYSNAME parameter of the IEASYSxx parmlib member. SYSTEM= is mutually exclusive with the DELETE keyword from SUBSYS-options2.

Time of day considerations for logrec

When using the SUBSYS DD statement for LOGR, handle the time of day filtering carefully. The SUBSYS parameter does not accept a stop time of 24:00, but the EREP parameters do accept 24:00 as a stop time. If it is necessary to write JCL and EREP control statements, you might have to request filtering through both the SUBSYS DD statement and the EREP parameters.
• SUBSYS parameters use blocks of records, and filtering of these blocks is done using time stamps assigned after each logical record enclosed in a block has been assigned its own time stamp.

Figure 175 on page 527 shows how to select logrec log stream records that were produced between 05:00 on June 1st, 1997, and the end of that day.

```
//ACCIN DD DSN=SYSPLEX.LOGREC.ALLRECS,DISP=SHR,
//       DCB=(RECFM=VB,BLKSIZE=4000),
//       SUBSYS=(LOGR,IFBSEXIT,
//               'FROM=(1997/152,05:00),TO=(1997/153,23:59),GMT')
```

Figure 175. Example: Using SUBSYS parameters

• EREP parameters use logrec logical records. When you use the TIME parameter with EREP, you are specifying a range of hours and minutes of interest on each day selected.

Table 69 on page 527 shows how to correctly select logrec records that were produced between 05:00 on June 1st, 1997, and the end of that day.

```
Correct coding example                  Incorrect coding example
DATE=(97152-97152), TIME=(0500-2400)   DATE=(97152-97153), TIME=(0500-0000)
```

<table>
<thead>
<tr>
<th>Correct coding example</th>
<th>Incorrect coding example</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE=(97152-97152), TIME=(0500-2400)</td>
<td>DATE=(97152-97153), TIME=(0500-0000)</td>
</tr>
</tbody>
</table>

Creating a history data set for log data

Use the JCL in “Example: Creating a history data set” on page 527 to create a history data set from log data recorded on the logrec log stream. In this example, DEVICESTATS requests device statistics and the records are to be recorded in the log stream. Records are read from the last block that was processed on the previous submission of a "LASTRUN" EREP job up to the youngest block in the log stream. The first time a job with the "LASTRUN" option is run, the records are read from the oldest block in the log stream.

```
//EREPDALY EXEC  PGM=IFCEREP1,PARM=('HIST,ACC=Y,SYSUM')
//ACCIN DD DSN=SYSPLEX.LOGREC.ALLRECS,
//       SUBSYS=(LOGR,IFBSEXIT,,'DEVICESTATS,LASTRUN'),
//       DCB=(RECFM=VB,BLKSIZE=4000)
//ACCDENV DD DSN=EREP.HISTORY,
//       DCB=(RECFM=VB,BLKSIZE=4000),
//       UNIT=SYSDA,SPACE=(CYL,(25,5))
//SERLOG DD DUMMY
//DIRECTWK DD UNIT=SYSDA,SPACE=(CYL,15,,CONTIG)
//TOURIST DD SYSOUT=A,DCB=BLKSIZE=133
//EREPPPT DD SYSOUT=A,DCB=BLKSIZE=133
//SYSAEND DD SYSOUT=A
//SYSIN DD DUMMY
/*
```

Example: Creating a history data set

Producing an event history from logrec

Use the JCL shown in “Example: Producing an event history” on page 528 to produce an event history report from records on the logrec log stream. By not specifying the FROM or TO keywords, the default is FROM=OLDEST and TO=YOUNGEST, indicating processing should include records from the beginning of the log stream to the end of the log stream. By specifying a print data set, EREPPT, the report can be browsed online for an overview of significant activity. When reading records by date and time, you can
provide both EREP and SUBSYS parameters. EREP selects records from those passed to it from the SUBSYS parameters.

**Example: Producing an event history**

```
//EREPMNOW EXEC PGM=IFCEREP1,REGION=4M,
//                  PARM='CARD'
//ACCIN      DD  DSN=SYSPLEX.LOGREC.ALLRECS,
//             DISP=SHR,
//             SUBSYS=(LOGR,IFBSEXIT,,)
//DIRECTWK   DD  UNIT=SYSDA,SPACE=(CYL,5,,CONTIG)
//EREPPPT     DD DSN=EREP.EVENT,DISP=(NEW,CATLG),
//            DCB=BLKSIZE=133,
//            UNIT=SYSDA,SPACE=(CYL,(25,5))
//TOURIST    DD SYSOUT=A,DCB=BLKSIZE=133
//SYSABEND   DD SYSOUT=A
//SYSIN      DD *
EVENT
HIST
ACC=N
TYPE=ACDEHIMOSX
ENDPARM
/*
```

**Obtaining information from the logrec recording control buffer**

When the system writes a dump, the dump includes the records in the logrec buffer in storage; the buffer records have been either written to the logrec data set or are queued to be written to the logrec data set.

When you begin to diagnose a dump for a system problem, you can use IPCS to view the system records in the logrec recording control buffer.

The logrec recording control buffer is one of the most important areas to be used when analyzing problems in MVS. This buffer serves as the interim storage location for hardware and software error records that are queued to be written to the logrec data set. The buffer is significant because of the error history it contains. Also, any records in the buffer that have not reached the logrec data set are almost certainly related to the problem you are trying to solve.

**Formatting the logrec buffer**

To format the logrec buffer, use the IPCS subcommand VERBEXIT LOGDATA. The entries that are still in the buffer will be formatted in the same way as entries that are printed in the EREP detail edit report.

**Finding the logrec and WTO recording control buffers**

There are two recording control buffers (RCB) in the SQA. The system uses one buffer for logrec messages, and the other for WTO messages. The CVT+X'16C' (CVTRBCB) points to the recording buffers control block (RBCB). The RBCB contains the following information about the two recording control blocks (which are also referred to as RCBs or buffers):

**For the logrec RCB:**

- RBCB+X'10' (RBCBLRCB) points to the logrec buffer.
- RBCB+X'14' (RBCBLLEN) contains the length of the logrec buffer.

**For the WTO RCB:**

- RBCB+X'18' (RBCBWRRCB) points to the WTO buffer.
- RBCB+X'1C' (RBCBWLLEN) contains the length of the WTO buffer.

The logrec and WTO recording control buffers reside in fetch-protected SQA. Entries in these buffers have time stamps (8-byte TOD clock values) that allow you to look at a dump and create a chronological list of the logrec events and WTO messages.
Reading the logrec recording control buffer

The logrec recording control buffer is a “wrap-table” similar to the system trace table. The entries are variable in size. The latest entries are the most significant especially if they have not yet been written to the logrec data set. Knowing the areas of the system that have encountered errors and the actions of their associated recovery routines, information obtained from the logrec data set and from the logrec recording control buffer helps provide an overall understanding of the environment you are about to investigate.

**Note:** The SDWA in the logrec buffer is a compressed SDWA in which the recordable extensions start directly after the used portion of the SDWAVRA. The SDWAURAL field contains the length of the SDWAVRA.

You can find the oldest entry in the buffer by locating the end of the unused or free area, obtained from RCBFREE+RCBFLNG. (If this sum brings you to a point beyond the end of the buffer, subtract RCBTLNG from the sum.) You can also read the buffer backwards by using the entry length at the end of each entry. The latest entry appears directly before the free or unused area of the buffer.

For details about the format of the RCB, see [z/OS MVS Data Areas](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary) in the z/OS Internet library.

Interpreting software records

There are two types of software records that are recorded in the logrec data set or the logrec log stream:

- **Software record**
  
  The system generates these records, providing information from the system diagnostic work area (SDWA) that describes problems detected because of an abend or a program check. See “Detail edit report for a software record” on page 529 for more information.

- **Symptom record**
  
  Either a user’s application program or the system can issue the SYMREC macro to request the creation of a symptom record. Generally, the symptom record describes problems not accompanied by an abend, but there are exceptions. See “Detail edit report for a symptom record” on page 534 for more information.

Use the search argument you obtain from the detail edit reports for either a software record or a symptom record to search for a known problem. If you do not conduct the search yourself, contact the IBM Support Center. The result of the search will be one of the following:

- The PTF that corrects the problem.
  
  Apply the PTF that corrects the error.

- The APAR, and possibly the related APAR, that describes the problem. In some cases, a temporary fix (either ZAP or update) or a procedure might circumvent the problem.
  
  Apply the temporary fix if it is available; otherwise, follow the circumvention procedure.

- A description of why the problem might have occurred, which often describes a frequent misuse of a product that causes the error record. This type of problem is referred to as a user error.
  
  When an error occurs because of the misuse of a product other than MVS, use the procedures documented for that product to determine how best to debug the problem.

For any case other than the three listed above, including the case where the service link database does not contain a record matching the search criteria, contact the IBM Support Center to report the problem.

**Detail edit report for a software record**

The detail edit report for a software record shows the complete contents of an error record for an abnormal end, including the system diagnostic work area (SDWA). The report is produced by EREP and, through the VERBEXIT LOGDATA subcommand, under IPCS.
Use the detail edit report for a software record to determine the cause of an abend, and the recovery action that the system or application has either taken or not taken. This report enables you to locate where an error occurred, similar to the analysis of an SVC dump. Once you locate the error, you can develop a search argument to obtain a fix for the problem.

For more information, refer to the following documentation:

- See [EREP User's Guide](#) for information about producing a detail edit report for an SDWA-type record.
- See [z/OS MVS IPCS Commands](#) for information about the VERBEXIT LOGDATA subcommand.

The example output shown in “Example: One record with SDWARC4 and 64-bit information” on page 530 is from one record with SDWARC4 and 64-bit information. This record also has information in the VRA, which is formatted.

### Example: One record with SDWARC4 and 64-bit information

<table>
<thead>
<tr>
<th>TYPE: SOFTWARE RECORD</th>
<th>REPORT: SOFTWARE EDIT REPORT</th>
<th>DAY.YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SVC 13)</td>
<td>REPORT DATE: 343.64</td>
<td></td>
</tr>
<tr>
<td>FORMATTED BY: IEAVTFDE</td>
<td>ERROR DATE: 336.04</td>
<td></td>
</tr>
<tr>
<td>MODEL: 2084</td>
<td>HH:MM:SS.TH</td>
<td></td>
</tr>
<tr>
<td>SERIAL: 11778D</td>
<td>TIME: 17:43:44.72</td>
<td></td>
</tr>
</tbody>
</table>

**JOBNAME:** PIDA1028  **SYSTEM NAME:** J50

**ERRORID:** SEQ=00757  **CPU=0056**  **ASID=0097**  **TIME=17:43:44.7**

**SEARCH ARGUMENT ABSTRACT**

<table>
<thead>
<tr>
<th>PIDS/5752SCLDR RIDS/IEWLDR00#L RIDS/IEWLUNF0 AB/S0378 PRCS/00000014 RIDS/IEWLRECV#R</th>
</tr>
</thead>
</table>

**SYMPTOM**

<table>
<thead>
<tr>
<th>PROGRAM ID: 5752SCLDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOAD MODULE NAME: IEWLDR00</td>
</tr>
<tr>
<td>CSECT NAME: IEWLUNF0</td>
</tr>
<tr>
<td>SYSTEM ABEND CODE: 0378</td>
</tr>
<tr>
<td>ABEND REASON CODE: 0000014</td>
</tr>
<tr>
<td>RECOVERY ROUTINE CSECT NAME: IEWLRECV</td>
</tr>
</tbody>
</table>

**OTHER SERVICEABILITY INFORMATION**

<table>
<thead>
<tr>
<th>SUBFUNCTION:</th>
<th>LSLOADER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERVICEABILITY INFORMATION NOT PROVIDED BY THE RECOVERY ROUTINE</td>
<td></td>
</tr>
</tbody>
</table>

**TIME OF ERROR INFORMATION**

<table>
<thead>
<tr>
<th>PSW: 07041000 80000000 00000000 012F902E</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSTRUCTION LENGTH: 02  INTERRUPT CODE: 0000</td>
</tr>
<tr>
<td>FAILING INSTRUCTION TEXT: 00181610</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BREAKING EVENT ADDRESS: 00000000 00000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR/GR 0-1 00000000/00000000_0A0D1800</td>
</tr>
<tr>
<td>AR/GR 2-3 00000000/00000000_00000020</td>
</tr>
<tr>
<td>AR/GR 4-5 00000000/00000001_008FD098</td>
</tr>
<tr>
<td>AR/GR 6-7 01FF000C/00000000_00000003</td>
</tr>
<tr>
<td>AR/GR 8-9 00000000/00000001_7F35FD50</td>
</tr>
<tr>
<td>AR/GR 10-11 00000000/00000001_2C417000</td>
</tr>
<tr>
<td>AR/GR 12-13 00000000/00000000_8651F240</td>
</tr>
<tr>
<td>AR/GR 14-15 00000000/00000000_8651FF54</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HOME ASID: 0097  PRIMARY ASID: 0097  SECONDARY ASID: 0097</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKM: 0000  AX: 0000  EAX: 0000</td>
</tr>
</tbody>
</table>

**RTM WAS ENTERED BECAUSE AN SVC WAS ISSUED IN AN IMPROPER MODE.**

**THE ERROR OCCURRED WHILE:** A TYPE 1 SVC WAS IN CONTROL

**LOCKS HELD:** LOCAL/CML

**NO SUPER BITS WERE SET.**
RECOVERY ENVIRONMENT

RECOVERY ROUTINE TYPE: FUNCTIONAL RECOVERY ROUTINE (FRR)
PSW AT ENTRY TO FRR: 070C0000 86502368
FRR PARAMETER AREA ON ENTRY TO FRR:
+00 7F33F4A8 00000000 00000000 00000000 00000000 00000000 00000000
RECOVERY ROUTINE ACTION

THE RECOVERY ROUTINE RETRIED TO ADDRESS 0651FFA2.
THE REQUESTED SVC DUMP WAS SUCCESSFULLY STARTED.
NO LOCKS WERE REQUESTED TO BE FREED.
THE SDWA WAS REQUESTED TO BE FREED BEFORE RETRY.
THE REGISTER VALUES TO BE USED FOR RETRY:

REGISTERS 0-7
GR: 008FD00 00000000 7FFFC100 00000000 008FD098 7FFFC150 7FFFBF48 00F52C00
AR: 00000000 00000000 00000000 00000000 00000000 00000000 01FF000C 01FF000C

REGISTERS 8-15
GR: 7F33F4A8 06520100 00FD5750 00000001 8651F240 7F33F0E8 7F33F638 00000000
AR: 00000000 00000000 00000000 01FF000C 00000000 00000000 00000000 00000000

HEXADECIMAL DUMP

HEADER
+000 40831820 00000000 0004336F 17434472 | C........?....|
+010 001177BD 20040000 | .....D.. |

JOBNAME
+000 D7C9C4C1 F1F0F2F8 | PIDA1028 |

SDWA BASE
+000 00000C00 04378000 00000000 00000000 | ........................ |
+010 00000000 00000000 84000000 84378000 | [.......D..D..] |
+020 00000000 00000000 00000000 00000000 | [.8...&] |
+030 00000000 00000000 7F33F4A8 00001748 | [........5...&] |
+040 2C417000 7F36EC88 8651F240 7F33F0E8 | [...."H."F.2*",Y] |

+180 00000000 00000000 00000000 0009BD27 | [........................ ] |
+190 00FFA0B0 | .... |

VARIABLE RECORDING AREA (SDWAVRA)
+000 KEY: 37 LENGTH: 06
+002 C4C4D5C1 D4C5 | DDNAME |
+008 KEY: 39 LENGTH: 08
+00A 6060C8C6 E2606060 | --HFS--- |

+0AA 0003 | .. |
+0AC KEY: 53 LENGTH: 00
+0AE KEY: FF LENGTH: 00

SDWA FIRST RECORDABLE EXTENSION (SDWARC1)
+000 E2C3D3C4 D93E2D3 D6C1C4C5 D9404040 | SCLDRLSLOADER |
+010 40404040 40404040 40404040 00000000 | .... |
+020 00000000 00000000 00000000 00000000 | [..........14 ] |
+030 00000000 00000000 F5F7F5F2 01000001 | [........5752...] |

+1B0 00000000 00000000 00000000 00000000 | [........................ ] |
+1C0 D1F5F040 40404040 | J50 |

SDWA SECOND RECORDABLE EXTENSION (SDWARC2)
+000 00000000 00000000 00000000 00000000 | [........................ ] |

SDWA THIRD RECORDABLE EXTENSION (SDWARC3)
+000 00000000 00000000 00000000 00000000 | [........................ ] |
+010 00000000 00000000 00000000 00000000 | [........................ ] |

SDWA FOURTH RECORDABLE EXTENSION (SDWARC4)
+000 00000000 84000000 00000000 84378000 | [.......D..] |
+010 00000000 00000000 00000000 00000000 | [..................] |
+020 00000000 00000000 00000000 00000000 | [0F52C00] |
+030 00000000 00000000 00000000 00000000 | [..................] |

Recording logrec error records 531
TYPE: SOFTWARE RECORD
Indicates that the detail edit report is for an SDWA-type record.

REPORT DATE
Indicates the date on which the EREP report was created.

ERROR DATE
Indicates the date on which the error occurred.

TIME
Indicates the time, as local, at which the error occurred.

JOBNAME
If the jobname is NONE-FRR, the error being recorded occurred in system or subsystem code covered by a functional recovery routine (FRR).

SYSTEM NAME
Indicates the name of the system where the SDWA-type record was created.

ERRORID
Allows you to coordinate diagnostic information from logrec, the console log (SYSLOG), and system dumps. The ERRORID is a concatenation of the following:

SEQ
A unique number assigned to each error. The sequence number indicates the order of the errors, but the records might not be listed in order. It is important to scan all entries and examine the sequence numbers to understand which error occurred first.

You might find the same sequence number used in more than one entry when several recovery routines, as a result of percolation, get control and request recording for the same error; however, the error time stamp will be different.

CPU
The internal identification number of the central processor that the failing process was running on at the time the error occurred. Use information from the system trace table about this CPU to learn more about the error.

ASID
The address space identifier (ASID) of the current, or home, address space at the time the error occurred.

TIME
Indicates the time of the error.

PIDS/... RIDS/... AB/... PRCS/...
Use this symptom string to do a structured search of any IBM database.

PROGRAM ID
The program ID (PID) indicates the product and the component where the error occurred. For IBM products, see the tables in z/OS MVS Diagnosis: Reference that list the products and components. For non-IBM products, see the appropriate vendor-supplied documentation.

LOAD MODULE NAME
Indicates the load module in control at the time of the error.
CSECT NAME
Supplied by the recovery routine that obtained control for the error. See the PSW for more information.

SYSTEM ABEND CODE
Indicates what system or user completion code was issued by the system, application, or component. See z/OS MVS System Codes for information about system abend codes. See the appropriate product documentation for user abend codes.

ABEND REASON CODE
Indicates the reason code, when available, associated with a system or user abend code.

RECOVERY ROUTINE CSECT NAME
Indicates the recovery routine that was given control to handle the error condition.

PSW
Indicates the program status word (PSW) at the time of the error.
If the software record is an SVC 13, the address in the second half of the PSW indicates the address of the module that detected the error. You need to find the caller of that module. The caller's address will reside either in register 14, or, if register 14 points to module IEAVEEXP, use the STATUS section of the software record to determine the caller. In the STATUS section, the interrupt code will indicate the last SVC that was issued.
If the software record is a program interrupt, the address in the second half of the PSW usually points to the failing module.

FAILING INSTRUCTION TEXT
Contains 12 bytes of the instruction stream at the time of the error, including the actual instruction that caused the abend. Starting at the end of the sixth byte, subtract the instruction length to indicate the failing instruction. In the preceding example, the failing instruction is X'0A0D'.

THE ERROR OCCURRED WHILE . . .
Provides information about the system environment at the time of error, indicating what type of routine was in control, whether locks were held, and whether supervisor FRRs were set at the time of the error.

STATUS
The PSW and registers that follow come from the request block (RB) associated with the ESTAE recovery routine that obtained control for the error. Using the information indicated will enable you to determine the program that was running at the time of the error. This information included in the STATUS section does not appear when an FRR handles recovery.

RECOVERY ROUTINE ACTION
Describes the recovery action performed or requested to be performed by the recovery routine. In the preceding example, an SVC dump was not requested. There are times, however, when the recovery routine will request an SVC dump. If SVC DUMP SUCCESSFULLY STARTED appears in this section, the error identifier (ERROR ID) appears in the SVC dump and in message IEA911E as it appears in the logrec error record.

HEXADECIMAL DUMP
Provides an unformatted hexadecimal dump of the SDWA control block. Depending on an indicator in the SDWA, which is set by the recovery routine generating the record, the SDWA is displayed in hexadecimal; EBCDIC text; or key, length, and data format.

VARIABLE RECORDING AREA (SDWAVRA)
Provides component-specific information. Using the information in the PROGRAM ID field, determine the component. For IBM products, see z/OS MVS Diagnosis: Reference for diagnostic information related to system components.
The SDWAVRA can optionally be mapped in a key-length-data format. Recovery routines use the SDWAVRA to construct messages and provide data that often contains valuable debugging information. Some MVS recovery routines use the key-length-data format to provide standardized diagnostic information for software incidents. This formatted information allows you to screen duplicate errors.
Constants for the key field have been defined to describe data, such as: return and/or reason codes, parameter lists, registers, and control block information. For example, a key of X'10' indicates a recovery routine parameter area. The SDWAVRAM bit (in the fixed portion of the SDWA) indicates that the SDWAVRA has been mapped in the key-length-data format as described by the IHAVRA mapping macro.

For the format of the SDWA, including a description of the keys, see z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary).

SDWA RECORDABLE EXTENSIONS
In addition to the SDWA standard area and the SDWAVRA, the SDWA recordable extensions also contain valuable debugging information, as follows:

- **SDWARC1** (recording extension 1) contains additional component service data (such as the component ID, the component name, the address of the TCB representing the task that incurred the failure, the control registers, original completion code and reason code, linkage stack pointer, and translation exception access register number).

- **SDWARC2** (recording extension 2) contains additional I/O machine check data (such as the machine check interruption code).

- **SDWARC3** (recording extension 3) contains locking information (such as the locks to be freed, and the addresses of lockwords).

**Note**: The SDWA that is in the logrec buffer is a compressed SDWA in which the recordable extensions start directly after the used portion of the SDWAVRA. The SDWAURAL field contains the length of the SDWAVRA.

Detail edit report for a symptom record
The SYMREC macro updates a symptom record with system environment information and then logs the symptom record in the logrec data set or logrec log stream. The system or application, using the SYMREC macro, creates a symptom record. The ADSR mapping macro maps the symptom record, and the symptom record contains diagnostic information determined by the application.

As an application or a system component detects errors during processing, it stores diagnostic information into the symptom record and issues the SYMREC macro to log the record. The diagnostic information consists of a description of a programming failure and a description of the environment in which the failure occurred.

See z/OS MVS Programming: Assembler Services Reference IAR-XCT for information about the SYMREC macro. See z/OS MVS Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary) for information about the ADSR data area.

Report output
The example in “Example: Detail edit report for a symptom record" on page 534 contains output from one record created by the system. Following the example is a list of the fields that are most important for diagnosis; only the highlighted fields are discussed.

Example: Detail edit report for a symptom record

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>SYMPTOM RECORD</th>
<th>REPORT: SOFTWARE EDIT REPORT</th>
<th>DAY.YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCP:</td>
<td>VS 2 REL 3</td>
<td>REPORT DATE: 176.92</td>
<td>DATE: 175.92</td>
</tr>
<tr>
<td>SERIAL:</td>
<td>031347</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEARCH ARGUMENT ABSTRACT:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID'S/5752SC1CM AB/58080 PRC'S/00000010 RIDS/IEAVTRSR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIDS/IGC0101C0L FLD'S/SR#ORIGIN VALU/CIEAVTRSR PCSS/FAILING</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSTEM ENVIRONMENT:</td>
<td></td>
<td>CPU MODEL: 9021</td>
<td>DATE: 175.92</td>
</tr>
</tbody>
</table>

534  z/OS: MVS Diagnosis: Tools and Service Aids
CPU SERIAL: 031347             TIME: 10:41:14.37
SYSTEM:     CPUR               BCP:   MVS
RELEASE LEVEL OF SERVICE ROUTINE:      JBB4422
SYSTEM DATA AT ARCHITECTURE LEVEL: 10
COMPONENT DATA AT ARCHITECTURE LEVEL: 10
SYSTEM DATA: 00000000 00000000 |........|
COMPONENT INFORMATION:
COMPONENT ID: 5752SC1CM
COMPONENT RELEASE LEVEL: D10
DESCRIPTION OF FUNCTION: RTM2 RECURSION ERROR RECORDING
PRIMARY SYMPTOM STRING:
PIDS/5752SC1CM AB/S080A PRCS/00000010 RIDS/IEAVTRSR
RIDS/IGC0101C#L FLDS/SR#ORIGIN VALU/CIEAVTRSR PCSS/FAILING
PCSS/CSECT PCSS/UNKNOWN FLDS/RTM2SCTC FLDS/FROM#PRWA
VALU/H00040000
SYMPTOM SYMPTOM DATA EXPLANATION
--------------- ------------- ---------------
PIDS/5752SC1CM 5752SC1CM COMPONENT IDENTIFIER
AB/S080A 080A ABEND CODE - SYSTEM
PRCS/00000010 00000010 RETURN CODE
RIDS/IEAVTRSR IEAVTRSR ROUTINE IDENTIFIER
RIDS/IGC0101C#L IGC0101C#L ROUTINE IDENTIFIER
FLDS/SR#ORIGIN SR#ORIGIN DATA FIELD NAME
VALU/CIEAVTRSR IEAVTRSR ERROR RELATED CHARACTER VALUE
PCSS/FAILING FAILING SOFTWARE STATEMENT
PCSS/CSECT CSECT SOFTWARE STATEMENT
PCSS/UNKNOWN UNKNOWN SOFTWARE STATEMENT
FLDS/RTM2SCTC RTM2SCTC DATA FIELD NAME
FLDS/FROM#PRWA FROM#PRWA DATA FIELD NAME
VALU/H00040000 00040000 ERROR RELATED HEXADECIMAL VALUE
SECONDARY SYMPTOM STRING:
FLDS/RTM2SCTR VALU/H00040000 FLDS/RTM2SCTX VALU/H00040000
SYMPTOM SYMPTOM DATA EXPLANATION
--------------- ------------- ---------------
FLDS/RTM2SCTR RTM2SCTR DATA FIELD NAME
VALU/H00040000 00040000 ERROR RELATED HEXADECIMAL VALUE
FLDS/RTM2SCTX RTM2SCTX DATA FIELD NAME
VALU/H00040000 00040000 ERROR RELATED HEXADECIMAL VALUE
FREE FORMAT COMPONENT INFORMATION:
KEY = FF00     LENGTH = 00048 (0030)
+000  C5D9D9D6   D940C4C5   E3C5C3E3   C5C440C2   |ERROR DETECTED B|
+010  E840D9E3   D4F240D9   C5C3E4D9   E2C9E5C5   |Y RTM2 RECURSIVE|
|   |   |   |   |
HEX DUMP OF RECORD:
HEADER
+000  4CB31800   00000000   0092175F   10411437   |<C.......K. ....|
+010  A6031347   90210000     |W....... |
SYMPTOM RECORD
+000  E2D9F9F6   F2F1F6F3   F1F3F4F7   00000000   |SR9021031347.|
+010  A5E21347   A5E41347   48404040   40404040   |VSS.V... |
+020  40404040   E4004040   40404040   40404040   |CPUR 5752JB|
|   |   |   |   |
TYPE: SYMPTOM RECORD
Indicates that the detail edit report is for a symptom record.
SEARCH ARGUMENT ABSTRACT
Provides information you can use to create a search argument. If enough information exists in this field, you can search the IBM service link problem reporting database to determine if there is a PTF to correct the error.
Recording logrec error records

The information that follows the search argument abstract in a symptom record depends on the options specified on the SYMREC macro either by a user program or by a system component. In the report output listed above, the system recorded a recursive error. The information contained in a symptom record is variable. To obtain an interpretation, contact the IBM Support Center for the product or for the component that built the record.

Customizing symptom record location

You can control the location of logrec symptom records from non-authorized programs. Use the ASREXIT installation exit just before writing the logrec record to control:

• If a program can write symptom records
• The location of the symptom record: the logrec data set, job log, both, or neither

See z/OS MVS Installation Exits for information about ASREXIT.
Chapter 16. AMBLIST: Map load modules and program objects

AMBLIST provides the following problem data:

- Formatted listing of an object module
- Map of the control sections (CSECTs) in a load module or program object
- List of modifications to the code in a CSECT
- Map of all modules in the link pack areas (LPA)
- Map of the contents of the DAT-on nucleus. The map no longer represents the IPL version and message AMB129I will be issued.

These formatted listings can help you diagnose problems related to modules as they currently exist on your system. AMBLIST is a batch job that runs in problem state.

The following topics describe AMBLIST:

- “Obtaining AMBLIST output” on page 537
- “Reading AMBLIST output” on page 548

Long name support: AMBLIST will process external names (labels and references) up to 32767 bytes long. Names exceeding 16 bytes in length will be abbreviated in the formatted part of the listings and an abbreviation-to-long name equivalence table will be printed at the end of the listing. AMBLIST functions that provide long names support are: LISTLOAD, LISTIDR, and LISTOBJ (XSD and GOFF only).

Note:
1. Any load module to be formatted and printed by AMBLIST must have the same format as those created by the linkage editor or by the program management binder.
2. Any program object to be formatted and printed by AMBLIST must have the same format as those created by the program management binder.
3. A program object format 2 or greater having the non-editable attribute cannot be listed by AMBLIST.

See “LISTLOAD OUTPUT=XREF output (comparison of load module and program object version 1)” on page 581 for a comparison of the formatted output of a load module and a program object.

AMBLIST supports all data sets allocated in the extended addressing space (EAS) of an extended address volume (EAV).

AMBLIST supports the following dynamic allocation (DYNALLOC or SVC 99) options for all data sets: S99TIOEX(XTIOT), S99ACUCB (NOCAPTURE), and S99DSABA (DSAB above the line).

Obtaining AMBLIST output

To obtain AMBLIST output, you must code JCL or use the UNIX System Services amblist command. The amblist command is described in the z/OS UNIX System Services Command Reference.

This section describes these topics:

- “Specifying the JCL statements” on page 538
- “Controlling AMBLIST processing” on page 538
- “Examples of running AMBLIST” on page 542
- “Examples for z/OS UNIX System Services file support” on page 547
Specifying the JCL statements

Generally, the minimum partition or region for running AMBLIST is 64 kilobytes for all functions except LISTLPA, which requires 100 kilobytes. However, for large load modules, IBM recommends a minimum region size of 200 kilobytes. For program objects, IBM recommends a minimum region size of 12 megabytes.

AMBLIST requires the following JCL statements:

**JOB**
- Initiates the job.

**EXEC PGM=AMBLIST**
- Calls for the processing of AMBLIST.

**SYSPRINT DD**
- Defines the message data set.

**Anyname DD**
- Defines an input dataset or a z/OS UNIX System Services pathname.

   Use the PATH parameter to specify a z/OS UNIX System Services pathname, and also use the PATHOPTS parameter to be able to access the file for reading. If pathname is a directory name, the filename must be specified on the MEMBER parameter of the AMBLIST control statement. If the pathname ends with the filename, then omit the MEMBER parameter.

**SYSin DD**
- Defines the data set (in the input stream) that contains AMBLIST control statements.

Controlling AMBLIST processing

You control AMBLIST processing by supplying one or more control statements in the input stream. Code the control statement that applies to the data you want to obtain according to the following rules:

- Leave column 1 blank, unless you want to supply an optional symbolic name. A symbolic name is analogous to the label name in a program. The maximum length of a symbolic name is eight characters. A symbolic name must end with one or more blanks.

- If a complete control statement will not fit on a single line, end the first line with a comma or a non-blank character in column 72 and continue on the next line. Begin all continuation statements in columns 2 - 16. Do not split parameters between two lines. The only exceptions are the MEMBER parameters, which you can split at any internal comma.

LISTLOAD control statement

Use the LISTLOAD control statement to obtain a listing of load module or program objects. The listed data can help you verify why certain link-edit errors might have occurred.

```
LISTLOAD
[OUTPUT={MODLIST|XREF|BOTH|MAP}]
[,TITLE=('title',position)]
[,DDN=ddname]
[,MEMBER={member|(member1,membern...)}]
[,RELOC=hhhhhhh]
[,ADATA={YES|NO}]
[,IMPEXP={DUMP|SYMBOLS}]
[,SECTION1={YES|NO}]
```
OUTPUT={MODLIST|XREF|BOTH|MAP}

OUTPUT=MODLIST requests a formatted listing of the text and control information of a load module or program object.

OUTPUT=XREF requests a module map and cross-reference listing for the load module or program object.

OUTPUT=BOTH requests both a formatted listing of the load module or program object and its map and cross-references.

OUTPUT=MAP requests a numerical map for the load module or program object.

If this parameter is omitted, OUTPUT=BOTH will be assumed.

TITLE=('title',position)

Specifies a title, from one to 40 characters long, to be printed below the heading line on each page of output. (The heading line identifies the page number and the type of listing being printed, and is not subject to user control.) The position subparameter specifies whether or not the title is indented; if TITLE=('title',1) is specified, or if the position parameter is omitted, the title will be printed flush left, that is, starting in the first column. If you want the title indented from the margin, use the position parameter to specify the number of characters to leave blank before the title. If you specify a position greater than 80, the indentation from the margin defaults to 1.

DDN=ddname

Identifies the DD statement that defines the data set containing the input object module. If the DDN= parameter is omitted, AMBLIST will assume SYSLIB as the default ddname.

MEMBER={member|(member1,membern...)}

Identifies the input load module or program object by member name or alias name. To specify more than one load module or program object, enclose the list of names in parentheses and separate the names with commas.

Note:

1. If you specify MEMBER=IEANUCxx, where xx is the suffix of the member used during the current IPL, AMBLIST will list the DAT-ON nucleus. If you do not include the MEMBER parameter, AMBLIST will print all modules in the data set.

2. AMBLIST will accept member names up to 63 bytes in length. For aliases longer than 63 bytes, their primary member names must be entered instead.

3. If the DD name associated with this operation is allocated to a z/OS UNIX System Services directory, the pathname must end with a file, or there must also be a MEMBER parameter specifying the file or files in that directory.

RELOC=hhhhhhhh

Specifies a relocation or base address in hexadecimal of up to eight characters. When the relocation address is added to each relative map and cross-reference address, it gives the absolute central storage address for each item on the output listing. If you omit the RELOC parameter, no relocation is performed.

ADATA={YES|NO}

ADATA=YES on LISTLOAD OUTPUT=MODLIST or OUTPUT=BOTH requests a formatted listing of all ADATA classes, if they exist, in the program object to be displayed in the traditional dump format, 32 bytes per line, with hexadecimal representation on the left and EBCDIC on the right, in addition to the output listing with the specified output parameter.

ADATA=NO on LISTLOAD OUTPUT=MODLIST or OUTPUT=BOTH requests a normal formatted listings with the specified output parameter, and ADATA suppressed.

If this parameter is omitted, ADATA=NO will be assumed.

IMPEXP={DUMP|SYMBOLS}

IMPEXP=SYMBOLS indicates that section IEWBCIE text is displayed as a symbolically formatted IMPORT/EXPORT section of the output.
IMEXP=DUMP indicates that section IEWBCIE text is displayed in the traditional dump format (as described under the ADATA parameter).

SECTION1={YES|NO}
SECTION1=YES requests that the module level section information be displayed.
SECTION1=NO requests that the module level section information not be displayed.

LISTOBJ control statement
Use the LISTOBJ control statement to obtain listings of selected object modules. LISTOBJ supports traditional object modules as well as object modules in XOBJ or GOFF format.

```
LISTOBJ
[TITLE=('title',position)]
[,DDN=ddname]
[,MEMBER={member|(member1,membern...)}]
```

**TITLE=('title',position)**
Specifies a title, from one to 40 characters long, to be printed below the heading line on each page of output. (The heading line identifies the page number and the type of listing being printed, and is not subject to user control.) The position parameter specifies whether or not the title is indented; if TITLE=('title',1) is specified, or if the position parameter is omitted, the title will be printed flush left, that is, starting in the first column. If you want the title indented from the margin, use the position parameter to specify the number of characters to leave blank before the title. If you specify a position greater than 80, the indentation from the margin defaults to 1.

**DDN=ddname**
Identifies the DD statement that defines the data set containing the input module. If the DDN parameter is omitted, AMBLIST will assume SYSLIB as the default ddname.

**MEMBER={member|(member1,membern...)}**
Identifies the input object module by member name or alias name. To specify more than one object module, enclose the list of names in parentheses and separate the names with commas.

**Note:**
1. You must include the MEMBER parameter if the input object modules exist as members in a partitioned data set (PDS or PDSE). If you do not include the MEMBER parameter, AMBLIST will assume that the input data set is organized sequentially and that it contains a single, continuous object module.
2. AMBLIST will accept member names up to 63 bytes in length. For aliases longer than 63 bytes, their primary member names must be entered instead.
3. If the DD name associated with this operation is allocated to a z/OS UNIX System Services directory, the pathname must end with a file, or there must also be a MEMBER parameter specifying the file or files in that directory.

**Example: Processing a pathname:** In this example, AMBLIST processes the pathname `/path/to/dir/longmembername`.

```
//SYSLIB DD PATH='/path/to/dir'
//SYSIN DD *
LISTOBJ MEMBER=longmembername
/*
LISTIDR control statement

Use the LISTIDR control statement to obtain listings of selected CSECT identification records (IDR).

```plaintext
LISTIDR
[OUTPUT={IDENT,ALL}]
[,TITLE=('title',position)]
[,DDN=ddname]
[,MEMBER={member|(member1,membern...)}
[,MODLIB]
```

### OUTPUT={IDENT,ALL}
Specifies whether AMBLIST must print all CSECT identification records or only those containing SPZAP data and user data. If you specify OUTPUT=ALL, all IDRs associated with the module will be printed. If you specify OUTPUT=IDENT, AMBLIST will print only those IDRs that contain SPZAP data or user-supplied data. If you omit this parameter, AMBLIST will assume a default of OUTPUT=ALL. Do not specify OUTPUT if you specify the MODLIB parameter.

### TITLE=('title',position)
Specifies a title, from one to 40 characters long, to be printed below the heading line on each page of output. (The heading line identifies the page number and the type of listing being printed, and is not subject to user control.) The position parameter specifies whether or not the title is indented; if TITLE=('title',1) is specified, or if the position parameter is omitted, the title is printed flush left, that is, starting in the first column. If you want the title indented from the margin, use the position parameter to specify the number of characters that are left blank before the title. If a position greater than 80 is specified, the indentation from the margin defaults to 1.

### DDN=ddname
Identifies the DD statement that defines the data set containing the input module. If you omit the DDN parameter, AMBLIST will assume SYSLIB as the default ddname.

**Note**: If the DD name associated with this operation is allocated to a z/OS UNIX System Services directory, there must also be a MEMBER parameter specifying the file or files in that directory.

### MEMBER={member|(member1,membern...)}
Identifies the input load module or program object by member name or alias name. To specify more than one load module or program object, enclose the list of names in parentheses and separate the names with commas.

**Note**:

1. Do not specify MEMBER if you specify the MODLIB parameter. If you do not include the MEMBER parameter, AMBLIST will print all modules in the data set.
2. AMBLIST will accept member names up to 63 bytes in length. For aliases longer than 63 bytes, their primary member names must be entered instead.
3. If the DD name associated with this operation is allocated to a z/OS UNIX System Services directory, the pathname must end with a file, or there must also be a MEMBER parameter specifying the file or files in that directory.

### MODLIB
Prevents AMBLIST from printing the module summary. AMBLIST prints the IDRs that contain SPZAP data or user-supplied data. No page ejects occur between modules. When you specify MODLIB, the OUTPUT or MEMBER parameters are not valid parameters.
LISTLPA control statement

Use the LISTLPA control statement to obtain listings of selected modules in the fixed link pack area (LPA).

```
LISTLPA [FLPA[,MLPA[,PLPA]]
```

LISTLPA

Lists the modules in the fixed link pack area, the modified link pack area, and the pageable link pack area (PLPA). This listing is a map that includes modules residing in the extended sections of each link pack area (LPA). If you do not specify any parameters on the LISTLPA control statement, then AMBLIST maps modules from all three LPAs.

The LISTLPA control statement does not support dynamic LPA. If the dynamic LPA support is used to update LPA, those changes will not be reflected in the AMBLIST LISTLPA output. The LISTLPA control statement will not be enhanced to support new operating system functions. The recommended replacement is the LPAMAP subcommand of IPCS. See z/OS MVS IPCS Commands for details about this command.

**FLPA**
- Requests mapping of the modules in the fixed link pack area.

**MLPA**
- Requests mapping of the modules in the modified link pack area.

**PLPA**
- Requests mapping of the modules in the pageable link pack area.

**Examples of running AMBLIST**

Using the control statements as input into the JCL for the job, you can invoke AMBLIST to provide output. The following examples of AMBLIST include the control statement needed to produce the output and sample JCL for each function.

**List the contents of an object module**

You can use AMBLIST to format three types of object module:

1. OBJ (traditional object module)
2. XOBJ (extended object module, based on OBJ)
3. GOFF (Generalized Object File Format).

You can list the following information from an object module:

- the head record (HDR) - which may contain information about the character set and expected operating environment (GOFF only)
- external symbol dictionary entries (ESD or XSD)
- relocation dictionary entries (RLD)
- the text of the program - the instructions and data, as output by the language translator (TXT)
- translator identification record (IDRL) - which contains the compiler ID and compile date
- ADATA records (GOFF only)
- LEN records (GOFF only)
- and the END record.

To list object module contents, invoke AMBLIST with the LISTOBJ control statement. For sample outputs, see “LISTOBJ outputs” on page 552.
In Figure 176 on page 543, AMBLIST is used to format and list an object module included in the input stream.

```
//LSTOBJDK JOB      MSGLEVEL=(1,1)
//             EXEC     PGM=AMBLIST,REGION=64K
//SYSPRINT    DD       SYSOUT=A
//OBJMOD      DD       *
object module
/*
//SYSIN       DD       *
LISTOBJ DDN=OBJMOD,
            TITLE=('OBJECT MODULE LISTING FOR MYJOB',25)
/*
```

**Figure 176. Example: Listing an object module**

**OBJMOD DD Statement**
Defines the input data set, which follows immediately. In this case, the input data set is an object module.

**SYSIN DD Statement**
Defines the data set containing AMBLIST control statements, which follows immediately.

**LISTOBJ Control Statement**
Instructs AMBLIST to format the data set defined by the OBJMOD DD statement. It also specifies a title for each page of output, to be indented 25 characters from the left margin.

In Figure 177 on page 543, AMBLIST is used to list all object modules contained in the data set named OBJMOD, and three specific object modules from another data set called OBJMODS.

**Note:** If you are using AMBLIST to list program objects, IBM recommends that you specify REGION=12M or higher.

```
//OBJLIST    JOB    MSGLEVEL=(1,1)
//LISTSTEP   EXEC   PGM=AMBLIST,REGION=64K
//SYSPRINT   DD     SYSOUT=A
//OBJLIB     DD     DSN=OBJMODS,DISP=SHR
//OBJSDS     DD     DSN=OBJMOD,DISP=SHR
//SYSIN       DD     *
LISTOBJ DDN=OBJSDS,
            TITLE=('OBJECT MODULE LISTING OF OBJSDS',20)
LISTOBJ DDN=OBJLIB,MEMBER=(OBJ1,OBJ2,OBJ3),
            TITLE=('OBJECT MODULE LISTING OF OBJ1 OBJ2 OBJ3',20)
/*
```

**Figure 177. Example: Listing several object modules**

**OBJLIB and OBJSDS DD Statements**
Define input data sets that contain object modules.

**SYSIN DD Statement**
Defines the data set in the input stream containing AMBLIST control statements.

**LISTOBJ Control Statement #1**
Instructs AMBLIST to format the data set defined by the OBJSDS DD statement, treating it as a single member. It also specifies a title for each page of output, to be indented 20 characters from the left margin.

**LISTOBJ Control Statement #2**
Instructs AMBLIST to format three members of the partitioned data set (PDS or PDSE) defined by the OBJLIB DD statement. It also specifies a title for each page of output, to be indented 20 characters from the left margin.
Map the CSECTs in a load module or program object

You can list the organization of CSECTs within the load module or program object, the overlay structure (if any), and the cross-references for each CSECT. To map CSECTs, invoke AMBLIST with the LISTLOAD control statement.

For sample output, see “LISTLOAD OUTPUT=MODLIST output” on page 561, “Alphabetical cross-reference” on page 580, and “LISTLOAD OUTPUT=XREF output (comparison of load module and program object version 1)” on page 581.

In Figure 178 on page 544, AMBLIST is used to produce formatted listings of several load modules or program objects.

Note: If you are using AMBLIST to format program objects, IBM recommends that you specify REGION=2M or higher.

```plaintext
//LOADLIST JOB MSGLEVEL=(1,1)
//LISTSTEP EXEC PGM=AMBLIST,REGION=64K
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.LINKLIB,DISP=SHR
//LOADLIB DD DSNAME=LOADMOD,DISP=SHR
//SYSIN DD *
LISTLOAD OUTPUT=MODLIST,DDN=LOADLIB,
MEMBER=TESTMOD,
TITLE=('LOAD MODULE LISTING OF TESTMOD',20)
LISTLOAD OUTPUT=XREF,DDN=LOADLIB,
MEMBER=(MOD1,MOD2,MOD3),
TITLE=('XREF LISTINGS OF MOD1 MOD2 AND MOD3',20)
LISTLOAD TITLE=('XREF&LD MOD LSTNG-ALL MOD IN LINKLIB',20)
/*
Figure 178. Example: Listing several load modules or program objects

SYSLIB DD Statement
Defines an input data set, SYS1.LINKLIB, that contains load modules or program objects to be formatted.

LOADLIB DD Statement
Defines a second input data set.

SYSIN DD Statement
Defines the data set (in the input stream) containing the AMBLIST control statements.

LISTLOAD Control Statement #1
Instructs AMBLIST to format the control and text records including the external symbol dictionary and relocation dictionary records of the load module or program object TESTMOD in the data set defined by the LOADLIB DD statement. It also specifies a title for each page of output, to be indented 20 characters from the left margin.

LISTLOAD Control Statement #2
Instructs AMBLIST to produce a module map and cross-reference listing of the load modules or program objects MOD1, MOD2, and MOD3 in the data set defined by the LOADLIB DD statement. It also specifies a title for each page of output, to be indented 20 characters from the left margin.

LISTLOAD Control Statement #3
Instructs AMBLIST to produce a formatted listing of the load module or program object and its map and cross-reference listing. Because no DDN parameter is included, the input data set is assumed to be the one defined by the SYSLIB DD statement. Because no MEMBER parameter is specified, all load modules in the data set will be processed. This control statement also specifies a title for each page of output, to be indented 20 characters from the left margin.
```
Figure 179 on page 545 shows how to use AMBLIST to verify three modules. Assume that an unsuccessful attempt has been made to link-edit an object module with two load modules or program objects to produce one large load module or program object.

```
//LSTLD0BJ JOB MSGLEVEL=(1,1)
//                 EXEC PGM=AMBLIST,REGION=64K
//SYSPRINT      DD      SYSOUT=A
//OBJMOD      DD      DSN=MYMOD,DISP=SHR
//LOADMOD1      DD      DSN=YOURMOD,DISP=SHR
//LOADMOD2      DD      DSN=HISMOD,DISP=SHR
//SYSIN         DD      *
LISTOBJ         DDN=OBJMOD,
                TITLE=('OBJECT LISTING FOR MYMOD',20)
LISTLOAD        DDN=LOADMOD1,OUTPUT=BOTH,
                TITLE=('LISTING FOR YOURMOD',25)
LISTIDR        DDN=LOADMOD1,OUTPUT=ALL,
               TITLE=('IDRS FOR YOURMOD',25)
LISTLOAD        DDN=LOADMOD2,OUTPUT=BOTH,
               TITLE=('LISTING FOR HISMOD',25)
LISTIDR        DDN=LOADMOD2,OUTPUT=ALL,
               TITLE=('IDRS FOR HISMOD',25)
```

Figure 179. Example: Listing several load modules or program objects

**OBJMOD DD Statement**
Defines an input load module or program object data set.

**LOADMOD1 and LOADMOD2 DD Statements**
Define input load module or program object data sets.

**SYSIN DD Statement**
Defines the data set containing AMBLIST control statements.

**LISTOBJ Control Statement**
Instructs AMBLIST to format the data set defined by the OBJMOD DD statement. It also specifies a title for each page of output, to be indented 20 characters from the left margin.

**LISTLOAD Control Statement #1**
Instructs AMBLIST to format all records associated with the data set defined by the LOADMOD1 DD statement. It also specifies a title for each page of output, to be indented 25 characters from the left margin.

**LISTIDR Control Statement #1**
Instructs AMBLIST to list all CSECT identification records associated with the data set defined by the LOADMOD1 DD statement. It also specifies a title for each page of output, to be indented 25 characters from the left margin.

**LISTLOAD Control Statement #2**
Instructs AMBLIST to format all records associated with the data set defined by the LOADMOD2 DD statement. It also specifies a title for each page of output, to be indented 25 characters from the left margin.

**LISTIDR Control Statement #2**
Instructs AMBLIST to list all CSECT identification records associated with the data set defined by the LOADMOD2 DD statement. It also specifies a title for each page of output to be indented 25 characters from the left margin.

**Trace modifications to the executable code in a CSECT**
You can list the information in a load module or program object's CSECT identification records (IDRs). An IDR provides the following information:

- The version and modification level of the language translator and the date that each CSECT was translated. (Translation data is available only for CSECTs that were produced by a translator that supports IDR generation.)
• The version and modification level of the linkage editor or binder that built the load module or program object and gives the date the load module or program object was created.
• Modifications to the load module or program object, by date, that might have been done using SPZAP.

An IDR might also contain optional user-supplied data.

To trace modifications, invoke AMBLIST with the LISTIDR control statement. For sample output, see “LISTIDR output” on page 587.

In Figure 180 on page 546, AMBLIST is used to list the CSECT identification records in several load modules or program objects.

//IDRLIST JOB MSGLEVEL=(1,1)
//LISTSTEP EXEC PGM=AMBLIST,REGION=64K
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSN=SYS1.LINKLIB,DISP=SHR
//LOADLIB DD DSN=LOADMODS,DISP=SHR
//SYSIN DD *
LISTIDR TITLE=('IDR LISTINGS OF ALL MODS IN LINKLIB',20)
LISTIDR OUTPUT=IDENT,DDN=LOADLIB,MEMBER=TESTMOD
LISTIDR TITLE=('LISTING OF MODIFICATIONS TO TESTMOD',20)
LISTIDR OUTPUT=ALL,DDN=LOADLIB,MEMBER=(MOD1,MOD2,MOD3),
LISTIDR TITLE=('IDR LISTINGS OF MOD1 MOD2 MOD3',20)
LISTIDR DDN=LOADLIB,MODLIB
/*

Figure 180. Example: Listing IDR information for several load modules

**SYSLIB DD Statement**
 Defines an input data set, SYS1.LINKLIB, that contains load modules or program objects to be processed.

**LOADLIB DD Statement**
 Defines a second input data set.

**SYSSIN DD Statement**
 Defines the data set (in the input stream) containing the AMBLIST control statements.

**LISTIDR Control Statement #1**
 Instructs AMBLIST to list all CSECT identification records for all modules in SYS1.LINKLIB (this is the default data set since no DDN parameter was included). It also specifies a title for each page of output, to be indented 20 characters from the left margin.

**LISTIDR control statement #2**
 Instructs AMBLIST to list CSECT identification records that contain SPZAP or user-supplied data for the load module or program object named TESTMOD. TESTMOD is a member of the data set defined by the LOADLIB DD statement. This control statement also specifies a title for each page of output, to be indented 20 characters from the left margin.

**LISTIDR control statement #3**
 Instructs AMBLIST to list all CSECT identification records for of the load modules or program objects MOD1, MOD2, and MOD3. These are members in the data set defined by the LOADLIB DD statement. This control statement also specifies a title for each page of output, to be indented 20 characters from the left margin.

**LISTIDR control statement #4**
 Instructs AMBLIST to list CSECT identification records that contain SPZAP or user-supplied data for the LOADLIB data set. The module summary print out is suppressed.

**List the modules in the link pack area and the contents of the DAT-on nucleus**

You can list all modules in the fixed link pack area, the modified link pack area, and the pageable link pack area.

To map link pack area modules, invoke AMBLIST with the LISTLPA control statement. For sample output, see “LISTLPA output” on page 590.
You can also produce a map and cross-reference listing of a nucleus.

To map the contents of the DAT-on nucleus, invoke AMBLIST with the LISTLOAD MEMBER=IEANUCxx control statement.

Figure 181 on page 547 shows how to use the LISTLOAD and LISTLPA control statements to list a system nucleus and map the fixed link pack area, the modified link pack area, and the pageable link pack area. Note that in this example the data set containing the nucleus is named SYS1.NUCLEUS, and the nucleus occupies the member named IEANUC01. The map no longer represents the IPL version of the nucleus and message AMB129I will be issued. Use IPCS to format the NUCMAP. For information on using IPCS, see z/OS MVS IPCS User’s Guide and z/OS MVS IPCS Commands.

```plaintext
//LISTNUC  JOB     MSGLEVEL=(1,1)
//STEP      EXEC    PGM=AMBLIST,REGION=100K
//SYSPRINT   DD      SYSOUT=A
//SYSLIB     DD      DSN=SYS1.NUCLEUS,DISP=SHR,UNIT=3330,
//                VOL=SER=nnnnn
//SYSIN      DD      *
LISTLOAD     DDN=SYSLIB,MEMBER=IEANUC01,
            TITLE=('LISTING FOR NUCLEUS IEANUC01',25)
LISTLPA
```

Figure 181. Example: Listing a system nucleus and the link pack area

**SYSLIB DD Statement**
Defines the input data set, which in this case contains the nucleus.

**SYSIN DD Statement**
Defines the data set containing AMBLIST control statements, which follows immediately.

**LISTLOAD control statement**
Instructs AMBLIST to format the control and text records including the external symbol dictionary and relocation dictionary records of the load module IEANUC01 in the data set defined by the SYSLIB DD statement. It also specifies a title for each page of output, to be indented 25 characters from the left margin.

**LISTLPA control statement**
Instructs AMBLIST to map the fixed link pack area (FLPA), the modified link pack area (MLPA), and the pageable link pack area (PLPA).

**Examples for z/OS UNIX System Services file support**
AMBLIST will support formatted listings of program objects and object modules in z/OS UNIX System Services files.

To obtain a formatted listing of a program object in a z/OS UNIX System Services file, specify the complete pathname in a DD statement and code the control statement. Use the JCL example shown in Figure 182 on page 547 as a guide.

```plaintext
//LIST EXEC PGM=AMBLIST
//HFS1 DD PATH='/u/USER1/outmod'
//                     PATHDISP=(KEEP,KEEP)
//SYSPRINT DD SYSOUT=*  
//SYSLIB DD *
LISTLOAD DDN=HFS1,OUTPUT=MODLIST
```

Figure 182. Example: z/OS UNIX System Services program object
To obtain a formatted listing of an object module in a z/OS UNIX System Services file, specify the complete pathname in a DD statement and code the control statement. Use the JCL example shown in Figure 183 on page 548 as a guide.

```
/LIST EXEC PGM=AMBLIST
//HFS1 DD PATH='/u/USER1/myobject.o',PATHDISP=(KEEP,KEEP),
//            PATHOPTS=(ORDONLY)
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
LISTOBJ DDN=HFS1
```

*Figure 183. Example: z/OS UNIX System Services object module*

AMBLIST will support the LISTIDR control statement for program objects in z/OS UNIX System Services files. Use the JCL example shown in Figure 184 on page 548 as a guide.

```
//LIST EXEC PGM=AMBLIST
//HFS1 DD PATH='/u/USER1/outmod'
//            PATHDISP=(KEEP,KEEP)
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
LISTIDR DDN=HFS1
```

*Figure 184. Example: z/OS UNIX System Services control statement*

For z/OS UNIX System Services files, MEMBER NAME is the file name and LIBRARY is the directory name. If the pathname is too long to fit in the space reserved on the line, it will be truncated on the left and preceded by two periods and a space (".. "). In Figure 185 on page 548, the library name is truncated while the member name is not.

```
MEMBER NAME:  01234567890123456789012345678901234567890123456789abc   MAIN ENTRY POINT:  00000000
LIBRARY:      .. 345678901234567890123456789012345678901234567890123456789abc/  AMODE OF MAIN ENTRY POINT: 31
```

*Figure 185. Example: Differences in output*

**Reading AMBLIST output**

AMBLIST produces a separate listing for each control statement that you specify.

- The first page of each listing always shows the control statement as it was entered.
- The second page of the listing is a module summary, unless you requested LISTOBJ, LISTLPA, or MODLIB with LISTIDR; in that case, no module summary will be produced, and the second page of the listing will be the beginning of the formatted output.

The module summary gives the member name (with aliases), the entry point and its addressing mode, alias entry points and their addressing modes, the attributes assigned to the module by the linkage editor or program management binder, the system status index information (SSI), the APF code, an residence mode for the module being formatted. For program objects, the PMAR and PMARL are displayed in hexadecimal for diagnostic information. Figure 186 on page 549 and Figure 187 on page 549 show samples of module summary processed by the linkage editor and the binder.

- The third page of the listing (or, for LISTOBJ, LISTLPA, or MODLIB with LISTIDR the second page) is the beginning of the formatted output itself.

**Module summary**

Figure 186 on page 549 is sample of a module summary for a load module that was processed by the linkage editor.
Figure 186. Example: Module summary for a load module processed by the linkage editor

Figure 187 on page 549 is sample of a module summary for a program object processed by the binder.

The following describes Figure 186 on page 549 and Figure 187 on page 549.

Entry Names. For the member, the library (ddname) and member name are displayed, along with the primary entry point offset and AMODE. The MEMBER NAME field contains the primary name.
For each alias or alternate entry point, AMBLIST shows the alias name, entry point offset and AMODE. If no aliases are present, AMBLIST prints NO ALIASES. If the input name is an alias, then its name is printed in the alias section preceded by two asterisks.

The constants ALT PRIMARY will be added to the right of the amode of the alias name which was a long primary name in which the binder had converted to an alias.

Attributes of the Module. The attributes of the module are represented by bits. Each bit is set either ON or OFF. In the listing, AMBLIST interprets the bit settings and shows a descriptive value in the STATUS column. For example, in Figure 186 on page 549 and Figure 187 on page 549, bit 0 is interpreted as NOT-RENT. This means the module is not reentrant. For a description of all the STATUS values, see Table 70 on page 550.

Other Attributes. The remaining module attributes are displayed following the table. This includes the system status index (SSI) field, the APF (authorized program facility) code, the RMODE (residence mode) for the entire module, the PO format (loader data level), the OS compat level (binder data format), and XPLINK. If attribute bit 19 is the OFF state, NONE will be displayed in place of SSI. SSI is usually set through the SETSSI control statement in the binder or SPZAP programs.

Note: For an OS Compat Level less than z/OS V1R3, no Compat level will be printed.

PO format and XPLINK are applicable only for program objects. PO format is the version of the program object. XPLINK indicates whether any routines use XPLINK linkage conventions. Compat level designates the lowest OS release at which the release’s binder could rebind this object. Note that the level at which the module can be executed is determined by the PO format.

Linking Program. The last line in the module summary identifies the linking program (VS linkage editor or binder) that created the module. For example:

*****PROGRAM OBJECT PROCESSED BY BINDER

This is applicable to a program object.

****LOAD MODULE PROCESSED EITHER BY VS LINKAGE EDITOR OR BINDER

The load module is either created by the linkage editor and processed by the binder, or created by the binder and processed by the linkage editor.

PMAR and PMARL. For program objects, the PMAR and PMARL are displayed in hexadecimal for diagnostic purposes, preceded by:

*** THE FOLLOWING ARE THE UNFORMATTED PDSE DIRECTORY ENTRY SECTIONS (PMAR AND PMARL)

Table 70 on page 550 summarizes the attributes of program objects and load modules. The first column shows the bit position. Columns 2 and 3 show the displayed constant and its meaning for the OFF condition. Columns 4 and 5 show the displayed constant and meaning for the ON condition.

<table>
<thead>
<tr>
<th>Bit Position</th>
<th>OFF Value</th>
<th>Meaning</th>
<th>ON Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>NOT-RENT</td>
<td>Module is not reentrant.</td>
<td>RENT</td>
<td>Module is reentrant.</td>
</tr>
<tr>
<td>01</td>
<td>NOT-REUS</td>
<td>Module is not reusable.</td>
<td>REUS</td>
<td>Module is reusable.</td>
</tr>
<tr>
<td>02</td>
<td>NOT-OVLY</td>
<td>Module is not in overlay format.</td>
<td>OVLY</td>
<td>Module is in overlay format.</td>
</tr>
<tr>
<td>Bit Position</td>
<td>OFF Value</td>
<td>Meaning</td>
<td>ON Value</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>----------------------------------------------</td>
<td>----------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>03</td>
<td>NOT-TEST</td>
<td>Test option was not specified during binding.</td>
<td>TEST</td>
<td>Test option was specified during binding.</td>
</tr>
<tr>
<td>04</td>
<td>NOT-OL</td>
<td>Program can be invoked through all CSV macros.</td>
<td>ONLY-LOAD</td>
<td>Program can be loaded only through LOAD macro.</td>
</tr>
<tr>
<td>05</td>
<td>BLOCK</td>
<td>Module consists of a single, contiguous block of text. This bit is always off for program objects.</td>
<td>SCTR</td>
<td>Module can be scatter loaded (MVS nucleus only).</td>
</tr>
<tr>
<td>06</td>
<td>NON-EXEC</td>
<td>Module is marked not executable.</td>
<td>EXEC</td>
<td>Module is marked executable.</td>
</tr>
<tr>
<td>07</td>
<td>MULTI-RCD</td>
<td>Module contains multiple text records. This bit is always off for program objects.</td>
<td>1-TXT</td>
<td>Module contains no RLD items and only one block of text.</td>
</tr>
<tr>
<td>08</td>
<td>DC</td>
<td>Module is processable by all levels of linkage editor.</td>
<td>NOT-DC</td>
<td>Module is processable only by F-level linkage editor and above. This bit is always on for program objects.</td>
</tr>
<tr>
<td>09</td>
<td>NOT-ZERO</td>
<td>Origin of first text block greater than zero.</td>
<td>ZERO-ORG</td>
<td>Origin of first text block is zero. This bit is always on for program objects.</td>
</tr>
<tr>
<td>10</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>11</td>
<td>RLD</td>
<td>Module contains RLD items.</td>
<td>NO-RLD</td>
<td>Module contains no RLD items.</td>
</tr>
<tr>
<td>12</td>
<td>EDIT</td>
<td>Module can be reprocessed by binder.</td>
<td>NOT-EDIT</td>
<td>Module cannot be reprocessed by binder.</td>
</tr>
<tr>
<td>13</td>
<td>NO-SYMS</td>
<td>Module contains no SYM records.</td>
<td>SYMS</td>
<td>Module contains SYM records.</td>
</tr>
<tr>
<td>14</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>15</td>
<td>NOT-REFR</td>
<td>Module is not refreshable.</td>
<td>REFRI</td>
<td>Module is refreshable.</td>
</tr>
<tr>
<td>16</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
</tbody>
</table>

**Note:** The following bits are shown only for program objects.

<table>
<thead>
<tr>
<th>Bit Position</th>
<th>OFF Value</th>
<th>Meaning</th>
<th>ON Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>&lt;16M</td>
<td>Module text size is less than 16 megabytes.</td>
<td>&gt;16M</td>
<td>Module text size is greater than or equal to 16 megabytes.</td>
</tr>
<tr>
<td>18</td>
<td>NOT-PL</td>
<td>Page alignment is not required for loaded text.</td>
<td>P-ALIGN</td>
<td>Page alignment is required for loaded text.</td>
</tr>
<tr>
<td>19</td>
<td>NO-SSI</td>
<td>System status index is not present.</td>
<td>SSI</td>
<td>System status index is present.</td>
</tr>
<tr>
<td>20</td>
<td>NOT-APF</td>
<td>There is not an APF section in the directory. (APFCODE is not present.)</td>
<td>APF</td>
<td>There is an APF section in the directory. (APFCODE is present.)</td>
</tr>
<tr>
<td>21</td>
<td>NOT-PO</td>
<td>This is a load module.</td>
<td>PGM OBJ</td>
<td>This is a program object. Always on for program object.</td>
</tr>
<tr>
<td>22</td>
<td>NOT-SIGN</td>
<td>Module is not digitally signed.</td>
<td>SIGN</td>
<td>Module is digitally signed.</td>
</tr>
<tr>
<td>23</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>24</td>
<td>ALTP</td>
<td>Alternate primary name.</td>
<td>NOT-ALTP</td>
<td>Not an alternate primary name.</td>
</tr>
<tr>
<td>25</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>26</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>27</td>
<td>RMODE24</td>
<td>Module must be loaded below 16 megabytes.</td>
<td>RMODEANY</td>
<td>Module can be loaded anywhere below 2 gigabytes.</td>
</tr>
<tr>
<td>28</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>Bit Position</td>
<td>OFF Value</td>
<td>Meaning</td>
<td>ON Value</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
<td>------------------------------</td>
<td>----------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>29</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>30</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>31</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>32</td>
<td>NON-MIGR</td>
<td>Program object cannot be converted directly to PDS load module format.</td>
<td>MIGRATE</td>
<td>Program object can be converted to PDS load module format.</td>
</tr>
<tr>
<td>33</td>
<td>PRIME</td>
<td>FETCOPT PRIME option.</td>
<td>NO-PRIME</td>
<td>FETCOPT NOPRIME option.</td>
</tr>
<tr>
<td>34</td>
<td>PACK</td>
<td>FETCOPT PACK option.</td>
<td>NO-PACK</td>
<td>FETCOPT NOPACK option.</td>
</tr>
<tr>
<td>35</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>36</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>37</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>38</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>39</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
<td>RESERVED</td>
<td>Reserved for IBM use.</td>
</tr>
</tbody>
</table>

**LISTOBJ outputs**

Figure 188 on page 552 shows sample output for LISTOBJ with an object module.

![LISTOBJ Output Example](image)

The record formats for OBJ and XOBJ records are identical except that XOBJ modules contain XSD records rather than ESD records. Except for XSD records, AMBLIST formats the records in the object.
module one record at a time. XSD records support names up to 32767 characters. These names may be
continued onto multiple records, but such a continued record will appear as a single XSD record in the
AMBLIST output. If the name is longer than 16 characters, a 16–character abbreviated name is printed
with the XSD record. An abbreviation table which maps abbreviated names to be true names is printed at
the end of the listing.

See the description of ESD data items in z/OS MVS Program Management: Advanced Facilities for a
description of the format of OBJ and XOBJ record formats.

Figure 189 on page 553 shows sample output for LISTOBJ with an XSD record.

Figure 189. Example: LISTOBJ output with XSD Record

Figure 190 on page 554 shows sample output for LISTOBJ with a GOFF records.
Description of LISTOBJ output for GOFF

The GOFF object listing is similar in function and content to the LISTOBJ format for traditional object modules. The output is formatted one logical record at a time. A logical record represents the concatenation of the first physical record (which contains the record type) and all continuation records. If a name in a record is longer than 16 characters, a 16-character abbreviated name is printed. The true name can be found from the abbreviated name to long name table, which is printed at the end of the listing. The start of a logical record is highlighted by a dingbat (“>”) in the first position.

A record group consists of one or more records of the same type and is preceded by a two- or three-line record header. The first line of each record header consists of the record type and the sequence number of the first record in the group. Following a page break, the record group header will be repeated, even though the record type may not have changed.

Although the GOFF format currently defines only six record types, the TXT record type is subdivided into three different text types:

- TEXT, containing the instructions and data of the program
- IDRL, containing IDR information from the compiler or assembler
- ADATA, containing additional data associated with the object module

Altogether there are eight different display formats.

Report Description: The keyed sections of this description correspond to the equivalent keys highlighting the page header and the eight record formats in “Example: LISTOBJ format for GOFF” on page 555. Note that some of the flags and lengths in the GOFF format are of a structural nature and do not represent the
Example: LISTOBJ format for GOFF

```plaintext
1 LISTOBJ MEMBER=HELLOW,TITLE=('MY PROGRAM IN GOFF FORMAT')
1                       ***** G E N E R A L I Z E D  O B J E C T  F I L E  F O R M A T
*****               PAGE        1
MY PROGRAM IN GOFF FORMAT
OBJECT MODULE LISTING                             MEMBER= HELLOW
0RECORD TYPE: HDR      SEQUENCE:        1
0           --- CHARACTER SET --    LANGUAGE          HDR       MODULE
ID         NAME          PRODUCT          VERSION    PROPERTIES
0>        00000                                        00000
0RECORD TYPE: ESD      SEQUENCE:        2
ESD   OWNER/    ITEM      ITEM    NAME   --------------------------- ATTRIBUTES
---------------------------
ESDID  TYPE  PARENT   OFFSET   LEN/ADA   SP/S   BA  AMD  RMD  REUS  AL  TXT  ORD  STR  BINDER_FLAGS
LNK SIGNATURE
0>000001  SD   000000     N/A       N/A    N/A    N/A N/S  N/A  RENT  N/A N/A N/A N/A N/A N/A           N/
A   N/A
NAME( )
0>000002  ED   000001         0        28  01-N/A C   ANY  31    N/A  03  B-D  N/A N/A L,A  N/
A   N/A
NAME(C_EXTNATTR)
0>000003  ED   000001         0        B8  01-N/A C   ANY  31    N/A  03  B-I  N/A N/A L,R,A  N/
A   N/A
NAME(C_CODE)
0>000004  LD   000003         0    000006  01-L   N/A ANY  N/A   N/A  N/A N-I  N/A   S   N
X   00000000
NAME( )
0>000005  ED   000001         0        03-N/A M   ANY  31    N/A  03  B-D  N/A N/A L,A,D  N/
A   N/A
NAME(C_WSA)
0>000006  PR   000001     N/A       N/A    01-L   N   N/S  N/A   N/A  N/A N-D  N/A   S   N/S
S   00000000
NAME(CEESG003)
0>000007  ED   000010     N/A       N/A    01-L   N   N/S  N/A   N/A  N/A N-D  N/A   S   N/S
NAME(CEESTART)
0>000013  ER   000010     N/A       N/A    01-L   N   N/S  N/A   N/A  N/A N-D  N/A   W   N/S
NAME(main)
0>000008  ER   000001     N/A       N/A    01-L   N   N/S  N/A   N/A  N/A N-D  N/A   S   N/S
NAME(CBCSG003)
0>000010  SD   000010     N/A       N/A    01-L   N   N/S  N/A   N/A  N/A N-D  N/A   S   N/S
NAME(CEESTART)
0>000011  ED   000010     N/A       N/A    01-L   N   N/S  N/A   N/A  N/A N-D  N/A   S   N/S
NAME(CEESTART)
```

***** MY PROGRAM IN GOFF FORMAT *****

NAME(CEEBETBL)
000016 ER 000010 N/A N/A 01-L N/S N/A N/A N/A N-D N/A S N/S

NAME(CEEBLST)
000017 ER 000010 N/A N/A 01-L N/S N/A N/A N/A N-I N/A S N/S

NAME(CEEROOTD)
000018 ER 000010 N/A N/A 01-L N/S N/A N/A N/A N-I N/A S N/S

NAME(CEESTART)
000019 ED 000001 0 0 03-N/A M ANY 31 N/A 03 B-D N/A N/A L,A N/

NAME(_C_@@PPA2)
000020 PR 000019 000000 000008 03-L N/A S N/A 00 U-D N/A S N

SORT KEY: 00000000 (HEX)

NAME( )
000021 ER 000001 N/A N/A 01-X N/S N/A N/A N/A N-I N/A S G,N

EXTENDED ATTRIBUTES: ESDID = 000002, OFFSET= 14

NAME(__ls__7os-amFPCc)
000022 ED 000001 0 0 03-N/A M ANY 31 N/A 03 B-D N/A N/A L,A,D N/

NAME(C_WSA)
000023 PR 000022 000000 000000 03-X N/A N/A 00 U-D N/A S N

SORT KEY: 00000000 (HEX)

NAME(cout)
000024 SD 000000 N/A N/A N/A N/A N/A N/A N/S N/A N/A N/A N/A N/A N/

NAME(CEEMAIN)
000025 ED 000001 0 10 01-N/A C ANY 31 N/A 03 B-D N/A N/A L,A N/

NAME(C_DATA)
000026 LD 000000 N/A 000000 01-L N/A ANY N/A N/A N/A N-D N/A S N/S

NAME(CEEMAIN)
000027 ER 000000 N/A N/A N/S N/A N/A N/A N/I N/A S N/S

NAME(EDCINPL)
000028 ER 000000 N/A N/A N/L N/S N/A N/A N/I N/A S N

NAME(main)
000029 ED 000001 0 1B0 01-N/A C ANY 31 N/A 03 B-D N/A N/A A N/

NAME(C_COPTIONS)
000030 ED 000001 0 22 01-N/A C ANY 31 N/A 03 F-U N/A N/A N/

NAME(B_IDRL)

RECORD TYPE: TEXT
SEQUENCE: 32
-- RESIDENT -- TRUE TEXT ENCODED
ESDID OFFSET LENGTH ENCODING LENGTH
--------------------------------- TEXT
0>000002 0000000 0000000 0000 00000028 0000014 00010001 00010010 00040000 01000000 00000014
<table>
<thead>
<tr>
<th>RECORD TYPE: IDRL</th>
<th>SEQUENCE: 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ESDID</td>
<td></td>
</tr>
<tr>
<td>---------- IDR DATA ----------</td>
<td></td>
</tr>
<tr>
<td>0&gt;00030</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RECORD TYPE: RLD</th>
<th>SEQUENCE: 41</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-PTR P-PTR OFFSET TYPE LEN ATTRIB R-PTR P-PTR OFFSET TYPE LEN ATTRIB</td>
<td></td>
</tr>
<tr>
<td>0&gt;00012 000011 000018 0000 004</td>
<td>000012 000011 000060 0000 004</td>
</tr>
<tr>
<td>0001 004</td>
<td></td>
</tr>
<tr>
<td>0&gt;00013 000011 00002C 0001 004</td>
<td>000014 000011 000066 0001 004</td>
</tr>
<tr>
<td>0001 004</td>
<td></td>
</tr>
<tr>
<td>0&gt;00017 000011 00007B 0001 004</td>
<td>000018 000003 0000A4 0000 004</td>
</tr>
<tr>
<td>0002 004</td>
<td></td>
</tr>
<tr>
<td>0&gt;00004 000020 000004 0000 004</td>
<td>000021 000006 00014 0001 004</td>
</tr>
<tr>
<td>7601 004</td>
<td></td>
</tr>
</tbody>
</table>
Display elements in “Example: LISTOBJ format for GOFF” on page 555 are described as follows. The numbers enclosed in braces following the field heading are the location (byte.bit) in the GOFF record where the data element can be found.

- **Page Header**
  - The page header is printed at the top of each page.
  - The second line contains an optional user title.

- **HDR Record**
  This is the first record in each GOFF module. The only data elements printed are the character set identifier and name and the language product (compiler or assembler) which produced the module.

  Data elements formatted:
  - CCSID
  - Character Set Name
  - Language Product Identifier

  Data elements not formatted:
  - Target Hardware Environment (U)
  - Target Operating System Environment (U)

- **ESD Record**
  The ESD describes each external name defined or referenced in the module. Unlike the traditional object module, which provides for up to three names per record, the GOFF format contains only one name per record.

  Data elements formatted:
  - Line 1
    - ESDID. The identifier for the name being defined or referenced.
    - ESD TYPE. Symbol Type (SD, ED, LD, PR, ER)
    - OWNER/PARENT. The ESDID of the owning or referenced record type in the ESD hierarchy.
    - ITEM OFFSET. The offset, in bytes, of the start of this named entity from the start of the higher level entity.
    - ITEM LENGTH/ADA. For ED- or PR-type ESD records, the length (in bytes) of the entity being defined. If the length field is -1, the true length will be in a LEN-type GOFF record. For LD records, the ESDID of the associated data.
    - NAME SP/S. Name space (00-99) and binding scope (S (local or section),M (module), L (library), or X (import/export)).
- BA. Binding algorithm (C=Catenate, M=Merge)
- AMD. AMODE (N/S, 24, 31, 64, ANY, MIN)
- RMD. RMODE (N/S, 24, 31, 64)
- REUS. Reusability or tasking behavior. (N/S, NONE, REUS, RENT, REFR)
- AL. Alignment. Print as decimal value n, where alignment boundary is 2**n. Range: 0-31.
- TXT. Text type. Displayed in format x-y where
  - x is text record style (B (Byte oriented = 0), F (Fixed = 1), or V (Variable = 2)).
  - y is Executable (U (Unspecified = 0), D (Data=1), I (Instructions=2), or digits 3-7).
- STR. Binding strength. (S (Strong=0), W (Weak=1)).
- BINDER_FLAGS. Binder attributes is a string consisting of zero or more of the following characters. The ESD types to which the attribute is applicable are listed in parenthesis.
  - L. Initial or deferred load (ED)
  - M. Movable (ED)
  - R. Read-only (ED)
  - A. Addressable. Text may contain adcons. (ED)
  - C. Common (ED)
  - I. Symbol defines or references a descriptor. (LD, ER, PR)
  - G. Mangled name (LD, PR, ER)
  - N. Name may be renamed. (LD, PR, ER)
  - D. Deferred load (ED)
  - V. Removable (ED)
- LNK. Linkage Type (S (standard, non-XPLINK), X (XPLINK))
- SIGNATURE. Any eight-byte string, printed in hexadecimal.
- Sort Key. (Priority) Optional Field. PR only.
- Extended Attributes Optional Field. Defines text location containing additional attributes for this ESD.
- Symbol name. The first line begins with NAME, followed immediately by the name (up to 16 bytes). Names longer than 16 bytes will be abbreviated and displayed here, and an abbreviation-to-long name equivalence table will be listed at the end of the listing. A closing parenthesis will immediately follow the last byte. A name consisting of a single blank character will be displayed as "NAME()".

Data elements not formatted:
- Extended Attribute ESDID (U)
- Extended Attribute Data Offset (U)
- Alias or Alternate Symbol ID (U)
- Name Length (S)
- 4 TEXT Record

TEXT records are a subset of the TXT record type. They contain the instructions and data of the program. TEXT is displayed in hexadecimal format.

Data elements formatted:
- Line 1
  - ESDID. Identifies the element or part to which the text belongs.
  - OFFSET. The offset within the element or part where the text is to begin.
  - TRUE LENGTH. The expanded length of the text once the encoding rules (if any) have been applied.
  - TEXT ENCODING. The technique for encoding or decoding the text. Current® values are 0 and 1.
  - ENCODED LENGTH. The unexpanded length of the text appearing in this record.
The IDRL Record

The IDRL provides identification information for the language translator which produced the GOFF. It is a subset of the TXT record type, identified as structured record data. In format 1, the IDRL records will be displayed in 19-byte segments, four per line. In format 3, IDRL records will be displayed in 30-byte segments to support four-digit year values and time stamps, two per line.

The relocation dictionary is a directory of address constants and other data areas which must be modified during binding and loading. Multiple such data areas or adcons can be described in a single RLD record. Relocation directory items begin at \{8.0\} in the RLD record and vary in length according to the presence or absence of various pointers and offsets in the item.

Directory items are formatted three per line. Each item consists of up to five fields. Flags in the first byte of each directory item indicate which fields are present in the item. As a result, except for the flag bytes in positions 1-8, offsets are not fixed within the directory item as it appears in the GOFF file.

The END record is the last record in the module. It contains a count of the records in the module and an optional entry point nomination, the latter specified by name or by class and offset.

The ENBLIST is the last record in the module. It contains a count of the records in the module and an optional entry point nomination, the latter specified by name or by class and offset.

- TEXT. The text, displayed as it appears in the record. The length of the text to be displayed appears in the ENCODED LENGTH field. Text is displayed in hexadecimal format, 32 bytes per line.

  Lines 2-n

  All text beyond byte 31 is displayed on continuation lines. All bytes beyond the last text byte must be set to blank characters.

Data elements not formatted:

- Data Length (S)

4 IDRL Record

5 RLD Record

6 END Record
Lines 2 contain the symbol name, if specified. The display format is identical to that on the ESD record type.

LISTLOAD OUTPUT=MODLIST output

“Example: Output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object” on page 561 is an example of the output produced by LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object.

Example: Output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object

LISTLOAD MEMBER=ADATA3,OUTPUT=MODLIST,ADATA=YES

***** MODULE SUMMARY *****

MEMBER NAME: ADATA3

LIBRARY: SYSLIB

NO ALIASES **

***** ATTRIBUTES OF MODULE *****

** BIT STATUS **
0 NOT-RENT
1 NOT-REUS
2 NOT-OVLY
3 NOT-TEST
4 NOT-OL
5 BLOCK
6 EXEC
7 MULTI-RCD
8 NOT-DC
9 ZERO-ORG
10 RESERVED
11 RLD
12 EDIT
13 NO-SYMS
14 RESERVED
15 NOT-REFR
16 RESERVED
17 <16M
18 NOT-PL
19 NO-SSI
20 APF
21 PGM OBJ
22 NOT-SIGN
23 RESERVED
24 NOT-ALTP
25 RESERVED
26 RESERVED
27 RMODE24
28 RESERVED
29 RESERVED
30 RESERVED
31 RESERVED
32 NON-MIGR
33 NO-PRIME
34 NO-PACK
35 RESERVED
36 RESERVED
37 RESERVED
38 RESERVED
39 RESERVED

MODULE MEMBER NAME: ADATA3

OUTPUT=MODLIST

ADATA=YES

MAIN ENTRY POINT: 00000368

AMODE OF MAIN ENTRY POINT: ANY

MODULE SUMMARY

MEMBER NAME: ADATA3

LIBRARY: SYSLIB

NO ALIASES **

***** PROGRAM OBJECT PROCESSED BY BINDER *****

PMAR  001E0309 02C00C03 00000000 05A40000   03680000 03680000 00000000 0000

PMARL 00628000 00000000 000A0000 10180000   10000000 27AC0000 74980000 00E00000
01400000 02400000 011C0000 000A0000   02200002 00000000 05300000 00180000
20002011 017F0131 240FC1C4 C1E3C1F3   40403000 00010000 005C0000 30000000
2000

LISTING OF PROGRAM OBJECT ADATA3 PAGE 1

THIS PROGRAM OBJECT WAS ORIGINALLY PRODUCED BY 5695PMB01 AT LEVEL 01.12 ON 01/17/2011 AT 13:12:40

MODULE SECTION: $SUMMARY

USABILITY: UNSPECIFIED AMODE: ANY OVERLAY SEGMENT: 0 OVERLAY REGION: 0

$WSA(ED)

CLASS: C_WSA LENGTH: 5C (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE FILL: 0 (HEX)

TEXT DEFER

$@DOLLI(ED)

CLASS: C_@DOLLI LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE FILL: 0 (HEX)

TEXT LOAD

$@@PPA2(ED)

CLASS: C_@@PPA2 LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE FILL: 0 (HEX)

TEXT LOAD

B_PRV(ED)

CLASS: B_PRV LENGTH: 4 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001) RMODE: 24

NAME SPACE: 2 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE FILL: UNSPEC

$PRIV000010(PD)

CLASS: C_@DOLLI LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: BYTE BIND METHOD: GENERATED,STRONG FILL: 0 (HEX)

ATTRIBUTES: PRIORITY: 0 (HEX) SCOPE: LIBRARY

$PRIV000011(PD)

CLASS: C_@@PPA2 LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: BYTE BIND METHOD: GENERATED,STRONG FILL: 0 (HEX)

ATTRIBUTES: PRIORITY: 0 (HEX) SCOPE: LIBRARY

$PRIV000012(PD)

CLASS: C_WSA LENGTH: 10 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: GENERATED,STRONG FILL: 0 (HEX)

ATTRIBUTES: PRIORITY: 0 (HEX) SCOPE: SECTION

--ls_7os-amFPcc(PD)

CLASS: C_WSA LENGTH: 20 (HEX) CLASS OFFSET: 10 (HEX) FORMAT: F(0001)

NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: GENERATED,STRONG,INDIRECT,MANGLED FILL: 0 (HEX)

ATTRIBUTES: PRIORITY: 0 (HEX) SCOPE: MODULE

---endl_F97-stream(PD)
**CONTROL SECTION: IIEWBLIT**

| USAGEABILITY: UNSPECIFIED | AMODE: ANY | OVERLAY SEGMENT: 0 | OVERLAY REGION: 0 |

### B_LIT(ED)

**CLASS:** B_LIT

**LENGTH:** 120 (HEX)

**CLASS OFFSET:** 0 (HEX)

**FORMAT:** F(0001)

**NAME SPACE:** 1

**ALLOCATION:** DOUBLE WORD

**BIND METHOD:** CATENATE

**RMODE:** ANY

### IIEWBLIT(LD)

**CLASS:** B_LIT

**TEXT TYPE:** DATA

**CLASS OFFSET:** 0 (HEX)

### AMBLIST

| AMBLIST: Map load modules and program objects |

**ABBREVIATION:** __ls__7os-amFPCc, endl__FR7-stream

**END OF PROGRAM OBJECT LISTING**
Example: Output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object

```
Example: Output for LISTLOAD OUTPUT=MODLIST for an overlay structured load module

LISTING OF LOAD MODULE PL1LOAD                   PAGE 0001
RECORD# 1     TYPE 20 - CESD     ESDID 1          ESD SIZE 240
CESD#    SYMBOL    TYPE     ADDRESS     SEGNUM   ID/LENGTH(DEC)   (HEX)
 1    PLITC0Z   00(SD)     000000        1            1206         486
 2    PLITC0ZA  00(SD)     000488        1             608         260
 3    IHEQINV   06(PR)     000000           3                 4               4
 4    IHESDA   02(ER)     000000
 5    IHEQRR    06(PR)     000004           3                   4             4
 6    IHEQTC    06(PR)     000008           3                   4             4
 7    IHEMAIN   00(SD)     000718           1                   4             4
 8    IHENTRY   00(SD)     000720           1                12            C
 9    IHEQPR   06(PR)     000010           3                   4             4
10    IHEQPTC   06(PR)     000014           3                   4             4
11    PLITC0ZB  06(PR)     000018           3                   4             4
12    PLITC0ZC  06(PR)     00001C           3                   4             4
RECORD# 2     TYPE 20 - CESD     ESDID 16         ESD SIZE 240
CESD#    SYMBOL    TYPE     ADDRESS     SEGNUM   ID/LENGTH(DEC)   (HEX)
16    IHELDQA   02(ER)     000000
17    IHELDQB   02(ER)     000000
18    IHEIQBT   02(ER)     000000
19    IHEIQBC   02(ER)     000000
20    IHESAFA   02(ER)     000000
21    IHESAFB   02(ER)     000000
22    AA          02(ER)     000000
23    C            00(SD)     000730        1                   4             4
24    B            00(SD)     000738        1                   4             4
25    A            00(SD)     000740        1                   4             4
26    IHEQPR   06(PR)     000020        3                   4             4
27    IHEQPS   06(PR)     000024        3                   4             4
RECORD# 3     TYPE 20 - CESD     ESDID 31         ESD SIZE 64
CESD#    SYMBOL    TYPE     ADDRESS     SEGNUM   ID/LENGTH(DEC)   (HEX)
31    IHEVPA    02(ER)     000000
32    IHEVSC    02(ER)     000000
33    IHEUPA    02(ER)     000000
34    IHEVQC    02(ER)     000000
```
### LISTING OF LOAD MODULE PL1LOAD

**Page 0003**

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**AMBLIST: Map load modules and program objects**
“Example: Output for LISTLOAD OUTPUT=MODLIST for a normal (non-overlay) structured load module” on page 568 is an example of the output produced by LISTLOAD OUTPUT=MODLIST for a normal (non-overlay) structured load module.

Example: Output for LISTLOAD OUTPUT=MODLIST for a normal (non-overlay) structured load module

**LOAD MODULE PROCESSED EITHER BY VS LINKAGE EDITOR OR BINDER**

LISTING OF LOAD MODULE MYMOD                  PAGE 0001

RECORD# 1    TYPE 20 - CESD     ESDID 1          ESD SIZE 144
CESD#    SYMBOL  TYPE     ADDRESS  R/R/A  ID/LENGTH(DEC)   (HEX)
1    A       00(SD)    000000   00          24          18
2    ENTA    03(LR)    000014   00           1           1
3    ENTB    03(LR)    000028   00           5           5
4    Q1      06(PR)    000000   03           4           4
5    B       00(SD)    000018   00          20          14
6    UNRES   02(ER)    000000
7    DANGLE  02(ER)    000000
8    $NULL   07(NULL)  000000   00           0           0
9    $NULL   07(NULL)  000000   00           0           0

“Example: Output for LISTLOAD OUTPUT=MODLIST for a PDSE (program object Version 1)” on page 568 is an example of the output produced by LISTLOAD OUTPUT=MODLIST for a PDSE (program object Version 1).

Example: Output for LISTLOAD OUTPUT=MODLIST for a PDSE (program object Version 1)

**LISTING OF PROGRAM OBJECT TESTPR**                  PAGE  1

THIS PROGRAM OBJECT WAS ORIGINALLY PRODUCED BY 5695DF108 AT LEVEL 01.00 ON 09/16/92 AT 09:42:47

-----------
CONTROL SECTION:  A

AMODE: 24                  ALIGNMENT: DOUBLE WORD       LENGTH:         24 (DEC)         MODULE OFFSET:          0 (DEC)
RMODE: 24                  USABILITY: UNSPECIFIED       LENGTH:         18 (HEX)         MODULE OFFSET:          0 (HEX)
STORAGE:   ANY               OVERLAY SEGMENT:       0         OVERLAY REGION:       0

----- IDRL -----  
TRANSLATOR   VER   MOD     DATE      TIME
566896201     02    01    09/16/92

----- ESDs -----  
ALPHA(PR)

----- RLs -----  
LENGTH: 00000004

----- TEXT -----  
LENGTH OF PSEUDO REGISTERS        14

**   END OF PROGRAM OBJECT LISTING**

“Example: Output for LISTLOAD OUTPUT=MODLIST,SECTION1=YES for a program object” on page 568 is an example of the output produced by LISTLOAD OUTPUT=MODLIST,SECTION1=YES for a program object.

Example: Output for LISTLOAD OUTPUT=MODLIST,SECTION1=YES for a program object

**MODULE SECTION:   $MODULE**

USABILITY: UNSPECIFIED    OVERLAY SEGMENT:       0     OVERLAY REGION:       0

----- IDRU -----  

568 z/OS: MVS Diagnosis: Tools and Service Aids
```
Example: Output for LISTLOAD OUTPUT=MODLIST,IMPEXP=YES for a program object

```

```
Description of MODLIST output for a program object

The listing produced by LISTLOAD OUTPUT=MODLIST consists of multiple parts (see “Example: Output for LISTLOAD OUTPUT=MODLIST,IMPEXP=YES for a program object” on page 561):

A page heading, displayed at the top of each page.

The page heading consists of one or two heading lines, in the following format:

```
LISTING OF PROGRAM OBJECT xxxxxxxx
```

The heading lines are followed by the title line, entered in the TITLE parameter of the LISTLOAD control statement.

The binder-generated program object identification record (IDRB).

The IDRB record is displayed on a line by itself, in the format:

```
THIS PROGRAM OBJECT WAS ORIGINALLY PRODUCED BY 5695PMB01 AT LEVEL 01.12
ON mm/dd/yyyy AT hh:mm:ss
```

```
The binder program identifier, version and level, date and time of binding are presented here. The IDRB line is followed by a line of dashes.

**An individual listing for each control section in the program object, separated by a dashed line.**

For each control section in the module, the ESD Section Definition (SD) record is formatted, followed by all data classes in the following sequence:

1. IDRZ - SPZAP identification data
2. IDRL - Language translator identification data
3. IDRU - User-supplied identification data
4. SYM - internal symbol dictionary
5. ESD - External Symbol Dictionary
6. RLD - ReLocation Dictionary
7. TEXT - Instructions and data for the CSECT
8. ADATA - ADATA information

The SD record occupies two print lines:

- The first begins with one of the constants CONTROL SECTION, SEGMENT TABLE, ENTRY TABLE, or MODULE SECTION, and displays either the section or common name. If there is no user-defined name, then a binder-generated name will be displayed as follows:
  - $PRIVxxxxx, where \( x \) is a number for user sections which originally had blank names or were unnamed.
  - $BLANKCOM - unnamed common
  - $MODULE - binder-generated section containing module level information, and is only output when SECTION1=YES
  - $SUMMARY - binder-generated section containing merge classes for the module

- The second line displays the USABILITY, AMODE, the overlay segment and region. USABILITY must contain one of the values UNSPECIFIED, NON-REUSABLE, REUSABLE, REENTRANT or REFRESHABLE. For non-overlay modules, the latter two fields will contain zero.

Each of the eight class subsections begin with an identifier line of the format:

```
===== class name =====
```

IDR detail is in the same format as described in “Description of LISTIDR output” on page 590, except that it is displayed only for the single section. The remainder of the classes are described below:

- SYM data is displayed 40 bytes per line
- ESD data occupies three to four lines per ESD record. The first containing the external name (abbreviated name, if name longer than 16 bytes), followed by the ESD record type in parenthesis. The rest of the formatted fields vary depending on the ESD record type:
  - ED records define an element definition. Its length, and various attributes will be used to bind and load the class contained in the section. Each ED record occupies three print lines:
    1. The first line displays:
       - CLASS name - up to 16 bytes.
       - LENGTH of defined class element in hexadecimal.
       - CLASS OFFSET - in hexadecimal.
       - FORMAT - where the first field is the class record format with either F (fixed length record), or V (variable length record), follows by the hexadecimal value of the record format in parenthesis.
    2. The second line shows:
- NAME SPACE - in hexadecimal.
- ALIGNMENT - any of the following:
  • DOUBLE WORD
  • QUAD WORD
  • 32 BYTE
  • 64 BYTE
  • 128 BYTE
  • 256 BYTE
  • 512 BYTE
  • 1024 BYTE
  • 2048 BYTE
  • PAGE
  DOUBLE WORD, QUAD WORD, or PAGE.
- BIND METHOD - CATENATE or MERGE.
- RMODE - 24, 64, ANY, or UNSPECIFIED

3. The third line displays the binder and loader attributes:
   - Binder attributes can be DESCRIPTIVE DATA, TEXT, or REMOVABLE
   - Loader attributes can be NOLOAD, LOAD, DEFER, READ-ONLY (or FILL: UNSPEC is printed, if there is no fill character).

- ER records define external references from the named section. For the $MODULE section these are external references with no corresponding RLDs. Each ER record occupies four print lines, where:
  1. The first line displays:
     - TEXT TYPE - can be either UNSPEC (unspecified), INSTRUC (instructions or code), DATA, or TRANS.DEF (translator defined).
     - CLASS OFFSET - in hexadecimal.
  2. The second line shows:
     - TARGET SECTION - Target section name (abbreviated name, if name is longer than 16 bytes).
     - TARGET CLASS - Name of class containing target label.
  3. The third line shows:
     - NAME SPACE - in hexadecimal.
     - SCOPE - Scope of name (SECTION, MODULE, LIBRARY, or IMP/EXP).
     - ELEMENT OFFSET - in hexadecimal.
     - AMODE - 24, 31, 64, ANY, MIN or UNSPEC
  4. The fourth line displays the ER status and autocall, where:
     - ER status can either be RESOLVED or UNRESOLVED
     - AUTOCALL can either be AUTOCALL or NEVERCALL
  5. The fifth line displays binder attributes. Possible attributes are XPL, STRONG or WEAK, MAPPED, INDIRECT, GENERATED, or MANGLED.
  6. If extended attributes exist, a sixth line displays the location of these attributes as the class and offset within that class.

- LD records define a label or entry point in the named section. Each LD record occupies three print lines, where:
1. The first line displays:
   - CLASS NAME - up to 16 bytes.
   - TEXT TYPE - can be either UNSPEC, INSTR, DATA, or TRANS.DEF
   - CLASS OFFSET - in hexadecimal.
2. The second line shows:
   - NAME SPACE - in hexadecimal.
   - SCOPE - Scope of name (SECTION, MODULE, LIBRARY, or IMP/EXP).
   - ELEMENT OFFSET - in hexadecimal.
   - AMODE - can either be 24, 31, 64, MIN, ANY, or UNSPECIFIED
3. The third line displays the binder attributes. Possible attributes are XPL (xplink), STRONG or WEAK, MAPPED, INDIRECT, GENERATED (the LD record was generated by the binder), or MANGLED. In addition, if the record contains the name of the symbol which defines the environment or associated data (ADA), that symbol will be printed.
4. If extended attributes exist, a fourth line will contain the resident class and offset.
   - PD (Part Definition) and PR (Part Reference) records define parts or pseudo registers. The PR record is a local definition of the part within the section, whereas the PD record is a global definition for all of the associated PRs (PRs with the same name). PR and PD records contain the same formatted fields. Each record occupies three print lines, where:
   1. The first line displays:
      - CLASS name - up to 16 bytes.
      - LENGTH - in hexadecimal.
      - CLASS OFFSET - in hexadecimal.
   2. The second line shows:
      - NAME SPACE - in hexadecimal.
      - ALIGNMENT - any of the following:
        • BYTE
        • HALF WORD
        • FULL WORD
        • DOUBLE WORD
        • QUAD WORD
        • 32 BYTE
        • 64 BYTE
        • 128 BYTE
        • 256 BYTE
        • 512 BYTE
        • 1024 BYTE
        • 2048 BYTE
        • PAGE
      - PRIORITY - Controls the order of the part within the element.
      - SCOPE - Scope of part (SECTION, MODULE, LIBRARY, or IMP/EXP).
   3. The third line displays binder attributes. Possible attributes are: XPL, STRONG or WEAK, MAPPED, INDIRECT, GENERATED, or MANGLED.
      - RLD data is displayed one line per RLD record, by element offset of the associated address constant. Where multiple RLD records refer to the same adcon, the element offsets will be the same. RLD data shown consists of:
- Element Offset - The offset, in hex, of the associated address constant within the element.
- Class Offset - The offset, in hex, of the associated address constant within the class.
- ACON TYPE - The type of address constant associated with this RLD entry. The type may be:
  - BR - Branch or V-type
  - N_BR - Non-branch or A-type
  - SEGM - address of start of class
  - C_OF - Q-type, offset from start of class
  - CPR - total length of the class
  - LTKN - loader token, for use of the system loader
  - R-IM - reference to an external symbol from a relative immediate instruction
  - DATA - data associated with the target symbol
  - LDIS - QY-type, reference to an external symbol from a long displacement instruction
  - L-PR - length of the individual PR
- Status - This field identifies the status of the associated address constant. Valid status values are: RES (resolved), UNRES (unresolved), and N-REL (non-relocatable constant).
- LENGTH - The adcon length in hexadecimal.
- ATTRIBUTES, which may be:
  - HOBCHG - High order bit of V-type adcon was changed by the binder. Possible value can be either YES or NO.
  - X - XPLINK linkage
  - S - part of a conditional sequential RLD string, will be followed by another RLD describing an adcon at the same location.
- NAME SPACE of reference in hexadecimal.
- TARGET NAME - Name of the referenced symbol.
- PARTRES - If the RLD describes an adcon on a part (PR), this will be the name of the resident part.
- XATTR NAME - Symbol defining the location at which the extended attributes (if any) are stored.
- XATTR OFF - Offset from symbol XATTR NAME at which the extended attributes are stored.
- TEXT data is displayed by class name. In addition to the hexadecimal representation, text data is in EBCDIC format.

For the $MODULE section, instead of TEXT, it is identified as MAP and shows the binder-generated class B_MAP information.

For the IEWBCIE section, when IMPEXP=SYMBOLS, instead of TEXT, it is identified as IEWBCIET VERS nn (where nn is the import/export table version number) and shows information about the imported and exported symbols. Columns with the heading +OFF/ADDR distinguish offsets from addresses by preceding offsets with a plus sign (+). They are always preceded by their corresponding class. However, when an address is shown, it is relative to the module beginning at a zero origin, not relative to the beginning of the class. To determine the address within the class (as shown in the NUMERICAL MAP), subtract off the location of the class from the address (the location of the class is available in the SEGMENT MAP TABLE). The attributes shown as follows:

O or X  referred symbol is OS linkage or XPLINK linkage
N or P  reference is by name or reference is by pointer
R or U  reference is Resolved or Unresolved
• ADATA information, if requested through ADATA=YES on the LISTLOAD OUTPUT=MODLIST control card, like TEXT data is displayed by class name in both hexadecimal and EBCDIC presentation. In the EBCDIC presentation, non-printable characters are replaced with periods (.).

The abbreviation-to-long name equivalence table is displayed prior to end of the listing, with all the abbreviated names (external names exceeding 16 bytes in length) in the formatted part of the listing with their long names.

** A trailer record. 

** END OF PROGRAM OBJECT LISTING

** Description of MODLIST Output for a Load module/PDS 

The listing produced by LISTLOAD OUTPUT=MODLIST consists of multiple parts (see “Example: Output for LISTLOAD OUTPUT=MODLIST for an overlay structured load module” on page 566 and “Example: Output for LISTLOAD OUTPUT=MODLIST for a normal (non-overlay) structured load module” on page 568).

** A page heading, displayed at the top of each page. 

The page heading consists of one or two heading lines, in the following format:

| LISTING OF LOAD MODULE PL1LOAD |

An individual listing for each record in the load module. Each record on DASD is identified by a sequence number (RECORD#), and type. Often there is size information for the record as well. This information is followed by its contents formatted according to the record type.

For more information on the details of the following fields, see z/OS MVS Program Management: Advanced Facilities, Appendix B. Load Module formats.

** TYPE 20 - CESD 

This is a record containing definitions or uses of external symbols.

• CESD# - An internal number for the symbol assigned by the binder.
• SYMBOL - The name of the symbol as used in the program, or an abbreviation of it.
• TYPE - See chapter 2 of z/OS MVS Program Management: User’s Guide and Reference for a description of the various types of external symbol dictionary entries.
  – ER - External Reference
  – WX - Weak External reference
  – LR - Label Reference
  – SD - Section Definition, a control section (CSECT)
  – PC - Private Code
  – CM - Common area
  – PR - Pseudoregister
• ADDRESS - Offset within the bound program where the symbol is defined.
• SEGNUM - Overlay structured modules only: the overlay segment number.
• R/R/A - Non-overlay modules only: A bit-coded byte, displayed in hex, indicating AMODE, RMODE, and read-only attributes. The values of the three attributes are ORed together in the value displayed.
  – 08 - Read-only
  – 04 - RMODE=ANY (RMODE=24 if off)
  – 01 - AMODE=24
  – 02 - AMODE=31
  – 03 - AMODE=ANY
- 10 - AMODE=64
- ID/LENGTH - ESD number of referenced symbol for an LR, length of the section or field for SD, PC, CM, or PR
- (DEC) - Length or ID displayed in decimal
- (HEX) - Length or ID displayed in hexadecimal

**TYPE 0 - RLD (May be 02, 06, or 0E)**
In the RLD record type, AMBLIST outputs information in the following columns:
- R-PTR - The ESDID of the target element
- P-PTR - The ESDID of the element containing the adcon or data area to be modified
- FL - flags
- ADDR - address

**TYPE 0 - CONTROL (May be 01, 05, or 0D)**
The CONTROL record lists information on each of the control sections for the load module:
- CESD# - CESD number of the control section
- LENGTH - length of that control section

**TEXT**
This record type contains the program as loaded for execution. Text data is displayed by class name. In addition to the hexadecimal representation, text data is in EBCDIC format.

A trailer record.
******END OF LOAD MODULE LISTING

**LISTLOAD OUTPUT=XREF output**
This section includes examples of LISTLOAD OUTPUT=XREF output as well as cross-reference listings, such as:
- “Example: Output for LISTLOAD OUTPUT=XREF for a program object with class names: B_PRV and B_TEXT” on page 576 shows the output from a program object version 2 that contains a single initial load text class. See the descriptions following this figure for explanations.
- Figure 191 on page 580 shows a sample segment map table for a multiple-text class module.
- “Example: Output for LISTLOAD OUTPUT=XREF for a load module” on page 581 and “Example: Output for LISTLOAD OUTPUT=XREF for a program object” on page 582 allow you to compare the output for a load module with the output for a program object version 1.

The listing has the following parts:
- Segment map, which only appears for Program Objects and not for Load Modules.
- Numerical map, which presents information approximately in the order in which it appears in the module.
- Numerical cross-reference.
- Alphabetical map, which presents information alphabetically by symbol name.
- Alphabetical cross-reference.

In z/OS V1R10, the format of the LISTLOAD numerical and alphabetical cross-references for program objects was significantly changed. The information is now presented in a more concise format that more closely resembles the format produced by the binder.

In the listing shown in “Example: Output for LISTLOAD OUTPUT=XREF for a program object with class names: B_PRV and B_TEXT” on page 576, page 1 shows the numerical map of the module. Page 2 shows the numerical cross-reference list of the module. Page 4 shows the alphabetical map, and page 5 the alphabetical cross-reference list.
** Note: ** The module shown in the “Example: Output for LISTLOAD OUTPUT=XREF for a program object with class names: B_PRV and B_TEXT” on page 576 is not in overlay format; for overlay modules, each segment is formatted separately.

As with the other output from AMBLIST, each page begins with a standard heading. The first line of each page contains a page number and begins with one of the following heading constants:

- SEGMENT MAP OF PROGRAM OBJECT ....
- NUMERICAL MAP OF PROGRAM OBJECT ....
- NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT ....
- ALPHABETICAL MAP OF PROGRAM OBJECT ....
- ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT ....

The member name will appear following the heading. If the name is more than sixteen characters, its formatted 16-bytes abbreviation name is printed instead. An optional second line will be used to print the title information, provided by the user on the LISTLOAD control statement. Each of the four parts has its own subheading line(s), to describe the detail that follows.

** Example: Output for LISTLOAD OUTPUT=XREF for a program object with class names: B_PRV and B_TEXT **

<table>
<thead>
<tr>
<th>** SEGMENT MAP TABLE **</th>
<th>PAGE</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS</td>
<td>SEGMENT</td>
<td>OFFSET</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

** NUMERICAL MAP OF PROGRAM OBJECT LOADMOD1 **

<table>
<thead>
<tr>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>LENGTH</th>
<th>TYPE</th>
<th>ALIGNMENT</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>430</td>
<td>ED</td>
<td>21</td>
<td>PAGE</td>
<td>SD1</td>
</tr>
<tr>
<td>430</td>
<td>238</td>
<td>ED</td>
<td>21</td>
<td>DOUBLE WORD</td>
<td>SD2</td>
</tr>
<tr>
<td>668</td>
<td>0</td>
<td>LD</td>
<td>21</td>
<td>DOUBLE WORD</td>
<td>SDX</td>
</tr>
<tr>
<td>66C</td>
<td>4</td>
<td>LD</td>
<td>31</td>
<td>DOUBLE WORD</td>
<td>SDX</td>
</tr>
<tr>
<td>1000</td>
<td>30</td>
<td>ED</td>
<td>31</td>
<td>PAGE</td>
<td>$BLANKCOM</td>
</tr>
<tr>
<td>2000</td>
<td>30</td>
<td>ED</td>
<td>31</td>
<td>PAGE</td>
<td>CM1</td>
</tr>
</tbody>
</table>

CLASS LENGTH: 2030

** NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT LOADMOD1 **

<table>
<thead>
<tr>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>FROM CLASS</th>
<th>FROM SECTION</th>
<th>REFERS TO SYMBOL</th>
<th>CLASS ELEM LOC</th>
<th>IN CLASS</th>
<th>IN SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>A</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>2</td>
<td>12E</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>B</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>196</td>
<td>196</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>C</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>1FE</td>
<td>1FE</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>D</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>266</td>
<td>266</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>E</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>2CE</td>
<td>2CE</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>F</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>336</td>
<td>336</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>G</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>39C</td>
<td>39C</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>$CLASS_LEN</td>
<td>$CLASS_LEN</td>
<td>B_PRV</td>
<td>B_PRV</td>
</tr>
<tr>
<td>47F</td>
<td>48</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>430</td>
<td>0 B_TEXT</td>
<td>0 B_TEXT</td>
<td></td>
</tr>
<tr>
<td>4F4</td>
<td>4F4</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>66C</td>
<td>4 B_TEXT</td>
<td>SDX</td>
<td></td>
</tr>
<tr>
<td>554</td>
<td>124</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>CM1</td>
<td>2000</td>
<td>0 B_TEXT</td>
<td></td>
</tr>
<tr>
<td>604</td>
<td>104</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>CM1</td>
<td>2000</td>
<td>0 B_TEXT</td>
<td></td>
</tr>
</tbody>
</table>

CLASS LENGTH: 2030

** NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT LOADMOD1 **

** RESIDENT CLASS: B_PRV **

**** NO RLD DATA ****

CLASS LENGTH: 18
Segment map

When the binder produces a program object executable, it is composed of one or more segments. The binder will always arrange the program so that segment 1 contains the entry point. To understand the importance of the information contained in the Segment Map Table, see Understanding binder programming concepts in z/OS MVS Program Management: Advanced Facilities, in particular Multiple-text class modules, load segments and ESD offsets. For an example of a Segment map for a multiple-text class module, see "Sample segment map table for LISTLOAD OUTPUT=XREF of mutiple-text class module" on page 580.

Each of the columns in a Segment map table is described as follows:

CLASS
The class name of this part of the segment. The segment will be composed of one or more classes. Note that a section may contribute to more than one class.

SEGMENT
The segment in which this class resides. A given class will reside in only one segment, and all classes in the same segment will have the same attributes.
OFFSET
The offset the beginning of the named class from the beginning of the segment. Note that every segment has its own origin (offset 0), because each may be independently loaded.

LENGTH
The length of the named class in the segment.

LOAD
The loading time attribute of the class, which will be the same for all classes with the same segment number. The possible values are:

INITIAL
An initial load class which is loaded when the program entry point or alias is loaded.

DEFER
A deferred load class which is not loaded when the program entry point or alias is loaded.

TYPE
The binding type of class. The possible values are:

CAT
A concatenated class. This is the usual way in which a section contributes to a class (known as elements). The elements are arranged one after the other.

MERGE
A "merge" class. This type of class is used for parts, which are for data, where one or more part comprises an element.

ALIGNMENT
The alignment of the class or elements contained in the class. The possible values are:

• BYTE
• HALF WORD
• FULL WORD
• DOUBLE WORD
• QUAD WORD
• 32 BYTE
• 64 BYTE
• 128 BYTE
• 256 BYTE
• 512 BYTE
• 1024 BYTE
• 2048 BYTE
• PAGE

RMODE
The residency mode of the class and the segment. If only one value is listed, it is the residency mode of both the class and segment. If a second value is given, the first value is the residency mode of the class and the second value is the residency mode of the segment (for example, 24,31 would indicate that a class with the attribute RMODE=24 is part of a segment that has RMODE=31). The segment is loaded according to the residency mode of the segment. The possible values are: 24, 31, and 64.

Numerical map
The A Numerical Map prints one line for each defined element definition, part, or control section in the composite ESD. The detail line contains the class offset (in hex), either a section offset for (labels/parts) or a length (for control sections element definitions), the ESD record type, alignment (for LD/PD record type), and the label/part, section or element definition name. Sections generated by the binder, or binder-generated names for unnamed user sections, will be displayed as:

• $PRIVxxxxxx - where xxxxxx is numeric.
All other entries will contain a valid name, assigned by the user for a label/part, a control section/element definition or named common. For label (LD) or part (PD) type ESD entries, the class offset and label/part name will be indented to show that the label/part is contained within the previous section entry.

If the module is in overlay format, the map and cross-reference will alternate for each segment. In this case, the map will begin with a segment identifier line:

```
SEG. nnnnn ----------------------------------------------------
```

and will end with a segment length line:

```
LENGTH OF SEGMENT  nnnnn
```

The numerical map is functionally equivalent to the load map produced by the linkage editor or binder.

**Numerical cross-reference**

The numerical cross-reference listing contains one entry for each RLD record in the module, presented in sequence by the hexadecimal class offset of the related address constant. There is one RLD record for each A-, V-, Q-, and J-type address constant in the module, and one RLD record for each class reference (RLD type=21), class length (CXD), or loader token.

Each entry consists of one line that is described as follows:

1. The first part of the line describes the adcon itself, showing the class and element offsets, in hex, and the name of the section (FROM SECTION) containing the adcon. Because all adcons must reside within a section, there will always be either a user-defined section name or a representation of the binder-generated name, such as $PRIV000001 or $BLANKCOM.

2. The second part of the line describes the referenced, or target, symbol. It contains the name of the referenced symbol (REFERS TO SYMBOL), the class and element offsets of the referenced label/part or section/element definition, and the class name of the referenced class name, if the reference is resolved, or one of the following constants:
   - $UNRESOLVED - A strong reference (ER) could not be resolved during binding.
   - $UNRESOLVED(W) - A weak reference (WX) could not be resolved during binding.
   - $NEVER CALL - The symbol was marked never call, and no attempt was made during binding to resolve the symbol from the library.
   - $CLASS-OFFSET - The reference was to a class offset (Q-con).
   - $CLASS-LEN - The reference was to a class length (RLD type=40).

   If the RLD item is for a class offset or class length, the constant string $CLASS_OFFSET or $CLASS_LEN will appear in place of a name.

3. The third part of the line will be blank except for resolved A-type and V-type address constants and displays the containing section name (IN SECTION). If the target section does not have a name, then a representation of the binder-generated name ($PRIV000005, $BLANKCOM) will be printed. If the target name in the second part of the line matches the containing section name, the containing section name will not be printed, since it would provide no additional information.

The last, or only, segment cross-reference will be followed by the length of the program object:

```
LENGTH OF PROGRAM OBJECT nnnn
```

If no RLD available in a class, the following message will appear instead of the formatted detail:

```
**** NO ADCONS IN THIS CLASS ****
```
Alphabetical map

The alphabetical map displays label definitions, part definitions, control sections and element definitions (except ER and PR) in alphabetical sequence, two print lines per ESD entry. It contains all of the same information as the Numerical Map, but in a different sequence. This part always begins on a new page, with a standard page heading of ALPHABETICAL MAP OF PROGRAM OBJECT.....

The first detail line contains the label, section or common name.

The second detail line consists of the class offset, the element offset (type LD/PD records) or element definition length (all other types), the class name (name of the containing class), and the name of the containing section/element (type LD/PD records) or the ESD entry type (all other types). Element lengths are indented, to distinguish them from element offsets. If the module is in overlay format, the segment number is printed to the right of the section length.

Note: There is no preset order in which entries with identical names are output.

Alphabetical cross-reference

The alphabetical cross-reference listing provides the same information as the numerical cross-reference listing, but in a different sequence. This part of the report is in collating sequence by referenced name (the name of the symbol being referred to in the address constant).

The alphabetical cross-reference begins on a new page with a standard page heading ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT, and like the numerical cross-reference, contains nine columns:

1. Class offset. This is the hex offset of the named item within a class of the program object. Class offsets for the second and third detail lines have been indented.
2. Element offset. This is the hex offset of the named label or part within its section. Lines referring to an element, rather than a label, will always display zero for the element offset.
3. Overlay segment. This is displayed for overlay format modules only.
4. Symbol. This field varies between the three detail lines, as described in the following text. If the displayed name is a special section name, then one of the binder-generated names for example, $PRIVxxxxxx), described earlier, will replace the name.

If no RLD is available in a program object, the following message will appear instead of the formatted detail:

**** NO RLD DATA ***

The cross reference listing concludes with the line

** END OF MAP AND CROSS-REFERENCE LISTING

Sample segment map table for LISTLOAD OUTPUT=XREF of multiple-text class module

Figure 191 on page 580 is an example of a segment map for a multiple-text class module.

<table>
<thead>
<tr>
<th>CLASS</th>
<th><strong>SEGMENT MAP TABLE</strong></th>
<th>LOAD</th>
<th>TYPE</th>
<th>ALIGNMENT</th>
<th>RMODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_CODE</td>
<td>1 0 160</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>1 160 99A</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
<tr>
<td>C_EXTRATTR</td>
<td>1 B00 28</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
<tr>
<td>C_DATA</td>
<td>1 B28 18</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
<tr>
<td>C_@BPPA2</td>
<td>1 B40 8</td>
<td>INITIAL</td>
<td>MERGE</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
<tr>
<td>B_LIT</td>
<td>1 B48 140</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
<tr>
<td>B_IMPEXP</td>
<td>1 CB8 98</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
<td>31</td>
</tr>
</tbody>
</table>

Figure 191. Example: Segment map table for LISTLOAD OUTPUT=XREF of multiple-text class module
LISTLOAD OUTPUT=MAP

This section produces output identical to the SEGMENT MAP TABLE and NUMERICAL MAP sections of the LISTLOAD OUTPUT=XREF Output. See “Segment map” on page 577 and “Numerical map” on page 578 for more information.

LISTLOAD OUTPUT=XREF output (comparison of load module and program object version 1)

“Example: Output for LISTLOAD OUTPUT=XREF for a load module” on page 581 shows an example of output produced by LISTLOAD OUTPUT=XREF for a load module.

Example: Output for LISTLOAD OUTPUT=XREF for a load module

```
LISTLOAD OUTPUT=XREF,DDN=DD1,
MEMBER=MAINRTN
*****  ATTRIBUTES OF MODULE  *****
MEMBER NAME:  MAINRTN                                                                MAIN ENTRY
POINT:    00000000
LIBRARY:      DD1                                                                    AMODE OF MAIN
ENTRY POINT: 31
NO ALIASES **
---------------------------------------------------------------------------------------------------------
---------------
****   LINKAGE EDITOR ATTRIBUTES OF MODULE   ****
**   BIT  STATUS         BIT  STATUS         BIT  STATUS         BIT  STATUS   **
0  NOT-RENT         1  NOT-REUS         2  NOT-OVLY         3  NOT-TEST
4  NOT-OL           5  BLOCK            6  NOT-EXEC         7  MULTI-RCD
8  NOT-DC           9  ZERO-ORG         10 EP-ZERO          11 RLD
12 EDIT             13 NO-SYMS          14 F-LEVEL          15 NOT-REFR
---------------------------------------------------------------------------------------------------------
---------------
MODULE SSI:  NONE
APFCODE:     00000000
RMODE:       ANY
LONGPARM:    NO
*****LOAD MODULE PROCESSED EITHER BY VS LINKAGE EDITOR OR BINDER
NUMERICAL MAP AND CROSS-REFERENCE LIST OF LOAD MODULE
MAINRTN                     PAGE 0001
CONTROL SECTION                                        ENTRY
LMOD LOC     NAME      LENGTH  TYPE                    LMOD LOC  CSECT LOC      NAME
00    MAINRTN        166   SD
168   $PRIVATE         BC   PC
1D4        6C      NONAME1M
228   $PRIVATE         BC   PC
294        6C     $PRIVATE
3F0    AAAAAAAA        54   CM
448   $BLANKCOM        54   CM
---------------------------------------------------------------------------------------------------------
---------------
LMOD LOC  CSECT LOC    IN CSECT              REFERS TO SYMBOL  AT LMOD LOC  CSECT LOC    IN CSECT
AC        AC      MAINRTN                   AAAAAAAA            3F0         00      AAAAAAAA
B0        B0      MAINRTN                   NONAME1M            1D4         6C     $PRIVATE
B4        B4      MAINRTN                   NONAME2M            294         6C     $PRIVATE
160       160      MAINRTN                   SUBRTN              2E8         00      SUBRTN
394        AC      SUBRTN                   $BLANKCOM            448         00     $BLANKCOM
LENGTH OF LOAD MODULE     4A0
ALPHABETICAL MAP OF LOAD MODULE
MAINRTN                                PAGE 0002
CONTROL SECTION                                        ENTRY
NAME     LMOD LOC   LENGTH  TYPE                      NAME    LMOD LOC  CSECT LOC  CSECT
$BLANKCOM       448        54   CM
$PRIVATE        168        BC   PC
$PRIVATE        228        BC   PC
AAAAAAA       3F0        54   CM
MAINRTN         00       166   SD
--------------------------
NAME     LMOD LOC   LENGTH  TYPE                      ENTRY
$PRIVATE        168        BC   PC
$PRIVATE        228        BC   PC
$PRIVATE
```

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---

**Example: Output for LISTLOAD OUTPUT=XREF for a program object**

```plaintext
LISTLOAD OUTPUT=XREF,DDN=DD1,
MEMBER=(MAINRTN,
THISISALONGALIASNAMEYOU MAY CHANGETHENAME IF YOU LIKE
ANY NAME WILL DOOOO),
TITLE=('XREF LISTINGS OF A LONG ALIAS NAME',10)

***** MODULE SUMMARY *****

**SEVERAL**
**ATTRIBUTES OF MODULE**

**BIT STATUS**

<table>
<thead>
<tr>
<th><strong>TEST</strong></th>
<th><strong>0</strong></th>
<th><strong>NOT-RENT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCD</strong></td>
<td><strong>5</strong></td>
<td><strong>BLOCK</strong></td>
</tr>
<tr>
<td><strong>RLD</strong></td>
<td><strong>6</strong></td>
<td><strong>EXEC</strong></td>
</tr>
<tr>
<td><strong>REFR</strong></td>
<td><strong>7</strong></td>
<td><strong>MULTI-</strong></td>
</tr>
<tr>
<td><strong>SSI</strong></td>
<td><strong>17</strong></td>
<td><strong>&lt;16M</strong></td>
</tr>
<tr>
<td><strong>RESERVED</strong></td>
<td><strong>21</strong></td>
<td><strong>PGM OBJ</strong></td>
</tr>
<tr>
<td><strong>RMODEANY</strong></td>
<td><strong>25</strong></td>
<td><strong>RESERVED</strong></td>
</tr>
<tr>
<td><strong>RESERVED</strong></td>
<td><strong>29</strong></td>
<td><strong>RESERVED</strong></td>
</tr>
<tr>
<td><strong>RESERVED</strong></td>
<td><strong>33</strong></td>
<td><strong>RESERVED</strong></td>
</tr>
<tr>
<td><strong>RESERVED</strong></td>
<td><strong>37</strong></td>
<td><strong>RESERVED</strong></td>
</tr>
</tbody>
</table>

MODULE SSI:

APFCODE:

RMODE:

XPLINK:

---

**THE FOLLOWING ARE THE UNFORMATTED PDSE DIRECTORY ENTRY SECTIONS (PMAR AND PMARL)**

<table>
<thead>
<tr>
<th><strong>PMAR</strong></th>
<th><strong>001E0109</strong></th>
<th><strong>02C00C12</strong></th>
<th><strong>00000000</strong></th>
<th><strong>04A00000</strong></th>
<th><strong>00000000</strong></th>
<th><strong>00000000</strong></th>
<th><strong>00000000</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0000</strong></td>
<td><strong>00328080</strong></td>
<td><strong>00000000</strong></td>
<td><strong>00020000</strong></td>
<td><strong>049C0000</strong></td>
<td><strong>01E80000</strong></td>
<td><strong>00000000</strong></td>
<td><strong>06A00000</strong></td>
</tr>
<tr>
<td><strong>00440000</strong></td>
<td><strong>018C0000</strong></td>
<td><strong>00200000</strong></td>
<td><strong>016C0000</strong></td>
<td><strong>001A0000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THIS PROGRAM OBJECT WAS ORIGINALLY PRODUCED BY 5695PMB01 AT LEVEL 01.10 ON 01/08/2008 AT 23:14:53

---

**END OF MAP AND CROSS-REFERENCE LISTING**

---

“Example: Output for LISTLOAD OUTPUT=XREF for a program object” on page 582 shows an example of output produced by LISTLOAD OUTPUT=XREF for a program object.
** NUMERICAL MAP OF PROGRAM OBJECT MAINRTN **

<table>
<thead>
<tr>
<th>RESIDENT CLASS:</th>
<th>B_TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td></td>
</tr>
<tr>
<td>MAINRTN</td>
<td>0</td>
</tr>
<tr>
<td>$PRIV000010</td>
<td>160</td>
</tr>
<tr>
<td>NONAME1M</td>
<td>228</td>
</tr>
<tr>
<td>$PRIV000011</td>
<td>294</td>
</tr>
<tr>
<td>NONAME2M</td>
<td>2E8</td>
</tr>
<tr>
<td>SUBRTN</td>
<td>3F0</td>
</tr>
<tr>
<td>$BLANKCOM</td>
<td>394</td>
</tr>
<tr>
<td>AAAAAAAAA</td>
<td>448</td>
</tr>
</tbody>
</table>

** NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT MAINRTN **

<table>
<thead>
<tr>
<th>SYMBOL REFERRED</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>FROM CLASS</th>
<th>FROM SECTION</th>
<th>IN CLASS</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>IN SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$BLANKCOM</td>
<td>448</td>
<td>0</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAAAAAAAA</td>
<td>3F0</td>
<td>0</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>160</td>
<td>166</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$PRIV000010</td>
<td>1D4</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$PRIV000011</td>
<td>294</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME1M</td>
<td>228</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
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</table>

** ALPHABETICAL MAP OF PROGRAM OBJECT MAINRTN **

<table>
<thead>
<tr>
<th>ENTRY NAME</th>
<th>CLAS LOC</th>
<th>ELEM LEN/LOC</th>
<th>CLASS NAME</th>
<th>SECTION NAME OR ENTRY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
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<td>B_TEXT</td>
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<td>BC</td>
<td>B_TEXT</td>
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<td>B_TEXT</td>
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<tr>
<td>AAAAAAAAA</td>
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<td>54</td>
<td>B_TEXT</td>
<td></td>
</tr>
<tr>
<td>MAINRTN</td>
<td>160</td>
<td>166</td>
<td>B_TEXT</td>
<td></td>
</tr>
<tr>
<td>NONAME1M</td>
<td>104</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
</tr>
<tr>
<td>NONAME2M</td>
<td>294</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
</tr>
<tr>
<td>SUBRTN</td>
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<td>102</td>
<td>B_TEXT</td>
<td></td>
</tr>
</tbody>
</table>

** ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT MAINRTN **

<table>
<thead>
<tr>
<th>SYMBOL REFERRED</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>FROM CLASS</th>
<th>FROM SECTION</th>
<th>IN CLASS</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>FROM SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$BLANKCOM</td>
<td>448</td>
<td>0</td>
<td>B_TEXT</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAAAAAAAA</td>
<td>3F0</td>
<td>0</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAINRTN</td>
<td>104</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME1M</td>
<td>294</td>
<td>6C</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME2M</td>
<td>2E8</td>
<td>102</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** LENGTH OF PROGRAM OBJECT **

4A0
LISTLOAD OUTPUT=BOTH Output

“Example: Output for LISTLOAD OUTPUT=BOTH for a PDSE” on page 584 shows an example of output produced by LISTLOAD OUTPUT=BOTH for a PDSE.

Example: Output for LISTLOAD OUTPUT=BOTH for a PDSE

1  LISTLOAD  MEMBER=TESTLR5,OUTPUT=BOTH,SECTION1=NO
1                                  *****  M O D U L E   S U M M A R Y  *****
0    MEMBER NAME:  TESTLR5                                                                MAIN ENTRY
0                                    **   BIT  STATUS         BIT  STATUS         BIT  STATUS         BIT  STATUS   **
0                      0  NOT-RENT         1  NOT-REUS         2  NOT-OVLY         3  NOT-TEST
4  NOT-OL           5  BLOCK            6  EXEC             7  MULTI-RCD
8  NOT-DC           9  ZERO-ORG         10 RESERVED         11 RLD
12 EDIT             13 NO-SYMS          14 RESERVED         15 NOT-REFR
16 RESERVED       17 <16M             18 NOT-PL           19 NO-SI
20 NOT-APF          21 PGM OBJ          22 NOT-SIGN         23 RESERVED
24 NOT-ALTP         25 RESERVED         26 RESERVED         27 RMODE24
28 RESERVED       29 RESERVED         30 RESERVED         31 RESERVED
32 MIGRATE          33 NO-PRIME         34 NO-PACK          35 RESERVED
36 RESERVED       37 RESERVED         38 RESERVED         39 RESERVED
0--------------------------------------------------------------------------------------------------------
----------------
-                                    MODULE SSI:        NONE
APFCODE:           00000000
RMODE:             24
LONGPARM:          NO
PO FORMAT:         2
XPLINK:            NO
0                   *****PROGRAM OBJECT PROCESSED BY BINDER
***THE FOLLOWING ARE THE UNFORMATTED PDSE DIRECTORY ENTRY SECTIONS (PMAR AND PMARL)
PMAR  001E0208 02C00400 00000000 00380000   00280000 00280000 00000000 0000
PMARL 00520080 00000000 00020000 00380000   02280000 07FC0000 09EC0000 00400000
013C0000 00200000 011C0000 00020000   017C0001 00000000 00380000 00000000
00082005 013F0193 505FC3D6 D7E84040   4040
1                                          LISTING OF PROGRAM OBJECT
TESTLR5                                PAGE      1
0THIS PROGRAM OBJECT WAS ORIGINALLY PRODUCED BY 5695PMB01 AT LEVEL 01.06 ON 01/13/2005 AT 19:35:05
0--------------------------------------------------------------------------------------------------------
----------------
0           MODULE SECTION:   $SUMMARY
0USABILITY: UNSPECIFIED    AMODE: ANY   OVERLAY SEGMENT: 0 OVERLAY REGION: 0
0           ESDs:     ****** ES0s ******
00          CLASS: B_PRV(ED)            LENGTH: 0 (HEX)            CLASS OFFSET: 0 (HEX)
00          FORMAT: F(0001)
00          RMODE: UNS
00          TEXT     NOLOAD           FILL:       UNSPEC
00          Q1(PD)
00          CLASS: B_PRV(ED)            LENGTH: 4 (HEX)            CLASS OFFSET: 0 (HEX)
00          NAME SPACE: 2
00          ALIGNMENT: FULL WORD        PRIORITY: 0 (HEX)
00          SCOPE:     MODULE
00          ATTRIBUTES: WEAK
0--------------------------------------------------------------------------------------------------------
### AMBLIST: Map load modules and program objects

<table>
<thead>
<tr>
<th>NAME SPACE</th>
<th>ALIGNMENT</th>
<th>TEXT TYPE</th>
<th>CLASS OFFSET</th>
<th>TARGET CLASS</th>
<th>SCOPE</th>
<th>AMODE</th>
<th>RESOLVED</th>
<th>ATTRIBUTES</th>
<th>NAME</th>
<th>XATTR</th>
<th>PARTRES</th>
<th>XATTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>DOUBLE WORD</td>
<td>UNSPEC</td>
<td>0 (HEX)</td>
<td>B_TEXT</td>
<td>LIBRARY</td>
<td>UNS</td>
<td>STRONG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>FULL WORD</td>
<td>UNSPEC</td>
<td>0 (HEX)</td>
<td>B_TEXT</td>
<td>LIBRARY</td>
<td>UNS</td>
<td>STRONG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

0 CONTROL SECTION: A

---

0 CONTROL SECTION: B

---

0 USABILITY: UNSPECIFIED

---

0 CONTROL SECTION: A

---

0 CONTROL SECTION: B

---

0 USABILITY: UNSPECIFIED

---

0 CONTROL SECTION: A

---

0 CONTROL SECTION: B

---

0 USABILITY: UNSPECIFIED

---

0 CONTROL SECTION: A

---

0 CONTROL SECTION: B

---

0 USABILITY: UNSPECIFIED

---
<table>
<thead>
<tr>
<th>Segment Map Table</th>
<th>Page 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEGMENT</strong></td>
<td><strong>OFFSET</strong></td>
</tr>
<tr>
<td><strong>0B_TEXT</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Numerical Map of Program Object Testlr5</th>
<th>Page 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLASS</strong></td>
<td><strong>SEGMENT</strong></td>
</tr>
<tr>
<td><strong>0B_TEXT</strong></td>
<td>1</td>
</tr>
</tbody>
</table>
** NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT TESTLR5
** PAGE 6

**RESIDENT CLASS: B_TEXT
**

**CLAS LOC ELEM LOC FROM CLASS FROM SECTION REFERS TO SYMBOL CLAS LOC ELEM LOC IN CLASS IN SECTION

<table>
<thead>
<tr>
<th>0</th>
<th>6</th>
<th>6 B_TEXT</th>
<th>A</th>
<th>ENTA</th>
<th>14</th>
<th>14 B_TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>C</td>
<td>C B_TEXT</td>
<td>A</td>
<td>Q1</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
</tr>
<tr>
<td>B</td>
<td>1E</td>
<td>6 B_TEXT</td>
<td>B</td>
<td>ENTB</td>
<td>28</td>
<td>10 B_TEXT</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>C B_TEXT</td>
<td>B</td>
<td>UNRES</td>
<td>30</td>
<td>0 B_TEXT</td>
</tr>
</tbody>
</table>

** CLASS LENGTH 38
----------------

** RESIDENT CLASS: B_PRV
** PAGE 7

** **** NO RLD DATA ****
** CLASS LENGTH 0
** LENGTH OF PROGRAM OBJECT 38
----------------

** ALPHABETICAL MAP OF PROGRAM OBJECT TESTLR5
** PAGE 8

**ENTRY NAME CLAS LOC ELEM LEN/LOC CLASS NAME SECTION NAME OR ENTRY TYPE

<table>
<thead>
<tr>
<th>$PRIV000003</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>ENTA</td>
</tr>
<tr>
<td>ENTB</td>
</tr>
<tr>
<td>Q1</td>
</tr>
<tr>
<td>UNRES</td>
</tr>
</tbody>
</table>

** ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT TESTLR5
** PAGE 9

**SYMBOL REFERRED CLAS LOC ELEM LOC IN CLASS IN SECTION CLAS LOC ELEM LOC FROM CLASS FROM SECTION

<table>
<thead>
<tr>
<th>GENTA</th>
<th>14</th>
<th>14 B_TEXT</th>
<th>A</th>
<th>6</th>
<th>6 B_TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>ENTB</td>
<td>28</td>
<td>10 B_TEXT</td>
<td>B</td>
<td>10</td>
</tr>
<tr>
<td>A</td>
<td>ENTB</td>
<td>28</td>
<td>10 B_TEXT</td>
<td>B</td>
<td>1E</td>
</tr>
<tr>
<td>B</td>
<td>Q1</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td>C</td>
<td>C B_TEXT</td>
</tr>
<tr>
<td>A</td>
<td>UNRES</td>
<td>30</td>
<td>0 B_TEXT</td>
<td>24</td>
<td>C B_TEXT</td>
</tr>
</tbody>
</table>

** LENGTH OF PROGRAM OBJECT 38
** END OF MAP AND CROSS-REFERENCE LISTING

LISTIDR output

Figure 192 on page 588 shows an example of LISTIDR output for a load module processed by the linkage editor or binder.
Figure 192. Example: LISTIDR output for a load module processed by linkage editor or binder

Figure 193 on page 589 shows an example of LISTIDR output for a program object processed by the binder.
The IDR listing, as in Figure 192 on page 588 and Figure 193 on page 589, has four sections that are separated by dashed lines. The four sections contain:

**A**

The linkage editor identification or binder identification record (IDRB). The identification record is displayed in a single line. This line shows the binder or linkage editor program identifier, version and release numbers, and the data and time of binding.

**Note:** The time of binding is listed only for a program object.

**B**

A list of SPZAP IDR entries (IDRZ), if any. The IDRZ records, if any, are formatted two or more lines per section. The first contains the associated CSECT name, and the second, and subsequent lines, a modification date and up to eight bytes of PTF number or other data entered on the SPZAP IDRDATA control statement. There will be one detail line for each modification to the control section. For load module output, the IDRZ records are formatted one line per section.
A list of language translator IDR records (IDRL). These entries are formatted only if OUTPUT=ALL was specified, or defaulted, on the LISTIDR control statement. The IDRL records, if any, are also formatted two or more lines per CSECT. The section name appears on the first line, and the translator program id, version and release, and date of translation on the second and subsequent lines. There will be one line of translator data for each compiler, assembler or other language product involved in the production of the object code for that section. For load module output, the IDRL records are formatted one line per section. Blank CSECT names in program objects will be seen as $BLANKCOM. They will be seen as $BLANKCM in load modules.

A list of user-supplied IDR data (IDRU), if any. The IDRU records normally appear two lines per CSECT. The first line shows the section name, and the second line an entry date and up to 80 bytes of data, entered by the user on the binder IDENTIFY control statement. If the section name is a module level section (identified as '00000001'x), the constants $MODULE LEVEL DATA are printed in place of the section name.

For program objects, if no data is available in a section, one of the following messages will appear instead of the formatted detail:

- NO SPZAP DATA EXISTS FOR THIS PROGRAM OBJECT
- NO BINDER DATA EXISTS FOR THIS PROGRAM OBJECT
- NO TRANSLATION DATA EXISTS FOR THIS PROGRAM OBJECT
- NO IDENTITY/USER DATA EXISTS FOR THIS PROGRAM OBJECT

For load modules, if no SPZAP data is available, the following message will appear instead of the formatted detail:

- THIS LOAD MODULE CONTAINS NO INFORMATION SUPPLIED BY SPZAP

Description of LISTIDR output

LISTLPA output

Figure 194 on page 591 shows an example of LISTLPA output.
<table>
<thead>
<tr>
<th>NAME</th>
<th>LOCATION</th>
<th>LENGTH</th>
<th>EP ADDR</th>
<th>MAJOR LPDE NAME</th>
<th>NAME</th>
<th>LOCATION</th>
<th>LENGTH</th>
<th>EP ADDR</th>
<th>MAJOR LPDE NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGC0020</td>
<td>00B42000</td>
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<td>008B37F4</td>
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<td>008B414D</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>IGC0005E</td>
<td>008B37F4</td>
<td>00B414D8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 194. Sample LISTLPA output**
Chapter 17. SPZAP: Modify data in programs and VTOCs

SPZAP is a service aid program that operates in problem state. SPZAP allows you to dynamically update and maintain programs and data sets. SPZAP can be used to apply fixes to modules or programs that need to be at current levels of the operating system. The functions of SPZAP provide many capabilities, including:

- Using the inspect and modify functions of SPZAP, you can fix programming errors that require only the replacement of instructions in a load module member of a PDS or a program object member of a PDSE without recompiling the program.
- Using the modify function of SPZAP, you can set traps in a program by inserting incorrect instructions. The incorrect instructions will force abnormal ending; the dump of storage provided as a result of the abnormal ending is a valuable diagnostic tool, because it shows the contents of storage at a predictable point during processing.
- Using SPZAP to replace data directly on a direct access device, you can reconstruct VTOCs or data records that may have been destroyed as the result of an I/O error or a programming error.
- On the advice of the IBM Support Center, start tracing in system components that do not use component trace. The IBM Support Center will tell you how to use the SPZAP service aid to start traces in these components.
- Update the system status index (SSI) in the directory entry for any load module in a PDS or program object in a PDSE. Update the CSECT identification record (IDR) in any load module in a PDS or program object in a PDSE.

Planning for SPZAP

SPZAP is an application that provides editing capabilities for data on a direct access storage device (DASD). Protect against SPZAP (and other applications that can update data sets) being used to damage data through use of the installation’s security protection scheme:

- In z/OS DFSMS Using Data Sets, see the chapter, "Protecting Data Sets" for information pertaining to protecting data sets.
- In z/OS DFSMSdfp Advanced Services, see the chapter, "Protecting the VTOC and VTOC Index" for information pertaining to protecting VTOCs.

Installations that use RACF should employ a combination of GDASDVOL and DASDVOL resource profiles to establish this protection. For more information about these profiles, see z/OS Security Server RACF Security Administrator’s Guide.

IBM recognizes the particular sensitivity of the VTOC. For a VTOC, the console operator must respond to message AMA117D before SPZAP processes an update request. This authorization must be supplied in addition to authorization through use of the installation’s security protection scheme.

To assist with packaging AMASPZAP jobs for distribution, CHECKSUM processing was enhanced with the introduction of PARM=PRECHECK. When PARM=PRECHECK is specified on the EXEC statement, SPZAP behaves differently. SPZAP first checks the SYSIN input for many error conditions and CHECKSUM validation. If errors in the input are detected, or a CHECKSUM mismatch occurs, SPZAP processing stops to avoid making partial updates. When no error conditions are detected, SPZAP processes all of the updates. Because this effectively results in [SUPERZAP] requiring two passes at the SYSIN data, other ramifications occur. Interactive input results in inconsistent behavior and is not supported. Also, output from SPZAP contains messages and data from both the prechecking and processing phases, which is double the usual amount of data. For example, output from commands like DUMPT is produced every time that it is encountered, in the PRECHECK and post-precheck phases. For more information about the PRECHECK option and sample output data from PRECHECK, see the following topics:
Invoking SPZAP

SPZAP provides functions to inspect, modify, update the IDR, dump, and other functions. The control statements, such as VERIFY, REPLACE, IDRDATA, DUMP, provide these functions. For more information, see “SPZAP control statements” on page 609. These functions are entered through the user's stream (SYSIN) in the JCL or through the system console. See “Running SPZAP” on page 604 for a detailed description.

Inspecting and modifying data

The inspection function is controlled by the VERIFY statement. VERIFY allows you to check the contents of a specific location in a load module member of a PDS, a program object member of a PDSE or a z/OS UNIX file, a specific physical record of a direct-access data set, or a record of a member of a data PDSE before you replace the contents. If the contents at the specified location do not agree with the contents as specified in the VERIFY statement, subsequent REP operations are not performed.

Note: A PDSE containing data other than a program object will be referred to as a PDSE data library.

The SPZAP modification function is controlled by the REP (replace) control statement. The REP control statement allows you to replace instructions or data at a specific location in a load module member of a PDS, a program object in a PDSE or a z/OS UNIX file, a physical record in a direct-access data set or a record of a member of a PDSE data library.

To avoid possible errors in replacing data, you should always precede any REP operation with a VERIFY operation.

SPZAP is often used to inspect and modify the contents of executable programs to correct errors. Executable programs can be in one of two forms:

- A load module is stored in a PDS and created by the linkage editor, binder, or IEBIMAGE utility.
- A program object is stored in a PDSE or z/OS UNIX file and created by the program management binder.

Note: All subsequent references in this topic to a program object in a PDSE also apply to a program object in a z/OS UNIX file.

In addition, SPZAP can be used to inspect and modify data other than executable programs. Examples of such types of data are:

- A sequential (QSAM/BSAM and EXCP) data set.
- A direct organization (BDAM) data set.
- A VSAM data set in a conventional DASD volume.

There are several types of data sets that are not supported by SPZAP:

- An extended format sequential data set.
- A VSAM data set in an extended address volume after the first 65520 cylinders.

See the following topics for more information:

- “Inspecting and modifying a load module or program object” on page 594
- “Inspecting and modifying a data record” on page 600

Inspecting and modifying a load module or program object

To inspect or modify data in a load module or program object, you need a NAME statement to supply SPZAP the name of the appropriate member of the file. The load module must be a member of the PDS,
identified by the SYSLIB DD statement included in the JCL. The program object must be a member of the
PDSE or a file in the z/OS UNIX directory identified by the SYSLIB DD statement included in the JCL.

To inspect or modify a program object that is in a z/OS UNIX file system, use the PATH parameter on the
SYSLIB DD statement instead of the DSNAME parameter. Use PATH to identify the directory that contains
the file that is the program object. Use the NAME statement to identify the file.

If the load module member of a PDS or program object member of a PDSE contains more than one control
section (CSECT), you must also supply SPZAP with the name of the CSECT that is to be inspected or
modified. If no CSECT name is given in the NAME statement, SPZAP assumes that the control section to
be processed is the first one encountered in searching the load module.

Whenever SPZAP updates a CSECT in a load module member of a PDS or program object member of a
PDSE in response to your NAME and REP control statements, it also puts descriptive maintenance data in
a CSECT identification record (IDR) associated with the load module or program object. This function will
be performed automatically after all REP statements associated with the NAME statement have been
processed; any optional user data that has to be placed in the IDR will come from the IDRDATA
statement. See “SPZAP control statements” on page 609 for an explanation of the IDRDATA statement.

Figure 195 on page 595 shows how to inspect and modify a load module containing a single CSECT.

Figure 195. Example: Inspecting and modifying a single CSECT load module

SYSLIB DD Statement
Defines the system library SYS1.LINKLIB containing the module IEEVLNKT that SPZAP is to process.

NAME Control Statement
Instructs SPZAP that the operations defined by the control statements that follow are to be performed
on the module IEEVLNKT.

VERIFY Control Statement
Requests that SPZAP check the hexadecimal data at offset X'0018' in the module IEEVLNKT to make
sure that it is the same as the hexadecimal data specified in this statement. If the data is the same,
SPZAP continues processing the subsequent statements sequentially. If the data is not identical,
SPZAP will not perform the REP and SETSSI operations requested for the module. It will, however,
perform the requested DUMP operation before discontinuing the processing. It will also dump a
hexadecimal image of the module IEEVLNKT to the SYSPRINT data set.

REP Control Statement
Causes SPZAP to replace the data at offset X'0018' in module IEEVLNKT with the data given in this
control statement, provided the VERIFY statement was successful.

SETSSI Control Statement
Instructs SPZAP to replace the system status information in the directory entry for module IEEVLNKT
with the SSI data given in the statement, if the VERIFY statement was successful. The new SSI is to
contain:

• A change level of 01
• A flag byte of 21
• A serial number of 1234
**IDRDATA Control Statement**
Causes SPZAP to update the IDR in module IEEVLNKT with the data 71144, if the REP operation is successful.

**DUMP Control Statement**
Requests that a hexadecimal image of module IEEVLNKT be dumped to the SYSPRINT data set. Since the DUMP statement follows the REP statement, the image will reflect the changes made by SPZAP if the VERIFY operation was successful.

Figure 196 on page 596 shows how to apply an IBM-supplied PTF in the form of an SPZAP fix, rather than a module replacement PTF.

```plaintext
//PTF40228 JOB MSGLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.NUCLEUS,DISP=OLD
//SYSIN DD *
NAME IEANUC01 IEWFETCH
IDRDATA LOCFIX01
VERIFY 01F0 47F0C018
VERIFY 0210 5830C8F4
REP 01F0 4780C072
REP 0210 4130C8F4
SETSSI 02114228
DUMPT IEANUC01 IEWFETCH
/*
```

**SYSLIB DD Statement**
Defines the library (SYS1.NUCLEUS) that contains input module IEANUC01.

**SYSIN DD Statement**
Defines the input stream.

**NAME Control Statement**
Instructs SPZAP that the operations defined by the control statements that immediately follow this statement are to be performed on the CSECT IEWFETCH contained in the load module IEANUC01.

**IDRDATA Control Statement**
Causes SPZAP to update the IDR in module IEANUC01 for CSECT IEWFETCH with the data LOCFIX01, if either of the REP operations is successful.

**VERIFY control statements**
Requests that SPZAP compare the contents of the locations X’01F0’ and X’0210’ in the control section IEWFETCH with the data given in the VERIFY control statements. If the comparisons are equal, SPZAP continues processing subsequent control statements sequentially. However, if the data at the locations does not compare identically to the data given in the VERIFY control statements, SPZAP dumps a hexadecimal image of CSECT IEWFETCH to the SYSPRINT data set; the subsequent REP and SETSSI statements are ignored. The DUMPT function specified will be performed before SPZAP ends processing.

**REP control statements**
Causes SPZAP to replace the data at offsets X’01F0’ and X’0210’ from the start of CSECT IEWFETCH with the hexadecimal data specified on the corresponding REP statements.

**SETSSI Control Statement**
Causes SPZAP to replace the system status information in the directory for module IEANUC01 with the SSI data given in the SETSSI statement after the replacement operations have been effected. The new SSI will contain a change level of 02, a flag byte of 11, and a serial number of 4228.

**DUMPT Control Statement**
Causes SPZAP to produce a translated dump for CSECT IEWFETCH of load module IEANUC01.
Use the JCL in Figure 197 on page 597 to inspect and modify two CSECTs in the same load module.

```
//CHANGIT JOB MSGLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.LINKLIB,DISP=OLD
//SYSIN DD *

NAME IEFX5000 IEFQMSSS
VERIFY 0284 4780,C096
REP 0284 4770,C096
IDRDATA PTF01483
SETSSI 01212448
DUMPT IEFX5000 IEFQMSSS
NAME IEFX5000 IEFQMRAW
VERIFY 0154 4780,C042
REP 0154 4770,C042
IDRDATA PTF01483
SETSSI 01212448
DUMPT IEFX5000 IEFQMRAW
```

Figure 197. Example: Inspecting and modifying two CSECTs

SYSLIB DD Statement
Defines the system library SYS1.LINKLIB containing the load module IEFX5000 that is to be changed by SPZAP.

NAME Control Statement #1
Instructs SPZAP that the operations requested through the control statements immediately following it are to be performed on CSECT IEFQMSSS in load module IEFX5000.

VERIFY Control Statement #1
Requests that SPZAP check the hexadecimal data at offset X'0284' in CSECT IEFQMSSS to make sure it is the same as the data specified in this control statement. If the data is identical, SPZAP continues processing the control statements. If the data is not identical, SPZAP does not perform the REP or SETSSI for CSECT IEFQMSSS, but it does perform the DUMPT operation. It also provides a hexadecimal dump of CSECT IEFQMSSS.

REP Control Statement #1
Causes SPZAP to replace the data at offset X'0284' in CSECT IEFQMSSS with the hexadecimal data given in this control statement.

IDRDATA Control Statement #1
Causes SPZAP to update the IDR in module IEFX5000 for CSECT IEFQMSSS with the data PTF01483, if the first REP operation is successful.

SETSSI Control Statement #1
Instructs SPZAP to replace the system status information in the directory entry for module IEFX5000 with the SSI data given. The new SSI will contain a change level of 01, a flag byte of 21, and a serial number of 2448.

DUMPT Control Statement #1
Provides a translated dump of CSECT IEFQMSSS.

NAME Control Statement #2
Indicates that the operations defined by the control statements that immediately follow this statement are to be performed on CSECT IEFQMRAW in the load module IEFX5000.

VERIFY Control Statement #2
Requests that SPZAP perform the VERIFY function at offset X'0154' from the start of CSECT IEFQMRAW. If the VERIFY operation is successful, SPZAP continues processing the subsequent control statements sequentially. If the VERIFY is rejected, however, SPZAP does not perform the following REP or SETSSI operations, but it does dump a hexadecimal image of CSECT IEFQMRAW to the SYSPRINT data set and performs the DUMPT operation as requested.

REP Control Statement #2
Causes SPZAP to replace the data at hexadecimal offset X'0154' from the start of CSECT IEFQMRAW with the hexadecimal data that is specified in this control statement.
IDRDATA Control Statement #2
Causes SPZAP to update the IDR in module IEFX5000 for CSECT IEFQMRAW with the data PTF01483, if the second REP operation is successful.

SETSSI Control Statement #2
Causes SPZAP to perform the same function as the previous SETSSI, but only if the second VERIFY is not rejected.

DUMPT Control Statement #2
Causes SPZAP to perform the DUMPT function on control section IEFQMRAW.

Use the JCL shown in Figure 198 on page 598 to inspect and modify control section PRINTF in z/OS UNIX System Services.

```
//ZAPUNIX EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD PATH='/sj/sjpl/binder/unixzap/',
// PATHDISP=(KEEP,KEEP)
//SYSIN DD *
NAME LOADMOD1 PRINTF
VERIFY 0000 5BF0C210
REP 0000 6BF0D210
DUMP LOADMOD1 PRINTF
/*
```

Figure 198. Example: Inspecting and Modifying a CSECT in z/OS UNIX System Services

SYSLIB DD Statement
Defines the directory '/sj/sjpl/binder/unixzap/' containing the program object LOADMOD1 that SPZAP is to process.

SYSIN DD Statement
Defines the input stream.

NAME control statement
Instructs SPZAP that the operations defined by the control statements that follow are to be performed on the control section PRINTF of the program object LOADMOD1.

VERIFY control statement
Requests that SPZAP compare the contents of the location X'0000' in the control section PRINTF with the data given on the VERIFY control statement. If the comparisons are equal, SPZAP continues processing subsequent control statements sequentially. If the data does not compare, SPZAP dumps a hexadecimal image of CSECT PRINTF to the SYSPRINT data set; the subsequent REP control statement is ignored.

REP control statement
Causes SPZAP to replace the data at offset X'0000' from the start of the CSECT PRINTF with the hexadecimal data provided.

DUMP control statement
Requests that a hexadecimal image of program object LOADMOD1, control section PRINTF be dumped to the SYSPRINT data set. Because the dump statement follows the REP statement, the image will reflect the changes made by SPZAP if the VERIFY operation was successful.
Use the JCL in Figure 199 on page 599 to inspect and modify a CSECT within a program object.

```plaintext
//UPDATE  JOB   MSGLEVEL=(1,1)
//ZAPSTEP EXEC  PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSN=SYS1.USERLIB,DISP=OLD
//SYSIN DD *
NAME                                                             LONG#
ALIASNAME       PDSPROCR
VERIFY    000070   58E0,9118
REP       000074   58E0,9434,9148,9058,47E6,20A8,45E0,C476,94BF,9058,9140,9058,47E0,C0A8,45E0,C476,94BF,9058,
           181D,58D0,D004,1FFF,43F0,A046,1F00,BF07,A047
REP       00009A   1861,1870,1F55,0E64,98EC,D00C,07FE
```

**Figure 199. Example: Using SPZAP to modify a CSECT**

**SYSLIB DD statement**
Defines the library SYS1.USERLIB containing a program object with an alias of LONGALIASNAME. (Note the continuation character (#) following LONG.) One CSECT in this program object is being changed.

**SYSIN DD statement**
Defines the input stream.

**NAME control statement**
This control statement contains a ‘#’ in column 72 and is continued to a second control statement. The first 18 columns of the continued statement are blanks and are ignored. The string ALIASNAME on this continued statement is concatenated with the string LONG to form member name LONGALIASNAME. Note that this statement could have been contained in one record as NAME LONGALIASNAME PDSPROCR. Either way, the NAME statement indicates that SPZAP is to use the VERIFY and two REP statements to one CSECT PDSPROCR in the program object member whose alias is LONGALIASNAME.

**Note:** Leading blanks on the continued statement are ignored. No characters on the first card are skipped. Therefore, in order to split an operand, part on the first card and the rest on the second, it is important that the part of the operand on the first card extends to column 71. A blank in column 71 indicates that the non-blank string in the second card begins a new operand.

**VERIFY control statement**
Requests that SPZAP check the data at hexadecimal displacement X'000070' from the start of the data record defined in the CCHHR statement to make sure it is the same as the hexadecimal data specified in this control statement. If the data is the same, SPZAP continues processing the following control statements sequentially. If the data is not identical, SPZAP does not perform the REP function but does perform the ABSDUMPT operation; it also dumps a formatted hexadecimal image of the data record defined by the CCHHR statement to the SYSPRINT data set.

**REP Control Statement #1**
Causes SPZAP to replace the data at offset X'000074' in CSECT PDSPROCR with the hexadecimal data given in this control statement. Notice that this statement contains a non-blank (#) in column 72 indicating that it is continued to a second control statement.

**REP Control Statement #2**
Causes SPZAP to replace the data at offset X'00009A' in CSECT PDSPROCR with the hexadecimal data given in this control statement.

**Accessing data in a CSECT**
For a complete description of the control statements mentioned in the following discussion, see “SPZAP control statements” on page 609.

Once the CSECT has been found, the use of offset parameters in the VERIFY and REP statements allow SPZAP to locate the data that is to be verified and replaced. The offset parameters are specified in hexadecimal notation and define the displacement of the data relative to the beginning of the CSECT. For example, if a hexadecimal offset of X'40' is specified in a VERIFY statement, SPZAP will find the location
that is 64 bytes beyond the beginning of the CSECT identified by the NAME statement, and begin verifying the data from that point.

Normally, the assembly listing address associated with the instruction to be inspected or modified can be used as the offset value in the VERIFY or REP statement. However, if a CSECT has been assembled with other CSECTS so that its origin is not at assembly location zero, then the locations in the assembly listing do not reflect the correct displacements of data in the CSECT. You must compute the proper displacements by subtracting the assembly listing address delimiting the start of the CSECT from the assembly listing address of the data to be referenced.

You can, however, use the BASE control statement to eliminate the need for such calculations and allow you to use the assembly listing locations. The BASE control statement should be included in the input to SPZAP immediately following the NAME statement that identifies the CSECT. The parameter in the BASE statement must be the assembly listing address (in hexadecimal) at which the CSECT begins. SPZAP then subtracts this value from the offset specified on any VERIFY or REP statement that follows the BASE statement, and uses the difference as the displacement of the data.

Figure 200 on page 600 is a sample assembly listing showing more than one control section. To refer to the second CSECT (IEFCVOL2), you could include in the input to SPZAP a BASE statement with a location of 0398. Then, to refer to the subsequent LOAD instruction (L R2, CTJCTAD) you could use an offset of X’039A’ in the VERIFY or REP statements that follow in the SPZAP input stream.

---

**LISTING TITLE**

<table>
<thead>
<tr>
<th>LOC</th>
<th>OBJECT CODE</th>
<th>ADDR1</th>
<th>ADDR2</th>
<th>STMT</th>
<th>SOURCE STATEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>000000</td>
<td>1 IEFCSVOL1 CSECT</td>
<td></td>
<td></td>
<td>10000017</td>
<td></td>
</tr>
<tr>
<td>000384</td>
<td>00000000</td>
<td>378 VCNQMSSS DC</td>
<td>V(IFQFMSSS)</td>
<td>55800017</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>379 *</td>
<td></td>
<td>56000017</td>
<td></td>
</tr>
<tr>
<td>000388</td>
<td>00000000</td>
<td>380 VCMMSG15 DC</td>
<td>V(IFVMG15)</td>
<td>56100017</td>
<td></td>
</tr>
<tr>
<td>00038C</td>
<td>D200 1001 0000 0000 0000 0000</td>
<td>381 MVCMSG MVC</td>
<td>0(1,R1),0(R8)</td>
<td>56200017</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>382 *</td>
<td></td>
<td>56300017</td>
<td></td>
</tr>
<tr>
<td>000392</td>
<td>D200 1001 1000 0001 0000 0000</td>
<td>383 MVCBLNKS MVC</td>
<td>1(1,R1),0(R1)</td>
<td>56400017</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>384 *</td>
<td></td>
<td>56500017</td>
<td></td>
</tr>
<tr>
<td>000398</td>
<td>386 CSECT</td>
<td></td>
<td></td>
<td>56600017</td>
<td></td>
</tr>
<tr>
<td>000398</td>
<td>0590</td>
<td>387 BALR R9,0</td>
<td></td>
<td>56700017</td>
<td></td>
</tr>
<tr>
<td>00039A</td>
<td>388 USING *,R9</td>
<td></td>
<td></td>
<td>56800017</td>
<td></td>
</tr>
<tr>
<td>00039A</td>
<td>5820 C010 00010</td>
<td>389 L R2, CTJCTAD</td>
<td></td>
<td>56900017</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 200. Sample Assembly Listing Showing Multiple Control Sections**

---

**Inspecting and modifying a data record**

You will inspect and modify a data record differently depending on whether the data record is in a PDSE or some other type of data set, such as a VTOC or sequential data set.

**Note:** The following information does NOT apply to a PDS. SPZAP only supports a PDS that contains load modules.

**Record not in a PDSE:** To inspect or modify a specific data record that is not in a PDSE you must use a CCHHR control statement to specify its direct access address. This CCHHR address must be within the limits of the direct access data set defined in the SYSLIB DD control statement.

When you use the CCHHR control statement, SPZAP reads the physical record you want to inspect or modify. The offset parameters specified in subsequent VERIFY and REP statements are then used to
locate the data that will be verified or replaced within the record. These hexadecimal offsets must define
the displacement of data relative to the beginning of the record and include the length of any key field.

If you request a REP operation for a record identified by a CCHHR control statement, SPZAP issues
message AMA112I to provide a record of your request.

In z/OS V1R7 and later DSNTYPE=LARGE data sets are supported when using V1R7 or a later release of
SPZAP.

**Record in a PDSE:** To inspect or modify a specific data record in a PDSE data library, you must use the
RECORD control statement preceded by a NAME control statement to specify its direct access address.
This combination of RECORD and NAME serves as a pointer to a specific location in a PDSE data library
member.

The CCHHR control statement does not apply to a PDSE. Any attempt to access data in a PDSE with a
CCHHR control statement will cause an error message. Any VER|VERIFY, REP, IDRDATA, or SETSSI control
statements immediately following a CCHHR statement will be flagged in error and ignored.

To determine the relative record number for a specific record, invoke SPZAP, specifying:

| NAME member|name
| ABSDUMP(T) | 1 99999999 |

The results show a display of all records in the member, record length, relative record number, and other
pertinent information.

In Figure 201 on page 601, the data set to be modified is a volume table of contents.

```
//ZAPIT     JOB        MSGLEVEL=(1,1)
//STEP      EXEC       PGM=AMASPZAP
//SYSPRINT   DD         SYSOUT=A
//SYSLIB     DD         DSNAME=FORMAT4.DSCB,DISP=OLD,
//                UNIT=3390,VOLUME=SER=111111,DCB=(KEYLEN=44)
//SYSIN      DD         *
CCHHR      0005000001
VERIFY     2C   0504
REP        2C   0A08
REP        2E   0001,03000102
ABSDUMPT    ALL
/*
```

**Figure 201. Example: Inspecting and modifying a data record**

**SYSPRINT DD Statement**
Defines the message data set.

**SYSLIB DD Statement**
Defines the data set to be accessed by SPZAP in performing the operations specified by the control
statements. In this example, it defines the VTOC (a Format 4 DSCB) on a 3390 volume with a serial
number of 111111. DCB=(KEYLEN=44) is specified so that the dump produced by the ABSDUMPT
control statement will show the dsname which is a 44-byte key. Note that this is not necessary for the
VERIFY and REP control statements.

**CCHHR Control Statement**
Indicates that SPZAP is to access the direct access record address “0005000001” in the data set
defined by the SYSLIB DD statement while performing the operations specified by the following
control statements.

**VERIFY Control Statement**
Requests that SPZAP check the data at hexadecimal displacement X'2C' from the start of the data
record defined in the CCHHR statement to make sure it is the same as the hexadecimal data specified
in this control statement. If the data is the same, SPZAP continues processing the following control
statements sequentially. If the data is not identical, SPZAP does not perform the REP function but
does perform the ABSDUMPT operation; it also dumps a formatted hexadecimal image of the data
record defined by the CCHHR statement to the SYSPRINT data set.
REP control statements
Causes the eight bytes of data starting at displacement 2C from the beginning of the record to be replaced with the hexadecimal data in the REP control statements. The 2C displacement value allows for a 44-byte key at the beginning of the record.

ABSDUMP Control Statement
Causes SPZAP to dump the entire data set to the SYSPRINT data set. Since DCB=(KEYLEN=44) is specified on the SYSLIB DD statement, the 44-byte dsname is also dumped.

Note: If the VTOC is to be modified, message AMA117D is issued to the operator, requesting permission for the modification.

Figure 202 on page 602 shows how to inspect and modify a record within a PDSE data library.

Figure 202. Example: Using SPZAP to modify a data record

<table>
<thead>
<tr>
<th>NAME</th>
<th>USERDATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECORD</td>
<td>0003</td>
</tr>
<tr>
<td>VER</td>
<td>000010 04B3,9017</td>
</tr>
<tr>
<td>REP</td>
<td>000014 10C7,C5E3,C4E2</td>
</tr>
<tr>
<td>ABSDUMP</td>
<td>3 3</td>
</tr>
</tbody>
</table>

SYSLIB DD statement
Defines the data set that SPZAP is to access to perform the operations specified by the control statements. In this example, it defines a private PDSE data library. The NAME statement identifies the member as USERDATA, which is shown in Figure 212 on page 623.

SYSIN DD statement
Defines the input stream containing the SPZAP control statements.

NAME control statement
Instructs SPZAP that the control statements that immediately follow this statement are to be performed on the member whose name is USERDATA.

RECORD control statement
Indicates that SPZAP is to access relative record 3, the third record in the member USERDATA. Record 3 is the object of the VERIFY and REP operations that follow.

VERIFY control statement
Requests that SPZAP check the data at hexadecimal displacement X'0010' to compare it to the string specified. If there is a difference, this VERIFY is flagged with an error message, the contents of record 3 are displayed, and the following REP statement is flagged and ignored.

REP control statement
Causes SPZAP to replace the data at offset X'000014' in record 3 of member USERDATA with the data X'10C7C5E3C4E2' if the preceding VERIFY statement completed successfully. If the preceding VERIFY statement was flagged in error, then this statement is also flagged in error, and no data is replaced.

ABSDUMP control statement
Causes SPZAP to display record 3 of member USERDATA. Record 3 is displayed whether the VERIFY succeeded or failed.

Updating the System Status Index (SSI)
You can use the SETSSI control statement to overlay the existing data in the SSI with your own data. For a complete description of the SETSSI control statement, see “SPZAP control statements” on page 609.
The SSI is a 4-byte field created by the linkage editor in the directory entry of a load module. It is useful for keeping track of any modifications that are performed on a load module. SPZAP updates the system status index automatically whenever it replaces data in the associated module.

Not all load modules have system status information. In those that do, the SSI is located in the last four bytes of the user data field in the directory entry. Figure 203 on page 603 shows the position of the SSI in load module directory entries.

```
+ Member Name | TTR | C | User Data Field | SSI *
+ 1          8 * 9    11 * 12 * 13 to 70 maximum * variable *
```

Figure 203. SSI bytes in a load module directory entry

Figure 204 on page 604 shows the composition of the SSI field and the flag bits used to indicate the types of changes made to the corresponding load module program.

The first byte of SSI information contains the member’s change level. When a load module is initially released by IBM, its change level is set at one. Thereafter, the change level is increased by one for each release that includes a new version of that program. If you make a change to the SSI for any of the IBM-released programs, take care not to destroy this maintenance level indicator unless you purposely mean to do so. To keep the change level byte at its original value, find out what information is contained in the SSI before using the SETSSI function. The LISTLOAD control statement of the LIST service aid can give you the information you need.
The second byte of the SSI is called the flag byte. Bits within the flag byte contain information reflecting the member's maintenance status. You need only be concerned with two of the eight bits when you are using SPZAP:

- Bit 2, the local fix flag, indicates that the user has modified a particular member. (It is not used to reflect modifications made by IBM-supplied program temporary fix or a PTF.) SPZAP sets this local fix flag bit to one after successfully modifying a load module.
- Bit 3, the program temporary fix flag, is set to one when an IBM-authorized PTF is applied to a system library to correct an error in an IBM module.

All other bits in the flag byte should be retained in the SSI as they appeared before the SETSSI operation took place, so as not to interfere with the normal system maintenance procedures.

The third and fourth bytes of the system status index are used to store a serial number that identifies the first digit and the last three digits of a PTF number. SPZAP will not change these bytes unless you request a change by using the SETSSI control statement.

### Running SPZAP

You can run SPZAP using control statements as input into the job stream or dynamically as part of selected macros:

- “Using JCL and control statements to run SPZAP” on page 605
Consider the following points when you run SPZAP:

- SPZAP uses the system OPEN macro. Therefore, SPZAP cannot modify or inspect RACF-protected data sets when SPZAP cannot successfully complete the access checks that occur during OPEN processing.

- A module can be a load module in a PDS or a program object in a PDSE. SPZAP replaces a program object in a PDSE rather than updating the program object in place. Users who have used the BLDL macro to establish a connection to a particular copy of a program object must invoke BLDL again to gain access to the new copy.

If you are using LLA to manage a program object that has been changed through the use of SPZAP, then, to make the modified object available, the operator must refresh LLA for the directory entries for that program object. Otherwise, LLA continues to load the unmodified version of the program object.

SPZAP itself cannot identify when a load module or a program object is in use by another user or is in the process of being loaded through LLA.

See z/OS DFSMS Using Data Sets for more information about PDSEs and their data structure.

- Unexpired data sets such as system libraries cannot be modified unless the operator replies r x, ’U’ to the expiration message that occurs during OPEN.

- If you use SPZAP to modify an operating system module that is made resident in virtual storage only at IPL time, you must IPL the system again to invoke the new version of the module you have modified. (Note that this requirement applies to all modules in SYS1.LPALIB, all data sets named in the LPALSTxx member of SYS1.PARMLIB, and all modules in SYS1.NUCLEUS.

SPZAP itself cannot determine when a module is loaded only at IPL time.

- The SYSLIB DD statement cannot define a concatenated or a multi-volume data set.

- SPZAP supports only direct access storage devices (DASD) for the SYSLIB device.

- When modifying a system data set, such as SYS1.LINKLIB, specify DISP=OLD on the SYSLIB DD statement.

- If you use SPZAP for a digitally signed module, message AMA165I is issued. The control statement is to be processed, but the digital signature is no longer valid.

- SPZAP supports placement of SYSIN and SYSPRINT data sets in cylinder-managed space.

- SPZAP (AMASPZAP or IGWSPZAP) supports all data sets allocated in the extended addressing space (EAS) of an extended address volume (EAV).

- SPZAP (AMASPZAP or IGWSPZAP) supports the following dynamic allocation (DYNALLOC or SVC 99) options for all data sets: S99TIOEX(XTIOT), S99ACUCB (NOCAPTURE), and S99DSABA (DSAB above the line).

### Using JCL and control statements to run SPZAP

One way to invoke SPZAP is through the job stream. The JCL statements you need to use when running SPZAP are:

- JOB statement
- EXEC statement
- SYSPRINT DD statement
- SYSLIB DD statement
- SYSABEND DD statement
- SYSIN DD statement

These JCL statements, when used with the control statements in “SPZAP control statements” on page 609, allow greater function for SPZAP.

Also, when running SPZAP, you must consider the region size available to your program. The minimum region size needed to run AMASPZAP is 200 kilobytes.
Usually, no REGION parameter is required on the EXEC statement but REGION=120K (or any other value less than 200K) will cause SPZAP to issue message AMA154I and stop processing with a return code of 16. In addition, SPZAP will issue message AMA154I if the program management binder has too small a region size. This problem might occur if the SYSLIB member is extremely large, when REGION=4M or REGION=6M might be needed.

**JCL statements**

**JOB Statement**
Marks the beginning of the job.

**EXEC Statement**
Invokes SPZAP. You identify AMASPZAP as the program to be run by specifying either PGM=AMASPZAP or PGM=IMASPZAP, which is an alias name for AMASPZAP.

**Note:** You must ensure that the region size is at least 200K for SPZAP to complete processing normally. The valid parameters that you can specify on the PARM parameter are:

1. IGNIDRFULL
2. PRECHECK

These options can be specified in any order, and are independent of each other. Each option can be the only value on the PARM parameter. The specification of multiple parameters requires a comma-separated list, where each parameter is individually enclosed within quotes and surrounded by parentheses. Duplicate or incorrect values cause SPZAP to fail with error message AMA129I being issued.

PARM=IGNIDRFULL enables SPZAP to override the standard restrictions that are placed on CSECT updates (through NAME and REP) when IDR space for the module is found to be full.

PRECHECK support provides a means for suppliers of SPZAP statements to ensure that their exact program, when combined with a non-blank CHECKSUM statement, was received unaltered by a consumer of their program. The PRECHECK parameter is supported to prevent most partial module updates from occurring if detectable errors are encountered while it is processing the input SYSIN data stream. Its sole purpose is to support the more intuitive CHECKSUM processing. So, when PARM=PRECHECK is specified on the EXEC statement, SPZAP behavior is radically different from the default behavior that occurs when PRECHECK is not specified. Therefore, any syntax or verification error or warning that is encountered during the PRECHECK processing phase, anywhere within the SYSIN input, prevents any updates from occurring against any of the target modules. When the SYSIN control statements are processed, the SYSPRINT output for PRECHECK contains messages and data from both the prechecking and modification processing phases. Therefore, PRECHECK might double the usual amount of output. For example, output from commands like DUMPT is produced every time that it is encountered. When the PRECHECK option is not specified, SPZAP behavior is unchanged. Similarly, when PRECHECK is specified, modifications to the target data set, if requested, are done only when the SYSIN input has no errors. Syntax errors for CHECKSUM, VERIFY, or SETSSI in the input SYSIN cause PRECHECK to fail SPZAP, and no updates are made in the target data set. Error scenarios, like those scenarios that lead to AMA102I, AMA104I, AMA105I, AMA109I, AMA110I, AMA111I, AMA112I, AMA133I and AMA134I, or VER failures in any NAME would now fail the entire SPZAP step. Thus, users might find that their SPZAP jobs behave differently. For example, VERIFY statements that confirm previous REP statements cannot be supported, as shown in the following example:

```
//SYSIN DD *
   NAME IEECB866 IEAVTS0L
   VER 20 F024 034E
   REP 20 F0FF 035F
   VER 20 F0FF 035F
/*
```

Without PRECHECK, the second VER statement would work, if the preceding REP was successful.
With PRECHECK, the REP would not run during prechecking, so the subsequent VER statement would fail, thus failing the entire SPZAP.

**Notes:**
1. Do not use PARM=IGNIDRFULL with IBM-maintained modules.
2. PARM=IGNIDRFULL has no meaning if SYSLIB is a program object library. There is no restriction on the number of IDRZ records associated with a program object library member.
3. Use PARM=PRECHECK with SYSIN input in batch mode, and combine it with a non-blank CHECKSUM statement. If SPZAP detects that SYSIN data is entered interactively, it issues message AMA166I and fails SPZAP.

**SYSPRINT DD Statement**
Defines a sequential output data set for messages that can be written on a system printer, a magnetic tape volume, or a direct access volume. This statement is required for each run of SPZAP.

**SYSLIB DD Statement**
Defines the direct access data set that will be accessed by SPZAP when performing the operations specified on the control statements. The DSNAME parameter and DISP=OLD or DISP=SHR are required. The VOLUME and UNIT parameters are necessary only if the data set is not cataloged. This statement cannot define a concatenated or multi-volume data set. It is required to run SPZAP.

**Notes:**
1. When this data set is the VTOC, you must specify DSNAME=FORMAT4.DSCB. When you access a record in the VTOC (that is, a DSCB) for modification, SPZAP issues message AMA117D to the console. No message is issued, however, when an ABSDUMPT operation is performed on the VTOC.
2. Standard VSAM processing requires the use of an ACB to access the data set. However, because SPZAP only supports open with DCB, it does not obtain the correct information that is needed to operate upon a VSAM data set. Where there is a blocksize mismatch reported by SPZAP, explicit specification of the blocksize on the SYSLIB DD statement will override SPZAP's normal size processing.

**SYSABEND DD Statement**
Defines a sequential output data set to be used in case SPZAP ends abnormally. The data set can be written to a printer, a magnetic tape volume, or a direct access volume. This statement is optional.

**SYSIN DD Statement**
Defines the input stream data set that contains SPZAP control statements.

**Return codes**
When SPZAP ends, one of the following return codes is placed in general purpose register 15:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>04</td>
<td>Warning of a condition. This can result in future errors if an action is not taken to correct the warning now.</td>
</tr>
<tr>
<td>08</td>
<td>An SPZAP input statement contains an error or was overridden by operator intervention. Check the syntax of the statements to determine the cause of the error.</td>
</tr>
<tr>
<td>12</td>
<td>A requested JCL statement is absent or specifies a data set that was not successfully opened. SPZAP ends immediately.</td>
</tr>
<tr>
<td>16</td>
<td>A permanent I/O error occurred, perhaps caused by a JCL error, such as incorrect blocksize. SPZAP ends immediately. The region size might be too small. REGION=200K is the smallest region size</td>
</tr>
</tbody>
</table>
permitted. However, the program management binder might require as much as 4M or 6M if the
program object is very large.

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Using DUMP, DUMPT, VER, or REP processing, SPZAP found a control record for a specific control
section that was larger than the specified BLOCKSIZE. SPZAP ends immediately.

Note: Return codes greater than 8 can result in the end of SPZAP processing at the point where the
problem was encountered. Therefore, there might be no other indication that processing completed, other
than the job ending.

Invoking SPZAP dynamically

You can run SPZAP from selected macros. SPZAP can be invoked by an application program at run time
through the use of the CALL, LINK, XCTL, or ATTACH macro. The program must supply a list of alternate
DDNAMEs of data sets to be used by SPZAP if the standard DDNAMEs are not used.

A program must be running APF authorized in order to update a VTOC through SPZAP. Other SPZAP
functions do not require the calling program to be authorized.

The following diagram shows the general form of these macros when used to invoke SPZAP.

```
(anyname)   CALL AMASPZAP,(oplist,ddnamlst),VL
(anyname)   XCTL EP=AMASPZAP
(anyname)   LINK EP=AMASPZAP,PARAM=(oplist,ddnamlst),VL=1
(anyname)   ATTACH EP=AMASPZAP,PARAM=(oplist,ddnamlst),VL=1
```

**anyname**
Indicates an optional statement label on the macro statement.

**EP**
The entry point for the SPZAP program.

**PARAM**
Specifies, as a sublist, parameters to be passed from the program to SPZAP.

**oplist**
Specifies the name of either a halfword of zeros (indicating no options) or a non-zero halfword
followed by a character string whose length is given in bytes. For the possible parameter value, see
the information about the EXEC statement in “JCL statements” on page 606.

**ddnamlst**
Specifies the name of a variable-length list containing alternate ddnames for data sets to be used
during SPZAP processing. If all the standard ddnames (SYSPRINT, SYSLIB, and SYSIN) are used, then
you can omit this parameter.

The DDNAME list must begin on a halfword boundary. The first two bytes contain a count of the
number of bytes in the rest of the list. The format of the list is fixed, with each entry having eight
bytes. Any name of less than eight bytes must be left justified and padded with blanks. If a name is
left out in the list, the entry must contain binary zeros; the standard name is then assumed. Names
can be omitted from the end of the ddname list by shortening the list.

The sequence of 8-byte entries in the list is as follows:

**Entry**

**Standard name**

**0-7**
not applicable

**8-15**
not applicable

**16-23**
not applicable
VL | VL=1

Indicates that the high-order bit is to be set to 1 in the last word of the address parameter list.

Note: If you do not supply the name of a DDNAME list, you must ensure that the high-order bit of the oplist address is set on. Coding VL|VL=1 sets the bit correctly.

Figure 205 on page 609 is an example of two functionally-equivalent dynamic invocations of SPZAP.

---

**SPZAP control statements**

SPZAP control statements (entered either through the user's input stream in the JCL or through the system console) define the processing functions to be performed during a particular run of SPZAP. To enter other SPZAP control statements through the system console, you can use the CONSOLE control statement. The control statements that define the running of SPZAP are:

- ABSDUMP or ABSDUMPT
- BASE
- CCHHR
- CHECKSUM
- Comment (*)
- CONSOLE
Coding rules for SPZAP control statements

Follow these rules when coding the control statements for SPZAP:

- The size of a SPZAP control card is 80 bytes; it can contain 71 bytes of control information.
- Statements can begin in any column up to column 71.
- The operation name of the statement must precede the parameters and must be complete on the first statement; you cannot continue the operation name.
- There must be at least one blank between the specified operation name and the first parameter.
- All parameters must also be separated by at least one blank space.
- Data field parameters may be formatted with commas for easier visual check, but blanks within data fields are not permitted.
- Data and offset values must be specified as a multiple of two hexadecimal digits.
- Following the last required parameter and its blank delimiter, the rest of the space on most control statements can be used for comments. Exceptions to this are the NAME and DUMP control statements: if you omit the CSECT parameter from either of these statements, do not use the space following the load module parameter for comments.
- A record beginning with an asterisk is considered to be a comment statement.
- A comment statement (one that begins with a single asterisk) cannot be continued.
- Member names and CSECT names for program objects can be as long as 1024 characters.
- When SYSLIB refers to a PDSE or a z/OS UNIX file, you can continue any non-comment statement as follows:
  - Column 72 of the control card to be continued must contain a non-blank character.
  - The string of characters on the immediately following card (starting with the first non-blank character) is concatenated with column 71 of the preceding card. AMASPZAP ignores leading blanks in a continuation card, but it displays the cards on SYSPRINT unchanged.
  - You can continue statements as necessary. You cannot, however, continue a comment field that follows the last parameter.
  - Even though some parameters allow you to use a single asterisk (*) to indicate an omitted parameter, the first non-blank character on a continuation card cannot be an asterisk. Select the break point carefully to avoid starting a continuation statement with a single asterisk.
- In other words, for continuation:
  - When the SYSLIB is a PDSE or a z/OS UNIX file, IGWSPZAP is invoked, which supports continuation.
  - When the SYSLIB is a PDS, AMASPZAP is invoked, which does not support continuation.

Following are detailed descriptions of the SPZAP control statements, in alphabetical order.

{ABSDUMP|ABSDUMPT} {startaddr stopaddr | startrec stoprec | membername | ALL}

This statement can be used to dump the following, as defined in the SYSLIB DD statement:

- A group of physical records
- A group of records belonging to a member of a PDSE data library
- A load module member or all load module members of a PDS
• All members of a PDSE
• The directory of a PDSE that contains program objects

If the key associated with each record is to be formatted, DCB=(KEYLEN=nn), where “nn” is the length of the record key, must also be specified by the SYSLIB DD statement. Note that when dumping a VTOC, DCB=(KEYLEN=44) should be specified; when dumping a PDS directory, DCB=(KEYLEN=8) should be specified. ABSDUMP produces a hexadecimal printout only, while ABSDUMPT prints the hexadecimal data, the EBCDIC translation, and the mnemonic equivalent of the data. See “Reading SPZAP output” on page 618. The variables are:

**startaddr**
- The absolute direct access device address of the first record to be dumped. This address must be specified in hexadecimal in the form cccchhhhrr (cylinder, track and record numbers). This parameter must be exactly 10 digits long.

**stopaddr**
- The absolute direct access device address of the last record to be dumped, and it must be in the same format as the start address.

Both addresses must be specified when this method of dumping records is used, and both addresses must be within the limits of the data set defined by the SYSLIB DD statement. The record number specified in the start address must be a valid record number. If a record number of 0 is specified, SPZAP will change it to 1 since the READ routine skips over such records. The record number specified as the stop address need not be a valid record number, but if it is not, the dump will continue until the last record on the track specified in the stop address has been dumped.

**Note:** When the SYSLIB DD statement describes a data set placed in an extended address volume (EAV), the startaddr and stopaddr values must be specified in hexadecimal in the form CCCCcHHRR, where CCCCc is referred to as a 28-bit cylinder address. The meanings of the codes are as follows:
- CCCC is the 16 low order bits of the cylinder number.
- ccc is the 12 high order bits of the cylinder number.
- H is the track number.
- RR is the record number.

**startrec**
- The value of the first relative record of a member of a PDSE data library to display. This parameter can be 1 to 8 digits long. The first record of a member has a startrec value of 1.

**Note:** ABDUMP/ABSDUMPT startrec stoprec is valid only following a NAME member statement where SYSLIB is a PDSE data library and member is a valid member of that library.

**stoprec**
- The value of the last relative record of a member of a PDSE data library to display. This parameter can be 1 to 8 digits long. If the value of stoprec specifies a relative record value greater than that of the last physical record, printing stops after the last record of the member is printed. If the value of stoprec is less than the value of startrec, no records are displayed. One can display all the records of a member of a PDSE data library by using the following two statements:

<table>
<thead>
<tr>
<th>NAME</th>
<th>member</th>
<th>ABDUMP</th>
<th>ABSDUMPT</th>
<th>1 99999999</th>
</tr>
</thead>
</table>

**membername**
- The name of a member of a PDS or a PDSE, as specified by the SYSLIB DD statement. The name can refer to a load module member of a PDS or a member of a PDSE data library. In each case, the entire member is dumped when this variable is specified. (Use DUMP/DUMPT for program object members of a PDSE.)
**ALL**

Specifies that the entire data set defined by the SYSLIB DD statement is to be dumped. How much of the space allocated to the data set is dumped depends on how the data set is organized:

- For a sequential data set, SPZAP dumps until it reaches end of file.
- For an indexed sequential and direct access data set, SPZAP dumps all extents.
- For a PDS, SPZAP dumps all extents, including all linkage editor control records, if any exist.
- For a PDSE data library, SPZAP displays a directory plus a listing of all members of the library. If the data set is a PDSE that contains program objects, SPZAP displays only the directory.

**BASE xxxxxxx**

Used by SPZAP to adjust offset values that are to be specified in any subsequent VERIFY and REP statements. This statement should be used when the offsets given in the VERIFY and REP statements for a CSECT are to be obtained from an assembly listing in which the starting address of the CSECT is not location zero.

For example, assume that CSECT ABC begins at assembly listing location X'000400', and that the data to be replaced in this CSECT is at location X'000408'. The actual displacement of the data in the CSECT is X'08'. However, an offset of X'0408' (obtained from the assembly listing location X'000408') can be specified in the REP statement if a BASE statement specifying X'000400' is included prior to the REP statement in the SPZAP input stream. When SPZAP processes the REP statement, the base value X'000400' will be subtracted from the offset X'0408' to determine the proper displacement of data within the CSECT. The variable is:

xxxxxxx

A 6-character hexadecimal offset that is to be used as a base for subsequent VERIFY and REP operations. This value should reflect the starting assembly listing address of the CSECT being inspected or modified.

**Note:** The BASE statement should be included in the SPZAP input stream immediately following the NAME statement that identifies the control section that is to be involved in the SPZAP operations. The specified base value remains in effect until all VERIFY, REP, and SETSSI operations for the CSECT have been processed.

Figure 206 on page 612 shows how to use the BASE control statement to inspect and modify a CSECT whose starting address does not coincide with assembly listing location zero.

### Figure 206. Example: Using the BASE control statement

| //MODIFY JOB      MSGLEVEL=(1,1) |
| //STEP EXEC     PGM=AMASPZAP |
| //SYSPRINT DD     SYSOUT=A |
| //SYSLIB DD       DSNAME=SYS1.LINKLIB,DISP=OLD |
| //SYSIN DD       * |
| NAME             IEFMCVOL IEFCVOL2 |
| BASE             0398 |
| IDRDATA          MOD004 |
| VERIFY           039A 5820C010 |
| REP              039A 47000000 |
| DUMP             IEFMCVOL IEFCVOL2 |

**SYSLIB DD Statement**

Defines the system library, SYS1.LINKLIB, that contains the module IEFMCVOL in which the CSECT to be changed, IEFCVOL2, resides.

**SYSIN DD Statement**

Defines the input stream that contains the SPZAP control statements.

**NAME Control Statement**

Instructs SPZAP that the operations defined by the control statements that immediately follow it are to be performed on CSECT IEFCVOL2 in the load module IEFMCVOL.
BASE Control Statement
Provides SPZAP with a base value that is to be used to readjust the offsets on the VERIFY and REP statements that follow it.

IDRDATA Control Statement
Causes SPZAP to update the IDR in module IEFMCVOL for CSECT IEFCVOL2 with the data MOD04, if the REP operation is successful.

VERIFY Control Statement
Requests that SPZAP inspect the data at offset X'039A'. The base value X'0398' given in the previous BASE statement is subtracted from this offset to determine the proper displacement of the data within CSECT IEFCVOL2. Therefore, SPZAP checks the data at the location that is actually displaced X'0002' bytes from the beginning of CSECT IEFCVOL2 to ensure that it is the same as the hexadecimal data specified in this control statement. If the data is the same, SPZAP continues processing the following statements in the order in which they are encountered. If the data is not identical, SPZAP does not perform the REP, SETSSI, or IDRDATA functions, but it does perform the DUMPs operation; it also dumps a hexadecimal image of CSECT IEFCVOL2 to the SYSPRINT data set.

REP Control Statement
Causes SPZAP to replace the data at displacement X'0002' (offset 039A minus base value 0398) into CSECT IEFCVOL2 with the hexadecimal data specified in this control statement.

DUMP Control Statement
Requests that SPZAP dump a hexadecimal image of CSECT IEFCVOL2 to the SYSPRINT data set. Since the DUMP statement follows the REP statement, the image will reflect the changes made by SPZAP (assuming no verification has been rejected).

CCHHR record address
Identifies a physical record on a direct access device that is to be modified or verified. The record must be in the data set defined by the SYSLIB DD statement. Any immediately following REP or VERIFY statements will reference the data in the specified record. The variable is:

record address
The actual direct access address of the record containing data to be replaced or verified. It must be specified as a 10-digit hexadecimal number in the form cccchhhhrr, where cccc is the cylinder, hhhh is the track, and rr is the record number. For example, 0001000A01 addresses record 1 of cylinder 1, track 10. A zero record number is incorrect and defaults to 1.

Notes:
1. You can define more than one CCHHR statement in your input to SPZAP. However, the VERIFY and REP statements associated with each CCHHR statement must immediately follow the specific CCHHR statement to which they apply.
2. When the SYSLIB DD statement describes a data set placed in an extended address volume (EAV), the record address value must be specified in hexadecimal in the form CCCCcccHRR, where CCCC is referred to as a 28-bit cylinder address. The meanings of the codes are as follows:
   - CCC is the 16 low order bits of the cylinder number.
   - ccc is the 12 high order bits of the cylinder number.
   - H is the track number.
   - RR is the record number.

CHECKSUM [hhhhhhhh]
Used to print or verify a fullword checksum (parity-check). All of the valid hexadecimal operands since the preceding CHECKSUM statement or SPZAP initialization are logically concatenated into a single string divided into fullwords, the sum of which is the checksum. For example, the string 12345678FACE produces the checksum 0D025678. Each CHECKSUM statement resets the accumulated checksum value to zeros.

The CHECKSUM statement is effective in detecting clerical errors that may occur when transcribing an SPZAP type of fix. CHECKSUM does not prevent errors; it only causes a message to be issued. By the time the CHECKSUM statement is processed, all prior replaces have been done. See the information
about PARM=PRECHECK in “JCL statements” on page 606 for details about CHECKSUM errors that can lead to SPZAP failures without making updates to the target data set.

**hhhhhhhh**

8 hexadecimal characters that are compared with the checksum. If the two values are equal, a message is written indicating that the checksum was correct and has been reset.

If the operand field is blank, a message is written giving the actual value of the checksum, and indicating that the checksum has been reset.

When the CHECKSUM control statement is provided with an incorrect operand, the REP and SETSSI statements processed already are not affected.

If the operand is not valid or is not equal to the checksum, a message is written indicating incorrect operand or checksum error. All subsequent REP and SETSSI statements are ignored until the next NAME or CCHHR statement is encountered. The results of previously processed statements are not affected.

***(Comment)***

When the first non-blank character in a statement is an asterisk, SPZAP recognizes the statement as a comment, used to annotate the SPZAP input stream and output listing. You can specify the asterisk in any position, but at least one blank space must follow the asterisk. You can include any number of comment statements in the input stream, but you cannot continue a comment statement. When SPZAP recognizes a comment, it writes the entire statement to the data set specified for SYSPRINT.

**CONSOLE**

Indicates that SPZAP control statements are to be entered through the system console. When this statement is encountered in the input stream, the following message is written to the operator:

```
AMA116A ENTER AMASPZAP CONTROL STATEMENT OR END
```

The operator may then enter in any valid SPZAP control statement conforming to the specifications described in the beginning of this control statement discussion. After each operator entry through the console is read, validated, and processed, the message is reissued, and additional input is accepted from the console until “END” is replied. SPZAP will then continue processing control statements from the input stream until an end-of-file condition is detected.

**Notes:**

1. You can enter control statements through the console in either uppercase or lowercase letters, but AMASPZAP does not fold lowercase input to uppercase.
2. You cannot continue a control statement entered through the console.

Figure 207 on page 614 shows how to enable SPZAP control statements to be entered through the console.

```
//CONSOLIN JOB MSGLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.LINKLIB,DISP=OLD
//SYSIN DD DSN1=SYS1.LINKLIB
//CONSOLIN CONSOLE
/*
```

*Figure 207. Example: Entering SPZAP control statements through console*

**SYSLIB DD Statement**

Defines the data set that contains the module to be updated.

**SYSIN DD Statement**

Defines the input stream.

**CONSOLE Control Statement**

Indicates that SPZAP control statements are to be entered through the console.
DUMPT member [CSECT | ALL | * ] [class-name]

Dumps a specific control section or all control sections in a load module in a PDS, a program object in either a PDSE or a z/OS UNIX file. DUMP produces a hexadecimal printout only, while DUMPT prints the hexadecimal data, the EBCDIC translation, and the mnemonic equivalent of the data (see “Reading SPZAP output” on page 618). The variables are:

member
The member name of the load module in a PDS or program object in a PDSE that contains the control section(s) to be dumped. (Note: This variable, ‘member’, must correspond to the name of a member of the PDS or PDSE that is defined by the SYSLIB DD statement.

csect | ALL | *
Defines the name of the particular control section that is to be dumped. To dump all the CSECTs of a load module in a PDS or a program object in a PDSE, specify “ALL” instead of the CSECT name. If you omit the variable entirely, or, for program objects only, code “*”, SPZAP assumes that you mean to dump only the first CSECT in the load module or program object.

If you specify a CSECT name that SPZAP does not find in the member, SPZAP dumps all of the CSECTs in the member.

Note: DUMP or DUMPT applied to a CSECT consisting only of space allocations (DS statements) will produce no output between the statement printback and the dump-completed message.

class-name
Indicates, for program objects only, the class of text that you want to dump. The default is B_TEXT. Specifying B_*, C_*, or D_* causes SPZAP to dump all text classes beginning with the string that precedes the asterisk. If you want to omit the CSECT name and supply a class-name, code a single asterisk for the CSECT name followed by the class-name.

For information about the values you can specify for class name, see z/OS MVS Program Management: User’s Guide and Reference.

Note: SPZAP does not fold lowercase input to uppercase; be sure to enter class-name in the correct case.

Figure 208 on page 615 shows how to use the DUMPT and DUMP control statements to inspect CSECTs in a program object with multiple text classes in a z/OS UNIX file:

```plaintext
//ZAPDUMP    EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=*  
//SYSLIB   DD PATH='/u/mydir',PATHDISP=(KEEP,KEEP)  
//SYSIN DD *  
DUMPT hwz CEEMAIN C_CODE
DUMP hwz CEESTART B_*
DUMP hwz ALL C_*
/*
```

Figure 208. Example: Using the DUMP control statement with a class name

**SYSLIB DD Statement**
Defines the z/OS UNIX directory that contains the module hwz in which the CSECTs to be inspected reside.

**SYSIN DD Statement**
Defines the input stream that contains the SPZAP control statements.

**DUMPT hwz CEEMAIN C_CODE**
This control statement requests that the contents of class C_CODE in csect CEEMAIN in module hwz be dumped.

**DUMP hwz CEESTART B_***
This control statement requests that the contents of all classes in csect CEESTART in module hwz whose class name begins with B_ be dumped.
**DUMP hwz ALL C_***

This control statement requests that the contents of all classes whose class name begins with C_ in any csect in module hwz be dumped.

**IDRDATA xxxxxxxx**

Causes SPZAP to place up to eight bytes of user data into the SPZAP CSECT identification record of the load module; this is only done if a REP operation associated with a NAME statement is performed and the load module was processed by the linkage editor to include CSECT identification records. The variable is:

xxxxxxx

Eight (or fewer) bytes of user data (with no embedded blanks) that are to be placed in the user data field of the SPZAP IDR of the named load module. If more than eight characters are in the variable field, only the first eight characters will be used.

**Note:** The IDRDATA statement is valid only when used in conjunction with the NAME statement. It must follow its associated NAME statement, or the BASE statement associated with a NAME statement, and precede any DUMP, DUMPT, ABSDUMP or ABSDUMPT statement. IDRDATA statements associated with CCHHR statements will be ignored.

**NAME member [csect | * ] [class-name]**

Identifies a CSECT in a load module member of a PDS, a program object member of a PDSE, or a z/OS UNIX file that is to be the object of subsequent VERIFY, REP, SETSSI, or IDRDATA operations. The variables are:

**member**

The member name of the load module belonging to a PDS, the program object belonging to a PDSE, or a z/OS UNIX file that includes the CSECT that contains the data to be inspected or modified. The load module or the program object must be a member of the data set defined by the SYSLIB DD statement.

**csect | * **

The name of the particular control section that contains the data to be verified or replaced. If you omit this variable, or, for program objects only, code "*", SPZAP assumes that the first CSECT in the load module contained in a PDS, the program object contained in a PDSE, or a z/OS UNIX file is the one to be used. If there is only one CSECT in the load module or program object, this variable is not necessary. If you specify a CSECT name that SPZAP does not find in the member you name, then SPZAP does not perform any requested processing. Instead, it produces hexadecimal dumps of all CSECTs in the member. (The class of text dumped is specified on the class-name variable, and the default is B_text.)

**class-name**

Indicates, for program objects only, the class of text that you want to modify. The default is B_text. If you want to omit the CSECT name and supply a class-name, code a single asterisk for the CSECT name, followed by the class-name.

For information about the values you can specify for class name, see z/OS MVS Program Management: User's Guide and Reference.

**Note:** SPZAP does not fold lowercase input to uppercase; be sure to enter class-name in the correct case.

Note that you can define more than one NAME statement in your input to SPZAP. However, the VERIFY, REP and SETSSI statements associated with each NAME statement must immediately follow the NAME statement to which they apply.

**NAME member**

Identifies the member of a data library that is to be the object of subsequent VERIFY, REP, ABSDUMP, ABSDUMPT or RECORD operations. The variable is:

**member**

The member name of a data library whose contents are to be displayed, verified and/or replaced.
**RECORD nnnnnnn**

This statement identifies a particular record in a member of a PDSE data library and must follow a NAME member statement where member specifies the name of the member. The combination of NAME and RECORD defines the record for which VER/VERIFY and possible REPs are to be performed. nnnnnnnn consists of 1 to 8 decimal digits and specifies the relative record of interest. Leading zeroes are ignored. For example, the first record of a member may be specified as 1 or 01 or 00000001.

**REP offset data**

Modifies data at a specified location in a CSECT or physical record that was previously defined by the NAME, NAME/RECORD combination, or CCHHR statement. The data specified on the REP statement will replace the data at the record or CSECT location stipulated in the offset variable field.

SPZAP issues message AMA122I to record the contents of the specified location as they were before the change was made.

**Note:** IBM recommends that, before you replace any data, you always use VER/VERIFY to make sure that the contents you are going to change with the REP function are what you expect. The offset and length that you specify on the VER/VERIFY statement, however, do not need to match any following REP statement exactly; a single successful VERIFY can validate multiple following REP statements.

**offset**

Provides the hexadecimal displacement of data to be replaced in a CSECT or data record. This displacement need not address a fullword boundary, but it must be specified as a multiple of two hexadecimal digits (0D, 02C8, 001C52).

If the offset value is outside the limits of data record (physical block) or CSECT being modified, the replacement operation will not be performed. When replacing data in a record with a key, the length of the key should be considered in the calculation of the displacement; that is, offset zero is the first byte of the key, not of the data.

**data**

Defines the bytes of data to be inserted at the location. As with the offset variable, the number of bytes of data defined must be specified as a multiple of two hexadecimal digits. If desired, the data within the variable may be separated by commas (never blanks); but again, the number of digits between commas must also be a multiple of two. For example, a REP data variable may look like this:

```
4160B820 (without commas)
  or like this:
 4160,B820 (with commas).
```

If all the data to be modified does not fit into one REP statement (72 bytes), you can code another REP statement.

**Notes:**

1. Remember that SPZAP automatically updates the system status index (SSI) when it successfully modifies the CSECT named or implied on the previous NAME statement.
2. If you are performing multiple VERIFY and REP operations on a CSECT, make sure that all the VERIFY statements precede all the REP statements. This procedure ensures that all REP operations are ignored if one VERIFY reject occurs.
3. You are not required to supply a VERIFY statement before the first REP statement; however, when SPZAP encounters a VERIFY statement, it must be satisfied before SPZAP processes any following REP requests.
4. When you access a record in the VTOC (for example, the data set control block (DSCB)) for modification, SPZAP issues the message AMA117D to the console. No message is issued, however, when an ABSDUMPT operation is performed on the VTOC.
5. The REP statement associated with a NAME or CCHHR must precede any DUMP, DUMPT, ABSDUMP, and ABSDUMPT statements.
SETSSI xxyynnnn
Places user-supplied system status information in the directory entry for the load module member in a PDS or program object member in a PDSE. The SSI entry must have been created when the load module or program object member was link edited. The variable is:

xxyynnnn
Four bytes of system status information the user wishes to place in the SSI field for this member. Each byte is supplied as two hexadecimal digits indicating the following:

<table>
<thead>
<tr>
<th>x</th>
<th>change level</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>flag byte</td>
</tr>
<tr>
<td>nnn</td>
<td>modification serial number</td>
</tr>
</tbody>
</table>

If SPZAP detects an error in any previous VERIFY or REP operation, the SETSSI function is not performed.

Note: Because all bits in the SSI entry are set (reset) by the SETSSI statement, be very careful when using it to avoid altering the vital maintenance-status information. SPZAP issues message AMA122I to record the SSI as it was before the SETSSI operation was performed. See “Updating the System Status Index (SSI)” on page 602.

{VERIFY|VER} offset expected-content
Causes the data at a specified location within a CSECT or physical record to be compared with the data supplied in the statement.

offset
The hexadecimal displacement of data to be inspected in a CSECT or record. This displacement does not have to be aligned on a fullword boundary, but it must be specified as a multiple of two hexadecimal digits, such as 0D, 021C, 014682. If this offset value is outside the limits of the CSECT or data record defined by the preceding NAME, NAME/RECORD, or CCHHR statement, the VERIFY statement is rejected. If this offset value plus the length of the expected-content string is outside the limits of the CSECT or record defined by the preceding NAME, NAME/RECORD combination, or CCHHR statement, the VERIFY statement is rejected and flagged in error. When inspecting a record with a key, the length of the key should also be considered in the calculation of the displacement; that is, offset zero is the first byte of the key.

expected-content
Defines the bytes of data that are expected at the specified location. As with the offset variable, the number of bytes of data defined must be specified as a multiple of two hexadecimal digits. If desired, the data within the parameter may be separated by commas (never blanks), but again, the number of digits between commas must also be a multiple of two. For example, expected content might look like this:

5840C032 (without commas),
or like this: 5840,C032 (with commas)

If all the data does not fit into one VERIFY statement (80-byte logical record), then another VERIFY statement must be defined.

Note: If the two fields being compared are not in agreement, that is, if the VERIFY operation is rejected, no succeeding REP or SETSSI operations are performed until the next NAME or CCHHR control statement is encountered. SPZAP provides a formatted dump of each CSECT or record for which a VERIFY operation failed. Also, note that a VER statement associated with a NAME or CCHHR must precede any DUMP, DUMPT, ABSDUMP and ABSDUMPT statements.

Reading SPZAP output
SPZAP provides two different dump formats for the purpose of checking the data that has been verified or replaced. These dumps (written to the SYSPRINT data set specified by the user) may be of the formatted
hexadecimal type or the translated form. Both formats are discussed below in detail with examples showing how each type will look.

**Formatted hexadecimal dump**

When DUMP or ABSDUMP is the control statement used, the resulting printout is a hexadecimal representation of the requested data. Figure 209 on page 620 gives a sample of the formatted hexadecimal dump. A heading line is printed at the beginning of each block. This heading consists of the hexadecimal direct access address of the block (ABSDUMP only), the length of the record, the class of text (program objects only), and the names of the member and the CSECT that contain the data being printed (if the dump is for specific CSECT or load module). Each printed line thereafter has a three-byte displacement address at the left, followed by eight groups of four data bytes each. The following message is printed under the last line of the dump printout:

```
AMA113I  COMPLETED DUMP REQUIREMENTS
```

**Translated dump**

The control statements DUMPT and ABSDUMPT also provide an operation code translation and an EBCDIC representation of the data contained in the dump. Not all characters are translated to EBCDIC, only upper case and a few special characters are translated. Others, such as lowercase letters are not translated and their translations are substituted by periods.
**Figure 209. Sample formatted hexadecimal dump**

Figure 210 on page 621 shows the format of the translated dump. The first byte of each halfword of data is translated into its mnemonic operation code equivalent, provided such a translation is possible. If there is not equivalent mnemonic representational value to be given, the space is left blank. This translated line of codes and blanks is printed directly under the corresponding hexadecimal line. An EBCDIC representation of each byte of data is printed on two lines to the right of the corresponding line of text, with periods substituted for those bytes that have been set not to be translated to valid printable characters.
**Figure 210. Sample translated dump**

<table>
<thead>
<tr>
<th>MEMBER NAME</th>
<th>IEANUC05</th>
<th>CSECT NAME</th>
<th>SUTFPL59</th>
</tr>
</thead>
<tbody>
<tr>
<td>000000</td>
<td>47F0</td>
<td>F01C</td>
<td></td>
</tr>
<tr>
<td>000020</td>
<td>18BF</td>
<td>41C0</td>
<td></td>
</tr>
<tr>
<td>000040</td>
<td>0000</td>
<td>0048</td>
<td></td>
</tr>
<tr>
<td>000060</td>
<td>0000</td>
<td>0048</td>
<td></td>
</tr>
</tbody>
</table>

AMA113I COMPLETED DUMP REQUIREMENTS
AMA100I AMASPZAP PROCESSING COMPLETED

**Notes:**

1. There are no **CCHHR** values. The program management binder manages its own DASD storage and returns no physical location.
2. **RECORD LENGTH:** indicates length of the CSECT or module, not the length of the physical record containing the CSECT or module.
3. Program management binder returns no text for named or unnamed common areas. The length of the common section will be indicated. Message AMA152I indicates that no text has been returned.
4. SPZAP displays MEMBER NAME and CSECT NAME on as many lines as necessary. The names can be as long as 1024 characters.
5. SPZAP labels common storage in a program object with the tag COMMON NAME instead of CSECT NAME. Named common displays that name. Unnamed common is flagged as $BLANK COMMON. Private code is displayed with the subheading CSECT NAME: $PRIVATE CODE.
6. **UNINITIALIZED DATA SKIPPED** may appear.
7. IGWSPZAP is the part of SPZAP that receives control when accessing or updating program objects in a PDS/E or z/OS UNIX file, or data in a PDS/E. Listings and messages refer to AMASPZAP when processing a PDS or IGWSPZAP when processing a PDSE or a z/OS UNIX file.
Figure 211. Sample formatted hexadecimal dump for PDSE program object module
Figure 212. Sample translated dump for PDSE data library
Figure 213 on page 624 shows sample output from a successful SPZAP when PARM=PRECHECK is specified.

AMASPZAP INSPECTS, MODIFIES, AND DUMPS CSECTS OR SPECIFIC DATA RECORDS ON DIRECT ACCESS STORAGE.
AMA167I SYSIN PRECHECKING STARTED
  NAME EXSPZAP EXSPZAP
  VER 0020 C2E8
  REP 0020 9999
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  REP 0020 C2E8
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  IDRDATA CHKSUMOK
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  CHECKSUM 00621F69
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  CHECKSUM 00621F69
AMA132I CHECKSUM WAS CORRECT, IS NOW 0.
  */
AMA167I SYSIN PRECHECKING COMPLETED

AMA168I SYSIN PROCESSING STARTED
  NAME EXSPZAP EXSPZAP
  VER 0020 C2E8
  REP 0020 9999
AMA122I OLD DATA WAS C2E8
  REP 0020 C2E8
AMA122I OLD DATA WAS 9999
  IDRDATA CHKSUMOK
  CHECKSUM 00621F69
AMA132I CHECKSUM WAS CORRECT, IS NOW 0.
/*
AMA168I SYSIN PROCESSING COMPLETED
AMA100I AMASPZAP PROCESSING COMPLETED

Figure 213. Sample report from a successful SPZAP with PARM=PRECHECK

Figure 214 on page 624 shows sample output from SPZAP when errors are found with PARM=PRECHECK specified.

AMASPZAP INSPECTS, MODIFIES, AND DUMPS CSECTS OR SPECIFIC DATA RECORDS ON DIRECT ACCESS STORAGE.
AMA167I SYSIN PRECHECKING STARTED
  NAME EXSPZAP EXSPZAP
  VER 0020 C2E8
  REP 0020 9999
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  REP 0020 C2E8
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  IDRDATA CHKSUMOK
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  CHECKSUM 00621F69
AMA167I SYSIN PRECHECKING SKIPS UPDATES
  CHECKSUM 00621F69
AMA133I CHECKSUM ERROR. NO-GO SWITCH SET
AMA125I EXSPZAP IDR COUNT = 0002 (MAX=0019)
  */
AMA168I SYSIN PRECHECKING FOUND ERRORS
AMA100I AMASPZAP PROCESSING COMPLETED

Figure 214. Sample report from SPZAP when errors are found with PARM=PRECHECK
Chapter 18. AMATERSE: Pack and unpack a data set

AMATERSE is a service aid program that operates in problem state. You can use AMATERSE to pack a data set before transmitting a copy to another site, typically employing FTP as the transmission mechanism. A complementary unpack service is provided to create a similar data set at the receiving site.

Note: IBM also supports z/OS Problem Documentation Upload Utility (PDUU), which is a utility that sends large amounts of documentation to IBM. AMATERSE is useful for compressing (packing) and unpacking relatively small amounts of service data, but is incompatible with PDUU (output and input), and offers no data transfer capability. For information about PDUU, see Chapter 19, “AMAPDUPL: Problem Documentation Upload Utility,” on page 631.

AMATERSE supports Direct Access Storage Device (DASD) and tape data sets:

- Sequential data sets, which can be unpacked by VM TERSE.
- Partitioned data sets (PDS), and partitioned data sets extended (PDSE) that do not contain program objects.
- Large format (DSNTYPE=LARGE) data sets.
- Fixed and variable, blocked and unblocked, spanned and unspanned record formats (RECFM) =F, FB, FBS, V, VB,VBS where the logical record length (LRECL) is less than 32K; and RECFM=VBS where the LRECL may be more than 32K but less than 64K.
- Data sets with records containing ISO/ANSI or machine code printer control characters.
- Placement of data sets into cylinder-managed space is also supported.

Planning for AMATERSE

AMATERSE is an application that prepares diagnostic materials, such as z/OS dumps and traces, for transmission to IBM and independent software vendor sites. When the materials arrive, AMATERSE also provides a means to create similar data sets to support diagnosis of problems.

If you have previously used the TRSMAIN utility (see TRSMAIN Utility (techsupport.services.ibm.com/390/trsmain.html)), note the following changes made to prepare AMATERSE for formal inclusion in z/OS:

- Use AMATERSE as the preferred application program name rather than TRSMAIN. TRSMAIN ships as an alias entry point to AMATERSE.
- Use the replacements for the DDNAMES, which are SYSUT1 and SYSUT2. When the TRSMAIN entry point of AMATERSE is invoked, DDNAMES INFILE and OUTFILE remain as the defaults.
- AMATERSE is in MIGLIB, a library that is part of the link list. No STEPLIB DDNAME is necessary to invoke AMATERSE.
- In nearly all cases, you can use AMATERSE, the TRSMAIN utility, and VM terse interchangeably. See “Restrictions for AMATERSE” on page 628 for the exceptions to this rule.
Invoking AMATERSE

Figure 215 on page 626 shows an example of the JCL to invoke AMATERSE. Lower case text reflects the data that you must alter.

```plaintext
//jobname  JOB ...
//stepname EXEC PGM=AMATERSE,PARM=aaaaa
//SYSPRINT DD SYSOUT=*,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=12901)
//SYSUT1   DD DISP=bbb,DSN=your.input.dataset.name
//SYSUT2   DD DISP=ccc,DCB=ddd,DSN=your.output.dataset.name,
//          SPACE=space_parameters
//SYSUT3   DD DISP=ccc,SPACE=space_parameters
```

Figure 215. Example: AMATERSE JCL

Specifying the JCL statements for AMATERSE

If you have previously used the TRSMAIN program to invoke AMATERSE, you can continue using it along with the old DDNAMES. However, if you choose to use AMATERSE instead of TRSMAIN, realize that the DDNAMES are changed: SYSUT1 replaces INFILE and SYSUT2 replaces OUTFILE.

A missing SYSUT1 DD statement results in an RC X'10' error message:

```plaintext
RC X'10', AMA522E INPUT DATASET HAS AN UNSUPPORTED DATASET ORGANIZATION
```

A missing SYSUT2 DD statement will result in an RC X'28' error message:

```plaintext
RC X'28', AMA518E UNABLE TO OPEN OUTPUT DATASET
```

AMATERSE requires the following JCL statements. The required DD statements are SYSPRINT, SYSUT1 and SYSUT2. SYSUT3 is optional. Replace aaaaa in the example with one of the following values:

**EXEC**

Marks the beginning of the job.

**PACK**

Compresses records in a data set so that the output is known as the simple format.

**SPACK**

Compresses records in a data set so that the output is known as the complex format. The SPACK option is more time-consuming than the PACK option by a factor of about three, but in many cases produces much smaller output.

**Note:** A data set compressed by either PACK or SPACK should not be modified in any way. If such a data set is modified, the UNPACK routines are unable to reconstruct the original data set.

**UNPACK**

Reverses the PACK or SPACK operation. If you inadvertently packed a data set multiple times, restore it using the UNPACK function the same multiple number of times.

**SYSPRINT statement**

This DD defines where all messages from the program are sent. It must be RECFM=FBA and an LRECL between 121 and 133. Any block size that is a legal multiple of the LRECL is supported.

**Note:** The DCB information does not have to be specified on the DD statement and will default to the correct values.
**SYSUT1 statement**
This DD defines the data set to be compressed if PACK or SPACK parameter is specified on the EXEC statement. If UNPACK is specified, then it defines the compressed data set to be restored. See "Restrictions for AMATERSE" on page 628 for special considerations.

**Note:** If TRSMAIN entry point is used, INFILE statement is used instead of SYSUT1.

**SYSUT2 statement**
This DD defines the data set to receive the compressed output. If you specify PACK or SPACK on the EXEC statement, this is the data set that receives the compressed output. If you specify UNPACK, this is the data set that receives the restored output. See “Allocation considerations” on page 629 and “Space considerations” on page 629.

**SYSUT3 statement**
This optional DD defines the temporary data set to use when the PACK or UNPACK operation is performed against large PDS data sets. This data set acts as an intermediate form between PDS and PACKED data set. Only the DISP and SPACE parameters are necessary to be supplied by JCL. If the SYSUT3 DD statement is missing, AMATERSE allocates this data set by itself and deletes it automatically after AMATERSE ends.

**AMATERSE return codes**
When AMATERSE ends, one of the following return codes is placed in general purpose register 15. Refer to other AMA messages issued to debug the problem.

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion.</td>
</tr>
<tr>
<td>4</td>
<td>Error in file operation.</td>
</tr>
<tr>
<td>8</td>
<td>Error in file operation.</td>
</tr>
<tr>
<td>10</td>
<td>Unsupported data set format.</td>
</tr>
<tr>
<td>12</td>
<td>Operation cannot be performed with the specified data set.</td>
</tr>
<tr>
<td>16</td>
<td>Invalid input specified.</td>
</tr>
<tr>
<td>20</td>
<td>Invalid input specified.</td>
</tr>
<tr>
<td>24</td>
<td>Severe error in file operation.</td>
</tr>
<tr>
<td>28</td>
<td>Severe error occurred during file open.</td>
</tr>
<tr>
<td>32</td>
<td>Invalid output device.</td>
</tr>
<tr>
<td>33</td>
<td>Invalid record length.</td>
</tr>
<tr>
<td>36</td>
<td>Buffer storage obtain failure.</td>
</tr>
</tbody>
</table>
Severe error. Abend with 1111.

System or user abend occurred.

**Invoking AMATERSE from a problem program**

To invoke AMATERSE from a program, specify the following information:

- PACK, SPACK, or UNPACK on the PARM parameter of the EXEC statement
- The DDNAMES of the data sets to be processed by the AMATERSE program, if the calling program is to override the DDNAMES.

Figure 216 on page 628 shows how to invoke AMATERSE using alternate DDNAMES:

```plaintext
*        Invoke AMATERSE to perform SPACK processing
        LINK EP=AMATERSE,PARAM=(PARM,DDNAMES),VL=1

*        Request SPACK option
        PARM DS 0H EXEC PARM= data
        PARMLEN DC Y('PARMTEXT') Length of data
        PARMTEXT DC C'SPACK' AMATERSE processing option

*        Request MYPRINT, MYSYSUT1, and MYSYSUT2 instead
        of SYSPRINT, SYSUT1, and SYSUT2 respectively
        DDNAMES DS 0H DDNAME override data
        DDNAMEL DC Y(DDNAME9-DDNAMET) Length of data
        DDNAMTT DS 0C DDNAME override list
        DC 5X8'0' Not used by AMATERSE

*        SYSPRINT DS CL8'MYPRINT' Instead of SYSPRINT
        DC X8'0' Not used by AMATERSE

*        SYSUT1 DS CL8'MYSYSUT1' Instead of SYSUT1
        DC X8'0' Not used by AMATERSE

*        SYSUT2 DS CL8'MYSYSUT2' Instead of SYSUT2
        DC X8'0' Not used by AMATERSE

*        SYSUT3 DS CL8'MYSYSUT3' Instead of SYSUT3

*        DDNAME9 DS 0C End of list
```

**Figure 216. Example: AMATERSE JCL from a problem program**

For a description of the parameter list, see the topic on Invoking Utility Programs from an Application Program in z/OS DFSMSdfp Utilities. From that information, AMATERSE supports the `optionsaddr` and `ddnameaddr`, but not `hdingaddr`. AMATERSE also supports DDNAMES SYSPRINT, SYSUT1, SYSUT2, and SYSUT3, but not DDNAMES SYSIN and SYSUT4, which are shown in the "ddname parameter list (DDNMELST)" in that information.

**Additional considerations for AMATERSE**

When using AMATERSE, certain restrictions apply as well as allocation and space considerations, as well as restrictions to consider when you are using AMATERSE.

**Restrictions for AMATERSE**

The following restrictions apply to AMATERSE:

- VSAM data sets and direct (DSORG=DA) data sets are not supported.
- Data sets with keys (KEYLEN) are not supported.
- A partitioned data set (PDS) compressed by AMATERSE on MVS cannot be unpacked by VM TERSE. This results in a 1007 or 1009 return code from VM TERSE.
- A PDS must be compressed to a DASD.
- Partitioned data sets extended (PDSE) containing program objects are not supported.
• AMATERSE handles data sets with a LRECL of more than 32K but less than 64K only when RECFM=VBS DASD data sets are processed.
• A data set with the FB record format can be packed and unpacked to a FBS data set. However, during the UNPACK operation, extending a non-empty output data set with DISP=MOD is not possible because this results in a FB data set. An error message is issued for this.
• AMATERSE does not support large block interface (LBI).

Allocation considerations

The data set compressed by AMATERSE (produced by PACK or SPACK) must be of fixed or fixed-blocked record format (RECFM) with a record length (LRECL) of 1024 and any legal block size (BLKSIZE). These values do not have to be specified explicitly on the DD statement.

The data set restored by AMATERSE (produced by UNPACK) must match the original RECFM and LRECL. Leave the DCB information off the DD statement for AMATERSE program to set it up. If it unpacks to an already existing data set then the DCB parameters are checked for compatibility. RECFM must be the same in all cases except for Variable to Undefined and Undefined to Variable. If you specify the DCB parameters to force data that was originally variable (V) format into undefined (U) format, or conversely, a warning message is written and the operation is performed.

Space considerations

When allocating space for the output data set SYSUT2, you must estimate the required size information:

• For the PACK or SPACK option a data set compressed by AMATERSE is expected to be about half the size of the original. Allocate more than expected and use the RLSE (partial release parameter) function of the SPACE value to release the unused portion back to the system.
• For the UNPACK option: If the data set contains random data, allocate three to five times the size of the compressed data set. If the data set contains Listing, Document, or Messages type data, allocate five to ten times the size of the compressed data set.

If there is not enough allocated space, the program issues ABEND X'B37':

Not Enough Space Allocated for the Output Data Set
Chapter 19. AMAPDUPL: Problem Documentation Upload Utility

The IBM z/OS Problem Documentation Upload Utility (PDUU) is a utility that sends large amounts of documentation in a more efficient manner than sending one large data set to IBM sites. This utility sections the input data set (such as stand-alone dump data set) into smaller data sets that are compressed and sent in parallel using multiple, simultaneous transfer sessions. This results in shorter transmission time for very large data sets. You can also encrypt the data sets. These sessions can send diagnostic documentation to IBM using File Transfer Protocol (FTP) or Secured Hypertext Transfer Protocol (HTTPS).

There are two work buffers for each transfer session (the "A" buffer and the "B" buffer). Each "A" work buffer is filled by copying records from the input data set. When the "A" buffer is full, the sessions are started in parallel. At the same time, each "B" work buffer is filled by copying records from the input data set. When the "B" buffer is full and the transfer of the "A" buffer is complete, transfer of the next "B" buffer starts. This process continues between the "A" and the "B" buffers, until everything in the input data set is sent.

You can have up to 20 transfer sessions running simultaneously, specifiable by the CC_FTP or CC_HTTPS parameter.

For FTP sessions, data is buffered into work data sets. The work data sets are dynamically allocated and can range in size from 1 MB to 9,999 MB. You can experiment to see what works best in your environment, but here are some guidelines:

- Start with three or four parallel FTP sessions. Too many parallel FTP sessions can saturate the network link.
- Use medium size work data sets.

For HTTPS sessions, data is buffered into 31-bit storage. When choosing a WORK_SIZE value, note that you may have limited private storage available (managed on an installation basis) and this number will be used as the size of the buffer.

Each WORK_SIZE buffer sent to IBM results in the creation of a numbered file that IBM uses to recreate the original data set for diagnosis. If the WORK_SIZE is very small in relationship to the input data set, you can end up with too many files on the IBM sites. For example, if you are sending a 100 GB z/OS stand-alone dump and make the work data set size 1 MB, PDUU will attempt to create 100,000 files on the IBM site, which exceeds the IBM limit of 99,999 files. This also causes a lot of delay by starting and stopping the transfer sessions for each file.

If the work buffers are very large in relationship to the input data set size, the amount of overlap time is decreased. When the program first starts, it must fill the "A" work buffer before it starts transmitting any data, which means the copy time is not overlapping with data that needs to be sent. For example, if you were sending a 1 GB dump and you set the work data set size to 1 GB (1,000 MB), there is no overlap between copying the records and sending the work files.

If the input data set is a partitioned data set (PDS/PDSE), PDUU unloads it first into a sequential data set using the IEBCOPY utility.

PDUU typically compresses the input data before it is written to the work buffer; therefore, it is counterproductive to use a tool such as AMATERSE or TRSMAIN to compress the input data set before using PDUU to send it to the IBM site. If a file is tersed, PDUU will not perform further compression. Overall performance of using AMATERSE with PDUU to send the file takes longer than if an untersed file is compressed and sent using PDUU.
Planning to use PDUU

Use PDUU as the primary utility for sending large volumes of documentation, such as stand-alone dumps, to the IBM site.

When using HTTPS mode, PDUU uses virtual storage to buffer requests instead of DASD data sets. The requesting AMAPDUPL job must have access to enough private virtual storage to satisfy the request. Please refer to the discussion of the WORK_SIZE parameter for details.

If you have previously used the MTFTPS stand-alone tool program (before z/OS V1R13), you must understand the following changes made to package the PDUU utility as part of z/OS:

- The PDUU utility name is AMAPDUPL; however, MTFTPS ships as an alias entry point to AMAPDUPL.
- AMAPDUPL resides in SYS1.MIGLIB (which must be a data set in the LNKLST concatenation), so a STEPLIB DDNAME is not necessary to invoke AMAPDUPL.
- AMA messages are described in z/OS MVS System Messages, Vol 1 (ABA-AOM).

Prerequisites and restrictions for PDUU

With APAR OA55959, PDUU now supports two transmission protocols: FTP and HTTPS. Both require proper configuration of the z/OS Communications Server to use the preferred protocol.

For HTTPS mode, specify HTTPS mode using the USE_HTTPS=Y SYSIN parameter. You will need a valid configured key store containing the necessary certificates to access the IBM documentation sites. This can be specified by the HTTPS_KEYRING or HTTPS_KEYFILE parameters.

For FTP mode, see the topic on Transferring files using FTP in z/OS Communications Server: IP Configuration Guide. The PDUU uses active FTP mode as the default, unless another mode is requested with the corresponding FTP subcommands defined in FTPCMDS data set.

The PDUU supports the following types of input data sets:

- Members of partitioned data sets (PDS) and partitioned data sets extended (PDSE)
- Large format (DSNTYPE=LARGE) and traditional sequential data sets
- Extended format sequential data sets
- Fixed, variable, and undefined-length, blocked and unblocked, spanned and unspanned record formats (RECFM) = F, FB, FBS, V, VB, VS, VBS, U
- Data sets with records containing ISO/ANSI or machine code control characters
- Data sets in cylinder-managed space.
- Partitioned data sets (PDS) and partitioned data sets extended (PDSE).

PDUU does not support the following types of input data sets:

- Large block interface (LBI) (no BLKSIZE value).
- VSAM and direct (DSORG=DA) data sets
- Data sets with keys (KEYLEN)
- z/OS UNIX files
- Concatenated data sets of any type

JCL statements for PDUU

The JCL statements for the PDUU are:

**SYSPRINT**

The data set can be either SYSOUT or a sequential data set. The data set must be RECFM=FB, LRECL=134. For additional details, see “Prerequisites and restrictions for PDUU” on page 632.
SYSUT1
The sequential or partitioned data set to transfer to IBM. For additional details, see “Prerequisites and restrictions for PDUU” on page 632.

SYSUT2
This data set is optional and can be used only when transferring partitioned data sets (PDS/PDSE). It defines a sequential unload data set for IEBCOPY output produced during the unload operation. If the SYSUT2 statement is omitted the unload data set will be allocated dynamically. This parameter can be used if you want to directly control the allocation of the unload data set, for example, to specify a particular volume or certain amount of volume space. For additional details about usage and allocation parameters of the unload data set see the topic on Unloading (Backing up) Data Sets in z/OS DFSMSdfp Utilities. See also “Example 9: Using SYSUT2 to allocate an unload data set” on page 641.

SYSIN
A sequential data set that uses the following control statements. The data set must be RECFM=FB, LRECL=80. For additional details, see “Prerequisites and restrictions for PDUU” on page 632.

PDUU is managed through the following SYSIN statements with these guidelines:
- Use an asterisk (*) in the first column of each comment line to indicate comments.
- Keywords must start in column one.
- Use control statements that are in form VERB=OPERAND.
- Mixed case verbs and operands are allowed.
- The operand starts in the column after the equal sign and goes to the first blank column except TARGET_SYS, DIRECTORY, CIPHER_KEY, ACCOUNT, HTTPS_KEYFILE, HTTPS_KEYRING, HTTPS_KEYSTASH, HTTPS_PROXY, HTTPS_LOCALIPADDR, USERID, and PASSWORD, which can contain blanks.
- Anything after the first blank is ignored except for any operands that can contain blanks. In those cases, do not use blanks from column one to the end of the operand.
- Control statements can be coded on one or more (up to 6) consecutive records. Control statements with operands that allow blanks must not extend beyond column 71, but can continue on the following record in columns 16 through 71. Columns 1 through 15 of the continuation record must be blank. See “Example 10: Using a multiple record control statement in SYSIN” on page 642. Control statements with operands that do not allow blanks can occupy columns 1 through 80.
- When specifying a control statement twice, the last specification is used.

USE_HTTPS
An optional parameter that when specified with a value of 'Y' enables HTTPS mode and indicates that PDUU use the HTTPS protocol to transfer data to IBM.

Omitting this parameter results in PDUU using the default FTP protocol.

TARGET_SYS
The name of the TCP/IP system to transfer the files to. One through 256 characters, dotted decimal format is allowed, no default value, can not contain blanks, and it must be specified.

For FTP mode, if using a proxy server, this should be the name of the proxy server.

You can include additional FTP command parameters on the TARGET_SYS parameter by using the z/OS UNIX specifications as shown in the topic FTP command -- Entering the FTP environment in z/OS Communications Server: IP User’s Guide and Commands. For example, to trace output (-d) and use a specific ftpdata_filename (-f) use the following command:

```
TARGET_SYS=-d -f"//WES.MYFTP.DATA" testcase.boulder.ibm.com
```

Use the -p parameter to specify an alternate IP stack.

For HTTPS mode, does not allow for the specification of a config file or proxy information through the TARGET_SYS parameter.
USERID
The user ID on the target system that is used to send the files. One through 64 characters, no default value, does not have to be specified, and can contain imbedded blanks.

For FTP mode only, if USERID and PASSWORD are not supplied and NETRCLEVEL=2, the values from the NETRC data set is used for the FTP sessions.

If using a proxy server, this can be the full login to the remote system in the format userid@remote.system.name.

PASSWORD
The password for the USERID on the target system. One through 64 characters and the default value is blanks.

For FTP mode only, if using a proxy server, this can be the USERID and PASSWORD for the proxy server in the format userid@password.

ACCOUNT
For FTP mode, the account data that is sent when an FTP session is started. One through 64 characters with no default value.

This parameter is ignored for HTTPS mode.

TARGET_DSN
The variable (descriptive) portion for the file names on the target system. One through 64 characters, no default value, and it must be specified.

WORK_DSN
For FTP mode, the prefix for the data set names of work files on the sending system. One through 40 characters, no default value, and it must be specified. The work data sets are large format, sequential, data sets and cannot have the compaction attribute.

Note: Because work files are dynamically allocated with large format and do not support compressed format, if you specify data class for work files with the compaction attribute or N, the following message is issued for all work files:

IGD17163I COMPRESSION REQUEST NOT HONORED FOR DATA SET
work_file_dsnname BECAUSE DATA SET CHARACTERISTICS
DO NOT MEET COMPRESSION CRITERIA, ALLOCATION CONTINUES

This parameter is ignored for HTTPS mode.

CC_HTTPS | CC_FTP
The number of parallel FTP transfer sessions to use when transmitting the files. One or two decimal digits, the value must be between one and 20, and the default is two. CC_HTTPS is an alias for CC_FTP.

WORK_SIZE | WORK_DSN_SIZE
The maximum size of the work buffer in megabytes. One through four decimal digits. When unspecified, the default is 100. WORK_SIZE is an alias for WORK_DSN_SIZE.

For FTP mode, two DASD data sets per session (CC_FTP) are dynamically allocated with this size.

For HTTPS mode, virtual storage of the size 2 * CC_HTTPS# * WORK_SIZE# * 1 MB is requested.

When choosing values for WORK_SIZE and CC_HTTPS parameters, be aware that these buffers are allocated in 31-bit storage, and this is limited to significantly less than 2 GB. For example, if you have CC_HTTPS=4 and WORK_SIZE=200, AMAPDUPL will attempt to allocate virtual storage of 1600 MB. This may fail with return code 12 and message AMA761E if requested storage is not available. Also, beware that transfers may begin, but fail due to the web enablement toolkit storage requirements. PDUU will also fail with return code 12 and message AMA761E if the web enablement toolkit is unable to obtain storage for PDUU. Consider lowering the CC_HTTPS or WORK_SIZE parameters in this case.
KEEP_WORK
For FTP mode, the parameter to save the work data sets that are dynamically allocated for each FTP session. If you omit the KEEP_WORK parameter, the program does not save the work data sets. Y is the only value for the KEEP_WORK parameter.

**Note:** Only specify this parameter when debugging a problem.
This parameter is ignored for HTTPS mode.

DATACLAS
For FTP mode, the data class to use when allocating the work files on the sending system. One through eight characters with no default value.

This parameter is ignored for HTTPS mode.

MGMTCLAS
For FTP mode, the management class to use when allocating the work files on the sending system. One through eight characters with no default value.

This parameter is ignored for HTTPS mode.

STORCLAS
For FTP mode, the storage class to use when allocating the work files on the sending system. One through eight characters with no default value.

This parameter is ignored for HTTPS mode.

DIRECTORY
The directory on the target system where the files will be sent with FTP or HTTPS. One through 32 characters, with no default, can contain blanks, and you must specify the directory.

For HTTPS transfer to www.secure.ecurep.ibm.com specify the destination without any leading or trailing slashes, such as 'DIRECTORY=mvs'.

CASE
The CASE id associated with the file and problem. This field must be 11 numeric or uppercase characters. Do not specify when the PMR statement is specified. Example: TS123456789

PMR
The PMR number with which this file is associated. Do not specify when the CASE statement is specified. This field must be 13 numeric or uppercase characters, specify in the form xxxxxx.yyy.zzz, and define the variables as:

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXXXX</td>
<td>PMR Number</td>
<td>34143</td>
</tr>
<tr>
<td>YYY</td>
<td>Branch office</td>
<td>055</td>
</tr>
<tr>
<td>ZZZ</td>
<td>IBM Country Code</td>
<td>724</td>
</tr>
</tbody>
</table>

CIPHER_KEY
The encryption key to use for 192-bit triple DES encryption. The 24 characters following CIPHER_KEY= are used as the key. The key can include imbedded and/or trailing blanks. For example, CIPHER_KEY=HERE IS CIPHER KEY IN 24 or CIPHER_KEY=Shortkey. If you do not specify CIPHER_KEY=, no encryption is performed. If you encrypt the data set using CIPHER_KEY, you must provide IBM with the encryption key so they can perform problem diagnosis.

**Note:** If CIPHER_KEY= is followed by 24 blanks, the file will be encrypted with a key of 24 blanks.

NO_FTP
A value of 'Y' specifies that PDUU compress, optionally encrypt, separate files into parts, and move the part to a local z/OS Unix Systems Services directory, without FTPing the files. PDUU uses TSO services to send data sets to USS directories. When you specify NO_FTP=Y:
• TARGET_SYS, CC_FTP, USERID, and PASSWORD are not required
• CC_FTP settings are ignored and set to 1
• FTPCMDS DD will be ignored
• The system allocates the SYSTSPRT DD to receive messages from TSO.

Once transferred, you can browse the files and extract them from the z/OS Unix Systems Service directory. The file names used depend on the PMR and TARGET_DSN input:

```
PMR.TARGET_DSN.Tdate.MTFTP.F00002 to ...Fnnnnn
```

The size and number of files you end up with depends on the WORK_DSN_SIZE SYSIN control statement and how well the input file compresses.

The date section is a random string based on the time the job is run, and PDUU creates different output file names if the same file is sent at a different time. In addition there will be a small file with suffix F001 containing the control record with information necessary to recreate the file on the receiving end.

Please package and send all generated files to IBM with the file names created. Use the NO_FTP=Y option if you have a closed data center (with no outside internet access). PDUU then prepares files you can send to IBM service on removable media as desired.

NO_FTP is ignored when USE_HTTPS is specified.

**HTTPS_KEYRING**
Specify a SAF key ring or PKCS #11 token containing certificates necessary to connect to the HTTPS sessions. Of the form:

- SAF key ring name, specified as userid/keyring
- PKCS #11 token, specified as *TOKEN*/token_name

**HTTPS_KEYFILE**
Specifies a path and file name of the key data base file created by the System SSL gskkyman utility.

**HTTPS_KEYSTASH**
Specifies the path and file name of the password stash file created by the System SSL gskkyman utility. This option is required when HTTPS_KEYFILE is specified.

**HTTPS_PORT**
An optional parameter when USE_HTTPS=Y is specified indicating the remote port number to which to connect. The default value is 443.

**HTTPS_IPSTACK**
An optional parameter when USE_HTTP=Y is specified indicating the local TCP/IP stack name to be used when connecting to the IBM site. 1-8 characters specifications are allowed.

**HTTPS_LOCALIPADDR**
An optional DD statement that gathers debug information such as messages issued to the SYSPRINT data set and the FTP protocol messages. The data set must be RECFM=FB, LRECL=134.

**HTTPS_LOCALPORT**
An optional parameter when USE_HTTP=Y is specified indicating the outgoing port number from which the connection is to originate.

**HTTPS_PROXY**
An optional parameter when USE_HTTP=Y is specified indicating the HTTP proxy to use. Must specify starting with http:// or https://. For example: http://my.proxy.com

**HTTPS_PROXYPORT**
An optional parameter when USE_HTTP=Y is specified indicating the proxy port to connect to.

**HTTPS_PROXYUSERNAME**
An optional parameter when USE_HTTP=Y is specified indicating the username to connect to the HTTP proxy. One through 64 characters and can contain embedded blanks. Must specify with HTTPS_PROXYPASSWORD.
HTTPS_PROXYPASSWORD
An optional parameter when USE_HTTP=Y is specified indicating the password to connect to the HTTP proxy. One through 64 characters and can contain embedded blanks. Must specify with HTTPS_PROXYUSERNAME.

HTTPS_VERBOSE
An optional parameter when that when specified with a value of 'Y' and when USE_HTTP=Y indicates to the web enablement toolkit to produce verbose messages for HTTPS transfers. These messages can be helpful in diagnosing connection issues and aiding in IBM problem determination. The HTTPS_VERBOSE_DD can be used to change where these messages are sent.

HTTPS_VERBOSE_DD
An optional parameter to specify a 1-8 character DD name that takes effect when the HTTPS_VERBOSE=Y parameter is used. The DD name indicates where the web enablement toolkit is to place the verbose messages. This must meet the requirements as described in HTTP/HTTPS enabler options and values in the HWTH_OPT_VERBOSE_OUTPUT option. The default is SYSPRINT when not specified.

DEBUG
An optional DD statement that gathers debug information such as messages issued to the SYSPRINT data set and the FTP protocol messages. The data set must be RECFM=FB, LRECL=134.

FTPCMDs
For FTP mode, an optional DD statement that provides additional flexibility for traversing firewall or proxy servers. When this DD statement is provided, after the initial USERID and PASSWORD are sent, the specified sequential data set is read by the application and the commands contained in the data set are included as FTP commands. The data set must be RECFM=FB and LRECL=80.

This DD is ignored for HTTPS mode.

SYSTSPRT
An optional DD statement that shows messages from TSO operations when you have NO_FTP=Y specified. If you receive message AMA778I with a return code of X’04’ and function code of X’C’, add this DD statement to your JCL to receive messages and rerun if necessary to receive messages.

JCL examples for PDUU
Use the following JCL examples as a guideline for creating your own JCL. Consider storing your user ID and password in a separate concatenated data set. Doing so provides added security because the user ID and password are not directly in the JCL. It is also makes it much easier to change the user ID and password across multiple jobs.

You can use some of the JCL examples as a starting point to traverse a firewall or proxy server. There are very few common characteristics for firewall or proxy servers with local customization. If you are able to traverse the firewall or proxy server with a plain FTP statement, modifications to the parameters USERID, PASSWORD, ACCOUNT, and TARGET_SYS, in conjunction with commands in the FTPCMDs data set, the ftp_data file, or both can permit the z/OS PDUU to traverse your firewall or proxy server.

Example 1: Simple FTP connection
The JCL example in Figure 217 on page 638 invokes the AMAPDUPL program to transfer file H44IPCS.WESSAMP.TRKS055K to the testcase.boulder.ibm.com system as a set of work files stored in /tobiom/mvs with the shared prefix 12345.123.123.wessamp.bigfile. Each of the three work files is 500 MB.
Example 2: FTP connection using a proxy server

In Figure 218 on page 638, the USERID control statement has the format `user@hostname`, where `hostname` is the name of the TCP/IP system to transfer files to, and `user` is the user name on the hostname system. The PASSWORD control statement has format `proxyuser@proxypass`, where `proxyuser` is the user name on the proxy server and `proxypass` is the user password on the proxy server. TARGET_SYS is the name of the TCP/IP proxy server.

Example 3: FTP connection using a proxy server with proxy user ID

In Figure 219 on page 639, the USERID control statement has format `user@proxyuser@hostname`, where `hostname` is the name of the TCP/IP system to transfer the files to, `user` is the user name on the hostname system, and `proxyuser` is the user name on the proxy server. The PASSWORD control statement has format `proxyuser@proxypass`, where `proxyuser` is the user name on the proxy server and `proxypass` is the user's password on the proxy server. TARGET_SYS is the name of the TCP/IP proxy server.
Example 4: Using a proxy server with the FTPCMDS DD statement

In Figure 220 on page 639, the USERID control statement has format proxyuser@hostname, where hostname is the name of the TCP/IP system to transfer the files to, and proxyuser is the user name on the proxy server. The PASSWORD control statement defines the user password on the proxy server. The data set name WES.FTPCMDS.DATA contains an additional user command with an anonymous user name and password on the hostname system.

Example 5: Using a proxy server with a port specification on the TARGET_SYS parameter

The example in Figure 222 on page 640 uses a proxy server with a port specification of 2121 on the TARGET_SYS parameter and inline FTPCMDS DD statement. This example is similar to the previous one, the only difference are the FTPCMDS is an in-stream data set and the port specification is included on the TARGET_SYS parameter.
Example 6: Forcing PASSIVE mode using the FTPCMDS inline DD statement

Figure 223 on page 640 shows the FTP connection set up from the FTP client to the FTP server using the FTP locsite fwfriendly command.

The FWFriendly parameter specifies that the FTP client is firewall-friendly. For additional details, see the topic about LOCSIte subcommand--Specify site information to the local host in z/OS Communications Server: IP User's Guide and Commands.

Note: When the FTP server has an IPv6 address, data connections are always set up from the FTP client to the FTP server without reference to the FWFriendly setting.

Example 7: Using a userid.NETRC data set

The example in Figure 224 on page 641 uses the proxy login and password stored in the userid.NETRC data set (you can submit this as a surrogate job where the userid.NETRC data set is invisible to the job originator). Use of the userid.NETRC data set requires NETRCLEVEL=2, which is set in the FTP.DATA data set. Using the -f parameter on TARGET_SYS control statement specifies which FTP.DATA data set to use.

- Find information about the use of the FTP.DATA data set in z/OS Communications Server: IP Configuration Reference.
Example 8: Using the DEBUG statement

The example in Figure 225 on page 641 adds the DEBUG DD statement, which creates a data set that contains the message data, as described in “DEBUG” on page 637.

Example 9: Using SYSUT2 to allocate an unload data set

The JCL example in Figure 226 on page 642 invokes the AMAPDUPL program to transfer partitioned data set H44IPCS.PDS.DATA to the testcase.boulder.ibm.com. The optional SYSUT2 statement is used to allocate an unload sequential data set for the IEBCOPY utility invoked by the PDUU.
Example 10: Using a multiple record control statement in SYSIN

The following JCL example in Figure 227 on page 642 invokes the AMAPDUPL program with FTP.DATA data set specified by the –f parameter on TARGET_SYS control statement coded on 3 consecutive SYSIN records.

```
--------1--------2--------3--------4--------5--------6--------7--
//FTP EXEC PGM=AMAPDUPL
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSUT1 DD DSN=H44IPCS.SEQ..DATA,DISP=SHR
//SYSUT2 DD DSN=H44IPCS.UNLOAD.DASD,DISP=(NEW,CATLG), DCB=(RECFM=VS), SPACE=(CYL,(1,1),RLSE),UNIT=SYSDA  
//SYSIN DD * 
USERID=anonymous 
PASSWORD=anonymous 
TARGET_SYS=-d -f /u/directoryForFtpData/subdirectoryForFtpData1/subdirectoryForFtpData2/subdirectoryForFtpData3/subdirectoryForFtpData4/ftpDataFile testcase.boulder.ibm.com 
TARGET_DSN=wessamp.bigfile 
WORK_DSN=wes.ftpout 
CC_FTP=03 
WORK_DSN_SIZE=500 
DIRECTORY=/toibm/mvs/ 
PMR=12345.123.123 
//
```

Figure 227. Using a multiple record control statement

Example 11: Using the NO_FTP option

The following JCL invokes the AMAPDUPL program to compress and separate the file into chunks that can be brought to IBM for documentation. File H44IPCS.WESSAMP.TRKS055K will be compressed and stored into several files at:

```
/u/nickj/pduu/12345.123.123.WESSAMP.BIGFILE.Txxxxx.MTFTP.Fnnnnn
```
Figure 228. Using the NO_FTP option

The following files will be stored on your local systems directory:

/u/nickj/pduu/:
12345.123.123.WESSAMP.BIGFILE.TE3246.MTFTP.F00002
12345.123.123.WESSAMP.BIGFILE.TE3246.MTFTP.F00003
12345.123.123.WESSAMP.BIGFILE.TE3246.MTFTP.F00004
... 
12345.123.123.WESSAMP.BIGFILE.TE3246.MTFTP.F001

Example 12: Using a proxy server with multiple FTPCMDS DD statements

The example in Figure 229 on page 643 uses a proxy server with multiple statements in an inline FTPCMDS DD. In this example, FTPCMDS DD runs the USER and PASS commands, and the USERID and PASSWORD SYSIN statements are omitted. The user also specifies PASSIVE mode.

Figure 229. FTP specifying multiple statements in an inline FTPCMDS DD

Example 13: Simple HTTPS connection to testcase

The JCL example in Figure 230 on page 644 invokes the AMAPDUPL program to transfer file H44IPCS.WESSAMP.TRKS055K to the testcase.boulder.ibm.com system as a set of work files stored in /toibm/mvs with the shared prefix 12345.123.123.wessamp.bigfile. Each of the three work files will be 100 MB. This connection uses the RACF keyring for user TSOUSER named 'pduu'.

PDS entry TSOUSER.FTPINFO(TESTCASE) contains the USERID and PASSWORD in a RACF protected and encrypted PDS with contents described in Figure 231 on page 644.
Example 14: Simple HTTPS connection with verbose HTTPS messages

The JCL example in Figure 232 on page 644 is similar to “Example 13: Simple HTTPS connection to testcase” on page 643 but puts verbose messages into the HTTPDEBG DD. This connection uses a key database file created by the gskkym man and a matching key database password stored in a key stash.

Example 15: Simple HTTPS connection to Ecurep

The JCL example in Figure 233 on page 645 invokes the AMAPDUPL program to transfer file H44IPCS.WESSAMP.TRKS055K to the testcase.boulder.ibm.com system as a set of work files. These will be sent to ecurep and directed to the mvs directories with the shared prefix 12345.123.123.wessamp.bigfile. Each of the three work files will be 100 MB. This connection uses the RACF keyring for user TSOUSER named ‘pduu’.
PDS entry TSOUSER.FTPINFO(TESTCASE) contains the USERID and PASSWORD in a RACF protected and encrypted PDS with contents described in Figure 234 on page 645.

```
//FTP     EXEC PGM=AMAPDUPL
//SYSUDUMP DD  SYSOUT=*  
//SYSPRINT DD  SYSOUT=*  
//DEBUG    DD  SYSOUT=*  
//SYSPRINT DD  SYSOUT=*  
//SYSUT1   DD  DISP=SHR,DSN=H44IPCS.WESSAMP.TRKS055K
//SYSIN    DD  DISP=SHR,DSN=TSOUSER.FTPINFO(ECUREP)
//   DD *
TARGET_SYS=www.secure.ecurep.ibm.com
TARGET_DSN=wessamp.bigfile
CC_FTP=03
WORK_SIZE=100
DIRECTORY=mvs
PMR=12345.123.123
USE_HTTPS=Y
HTTPS_KEYRING=TSOUSER/pduu
```

*Figure 233. Simple HTTPS connection to Ecurep*

```
USERID=user@domain.com
PASSWORD=userpassword
```

*Figure 234. Simple HTTPS connection contents of TSOUSER.FTPINFO(ECUREP)*

### Return codes for PDUU

Upon completion, PDUU places one of the return codes listed in Table 72 on page 645 in general purpose register (GPR) 15.

<table>
<thead>
<tr>
<th>Return Code</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful completion</td>
</tr>
<tr>
<td>4</td>
<td>Potential successful completion. If not, investigate messages.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid parameters in control statement</td>
</tr>
<tr>
<td>10</td>
<td>Unsupported data set format</td>
</tr>
<tr>
<td>12</td>
<td>Storage obtain failure</td>
</tr>
<tr>
<td>16</td>
<td>Required input parameters are missing</td>
</tr>
<tr>
<td>20</td>
<td>Invalid input data set specified</td>
</tr>
<tr>
<td>24</td>
<td>Severe error occurred during dictionary building</td>
</tr>
<tr>
<td>28</td>
<td>Severe error occurred during file open</td>
</tr>
<tr>
<td>32</td>
<td>Severe error occurred during compression process</td>
</tr>
<tr>
<td>36</td>
<td>Error in FTP or HTTPS operation</td>
</tr>
<tr>
<td>40</td>
<td>Severe error during IKJTSOEV operation for NO_FTP=Y invocations, see message AMA7771</td>
</tr>
<tr>
<td>44</td>
<td>Severe error during IKJEFTSR operation for NO_FTP=Y invocations, see message AMA7781 and SYSTSPRT DD</td>
</tr>
<tr>
<td>64</td>
<td>Severe error in file operation</td>
</tr>
</tbody>
</table>
Table 72. Return codes for z/OS Problem Documentation Upload Utility (continued)

<table>
<thead>
<tr>
<th>Return Code</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>Error unloading a PDS or PDSE</td>
</tr>
<tr>
<td>69</td>
<td>Failure to attach a subtask</td>
</tr>
<tr>
<td>70</td>
<td>Failure in pause element service</td>
</tr>
<tr>
<td>71</td>
<td>Failure in BPX1SDD service</td>
</tr>
<tr>
<td>98</td>
<td>System or user abend occurred during subtask operation</td>
</tr>
<tr>
<td>99</td>
<td>System or user abend occurred</td>
</tr>
</tbody>
</table>
Chapter 20. Dump suppression

The system requests dumps you might not need. To keep from using your system's resources on unneeded dumps, you should suppress them. The reasons for the unneeded dumps and ways to suppress them are:

• **Duplicate dumps**: The system can request a dump for a problem that recurs. The dump written when the problem first occurs can be used for diagnosis; additional dumps are unneeded. Also, sometimes a system can request several dumps for one instance of a problem. A recurring problem may have been diagnosed, but the fix has not yet been incorporated into the system.

  To eliminate the duplicate dumps, use dump analysis and elimination (DAE). See “Using DAE to suppress dumps” on page 647.

• **Dumps for certain abend codes**: For some abend codes, the accompanying messages provide the needed problem data. To eliminate the dumps for these abend codes, use a SLIP command. See “Using a SLIP command to suppress dumps” on page 655.

• **A dump for an abend in an application program**: if the dump is not needed. See “Using an ABEND macro to suppress dumps” on page 656.

• **Dumps the installation decides are not needed**: If you decide that certain dumps are not needed, you can code a routine for an installation exit to suppress these dumps. See “Using installation exit routines to suppress dumps” on page 656.

This topic lists the ways that an expected dump can be suppressed, so that you can determine why you did not receive an intended dump. See “Determining why a dump was suppressed” on page 657.

Using DAE to suppress dumps

Dump analysis and elimination (DAE) suppresses dumps that match a dump you already have. Each time DAE suppresses a duplicate dump, the system does not collect data for the duplicate or write the duplicate to a data set. In this way, DAE can improve dump management by only dumping unique situations and by minimizing the number of dumps.

For more information about the topics described in this section, refer to the following references:

• See [z/OS MVS Diagnosis: Reference](#) for symptoms and symptom strings.

• See [z/OS MVS Initialization and Tuning Reference](#) for the ADYSETxx and IEACMD00 parmlib members.

• See [z/OS MVS IPCS Commands](#) for the VERBEXIT DAEDATA subcommand.

• See [z/OS MVS Planning: Global Resource Serialization](#) for data set serialization.

• See [z/OS Security Server RACF Command Language Reference](#) to control access to data sets.

Performing dump suppression

To perform dump suppression, DAE builds a symptom string, if the data for it is available. If the symptom string contains the minimum problem data, DAE uses the symptom string to recognize a duplicate SVC dump or SYSMDUMP dump requested for a software error. When installation parameters request suppression, DAE suppresses the duplicate dump. The following describes DAE processing.

1. **DAE obtains problem data**. DAE receives the data in the system diagnostic work area (SDWA) or from values in a SYMREC parameter on the SDUMP or SDUMPX macro that requested the dump.

   • The ESTAE routine or the functional recovery routine (FRR) of the failing program supplies module-level information, such as the failing load module name and the failing CSECT name.

   • The system supplies system-level data, such as the abend and reason codes, the failing instruction, and the register/PSW difference.
If the failing component does not supply the failing load module name or CSECT name, the system determines the name, if possible. In this case, the name may be IEANUC0x.

2. **DAE forms a symptom string.** DAE adds a descriptive keyword to each field of problem data to form a symptom. DAE forms MVS symptoms, rather than RETAIN symptoms. DAE combines the symptoms for a requested dump into a symptom string.

The following tables show the required and optional symptoms. SDWA field names are given for the symptoms the failing program must provide to enable dump suppression. The tables have both MVS and RETAIN symptoms so that you can relate the MVS symptoms DAE uses to the RETAIN symptoms you might use to search the RETAIN data base. An MVS symptom string must contain at least five symptoms that are not null. DAE places symptoms into strings in the order shown in the tables.

Table 73 on page 648 summarizes the required symptoms, which are first and must be present.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>SDWA Field</th>
<th>MVS Keyword</th>
<th>RETAIN Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the failing load module</td>
<td>SDWAMODN</td>
<td>MOD/name</td>
<td>RIDS/name#L</td>
</tr>
<tr>
<td>Name of the failing CSECT</td>
<td>SDWACSCST</td>
<td>CSECT/name</td>
<td>RIDS/name</td>
</tr>
</tbody>
</table>

Table 74 on page 648 summarizes the optional symptoms, which must follow the required symptoms. DAE needs at least three of these optional symptoms to make a useful symptom string.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>SDWA Field</th>
<th>MVS Keyword</th>
<th>RETAIN Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product/component identifier with the component identifier base</td>
<td>SDWACID, SDWACIDB</td>
<td>PIDS/name</td>
<td>PIDS/name</td>
</tr>
<tr>
<td>System completion (abend) code</td>
<td></td>
<td>AB/S0hhh</td>
<td>AB/S0hhh</td>
</tr>
<tr>
<td>User completion (abend) code</td>
<td></td>
<td>AB/Uddd</td>
<td>AB/Uddd</td>
</tr>
<tr>
<td>Recovery routine name</td>
<td>SDWAREXN</td>
<td>REXN/name</td>
<td>RIDS/name#R</td>
</tr>
<tr>
<td>Failing instruction area</td>
<td></td>
<td>FI/area</td>
<td>VALU/Harea</td>
</tr>
<tr>
<td>PSW/register difference</td>
<td></td>
<td>REGS/hhhhh</td>
<td>REGS/hhhhh</td>
</tr>
<tr>
<td>Reason code, accompanying the abend code or from the REASON parameter of the macro that requests the dump</td>
<td></td>
<td>HRC1/nnnn</td>
<td>PRCS/nnnn</td>
</tr>
<tr>
<td>Subcomponent or module subfunction</td>
<td>SDWASC</td>
<td>SUB1/name</td>
<td>VALU/Cname</td>
</tr>
</tbody>
</table>

3. **DAE tries to match the symptom string from the dump to a symptom string for a previous dump** of the same type, that is, SVC dump or SYSMDUMP. When DAE finds a match, DAE considers the dump to be a duplicate.

When DAE is started, it selects active symptom strings to be used to determine which dumps to suppress. An active symptom is one where either the string was created for a unique dump within the last 60 days, or its dump count was updated within the last 60 days.

The systems in a sysplex can share the DAE data set to suppress duplicate dumps across the sysplex. While each system in a sysplex can use its own DAE data set, IBM recommends that systems in a sysplex share a DAE data set so that:

- DAE can write a dump on one system and suppress duplicates on other systems in the sysplex.
- Only one DAE data set is required, rather than a data set for each system.

See “Defining a DAE data set” on page 652 for more information, including recommended names for the data set.
4. **DAE updates the symptom strings in storage and, when the dump is written to a dump data set, in the DAE data set**, if updating is requested.
   - For a unique symptom string, DAE adds a new record. The record contains the symptom string, the dates of the first and last occurrences, the incidence count for the number of occurrences, and the name of the system that provided the string.
   - For a duplicate symptom string, DAE updates the incidence count for the string, the last-occurrence date, and the name of the last system that found the string.

If updating is requested, DAE examines the incoming dump requests against captured dumps. If the incoming dump's symptom string matches any dump on the captured dump queue, it is suppressed. Updates are done when the DAE data set is updated.

In a sysplex, changes to the in-storage strings of other systems are made after the shared DAE data set is updated. If an incident is occurring at about the same time on multiple systems, multiple dumps will be generated — but only one per system. Dumps on other systems are suppressed after one of the dumps is written, the DAE data set updated, and the updates propagated to the other systems.

If the system with the original dump fails before it writes the captured dump, the dump will not be suppressed the next time it is requested.

5. **DAE suppresses a duplicate dump**, if DAE is enabled for dump suppression.

Note that, if you specify an ACTION of SVCD, TRDUMP, or NOSUP on a SLIP command, the command overrides DAE suppression and the system writes the dump. Also, dumps requested by the DUMP operator command are not eligible for suppression.

When DAE does not suppress a dump, the symptom string is in the dump header; you can view it with the IPCS VERBEXIT DAEDATA subcommand. DAE also issues informational messages to indicate why the dump was not suppressed.

DAE suppresses a dump when all of the following are true:
   - DAE located in the dump the minimum set of symptoms.
     - **Note:** If more then the minimum number of symptoms are passed, ALL symptoms are used for comparison, up to 150 characters.
   - The symptom string for the dump matches a symptom string for a previous dump of the same type.
   - Either of the following is true:
     - The current ADYSETxx parmlib member specifies SUPPRESS for the type of dump being requested and the VRADAE key is present in the SDWA.
     - The current ADYSETxx parmlib member specifies SUPPRESSALL for the type of dump being requested and the VRANODAE key is absent from the SDWA.
   - The complete dump has been successfully written to a DASD data set; or while a complete captured dump remains un-deleted.

Table 75 on page 649 shows the effect of the VRADAE and VRANODAE keys on dump suppression when SUPPRESS and SUPPRESSALL keywords are specified in the ADYSETxx parmlib member. For SUPPRESS, the VRANODAE key can be present or absent; the system does not check it. The table assumes that the symptom string from the dump has matched a previous symptom string.

<table>
<thead>
<tr>
<th>ADYSETxx Option</th>
<th>VRADAE Key in SDWA</th>
<th>VRANODAE Key in SDWA</th>
<th>Dump Suppressed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPRESS</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>SUPPRESS</td>
<td>No</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>SUPPRESSALL</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Table 75. VRADAE and VRANODAE keys on dump suppression when SUPPRESS and SUPPRESSALL keywords are specified in ADYSETxx (continued)

<table>
<thead>
<tr>
<th>ADYSETxx Option</th>
<th>VRADAE Key in SDWA</th>
<th>VRANODAE Key in SDWA</th>
<th>Dump Suppressed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPRESSALL</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SUPPRESSALL</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SUPPRESSALL</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

The only way to ensure that a dump is not suppressed, regardless of the contents of the ADYSETxx parmlib member, is to specify the VRANODAE key in the SDWA.

Managing rapidly recurring dumps

DAE can suppress rapidly recurring dumps automatically and the support staff does not need to be aware when a dump request recurs. However, a surge of dump requests could affect system performance, even though the dumps are suppressed. The surge could go unnoticed for hours. To help the support staff take actions to avoid impact to users, the system can notify you of high-frequency dump requests.

To obtain notification, add a NOTIFY parameter to the SVCDUMP statement on the ADYSETxx parmlib member to establish a threshold for notification. The SVCDUMP statement must also specify UPDATE. The default threshold is 3 dumps requested in 30 minutes for the same symptom string. The notification time is measured from completion or suppression of dumps, rather than from initiation of dumps.

The notification is made by the event notification facility (ENF). You can use an ENF exit to:

- Notify the support staff by a message or a signal to a beeper
- Use automation

Any program can receive the ENF signal. If active, the First Failure Support Technology (FFST) issues a generic alert in response to this ENF signal.

If DAE is stopped and restarted, DAE begins counting dumps again to reach the threshold.

If each system has its own DAE data set, notification is for a system. If the systems of a sysplex share the DAE data set, notification is for the sysplex. For example, with a shared DAE data set, four dumps for the same symptom string on the same or different systems in 25 minutes would cause notification if the ADYSETxx parmlib member contains NOTIFY(4,25).

Note: The system in the sysplex that crosses the notification threshold is the system that does the notify.

Planning for DAE dump suppression

Planning for DAE dump suppression consists of tasks to be done before an initial program load (IPL). The system programmer performs the following tasks:

- Selecting or creating an ADYSETxx parmlib member
- Defining a DAE data set

Selecting or creating an ADYSETxx parmlib member

Select or create an ADYSETxx parmlib member to be used at IPL. IBM supplies three ADYSETxx members:

- **ADYSET00**, which starts DAE and keeps 400 symptom strings in virtual storage. The IBM-supplied ADYSET00 member contains:

```
DAE=START,RECORDS(400),
SVCDUMP(MATCH,SUPPRESSALL,UPDATE,NOTIFY(3,30)),
SYSMDUMP(MATCH,UPDATE)
```

ADYSET00 does not suppress SYSMDUMP dumps because installation-provided programs deliberately request them. If desired, change the ADYSETxx member being used to suppress SYSMDUMP dumps.
• **ADYSET01**, which stops DAE processing. The IBM-supplied ADYSET01 member contains:

| DAE=STOP |

When using the DAE Display facility's TAKEDUMP (T) action in a sysplex where DAE is active, you must change the contents of ADYSET01 to:

| DAE=STOP, GLOBALSTOP |

• **ADYSET02**, which contains the same parameters as ADYSET00.

The IBM-supplied IEACMD00 parmlib member issues a SET DAE=00 command, which activates ADYSET00 during IPL. If you do not want DAE to start during IPL, change IEACMD00 to specify SET DAE=01.

For a sysplex, IBM recommends that you use the same ADYSETxx parameter values in each system. To use the same values, use a shared SYS1.PARMLIB. If your installation does not share a SYS1.PARMLIB, make the ADYSETxx and IEACMDxx members in the SYS1.PARMLIB for each system identical. A shared ADYSETxx or identical ADYSETxx members should specify SHARE(DSN) to share the DAE data set.

IBM recommends that the ADYSETxx member specify SUPPRESSALL, which requests that dumps be suppressed even though the component or program did not request dump suppression with a VRADAE key in the system diagnostic work area (SDWA). SUPPRESSALL is useful because it allows more dumps to be eligible for suppression.

In the example shown in Figure 235 on page 651, the systems in the sysplex share a DAE data set, SYS1.DAESHARE, so DAE can suppress a duplicate of a previous dump from any system. This member also specifies SUPPRESSALL.

| DAE=START, RECORDS(400), SVCDUMP(MATCH, SUPPRESSALL, UPDATE, NOTIFY(3, 30)), SYSMDUMP(MATCH, UPDATE), SHARE(DSN, OPTIONS), DSN(SYS1.DAESHARE) |

**Figure 235. Example: An ADYSETxx Member for a System in a Sysplex**

The ADYSET00 member specifies RECORDS(400). If your system does not suppress a dump when the matching symptom string is in the DAE data set, you might need more than 400 records in storage; the IBM Support Center can advise you.

**Changing Parmlib Members to Change DAE Processing:** While the system is running, change the DAE data set or parameters for the dumps by creating a new ADYSETxx parmlib member. See “Changing DAE processing in a Sysplex” on page 655 for the operator actions needed to change the parmlib member.

There is another benefit when all the systems in a sysplex are sharing the DAE data set. That is, after DAE is started on each system using an ADYSETxx member which at least contains SHARE(DSN). One operator command can set the DAE values to be the same on all systems. This is accomplished by issuing the SET DAE= command, for an ADYSEYxx member which includes the GLOBAL parameter. ALL systems sharing the DAE data set will be effected.

In Figure 236 on page 651, the following ADYSET04 member changes the DAE data set being used on all systems to SYS1.DAESH2 and changes the dump options on all systems.

| DAE=START, RECORDS(400), SVCDUMP(MATCH, SUPPRESSALL, UPDATE, NOTIFY(3, 30)), SYSMDUMP(MATCH, UPDATE), SHARE(DSN, OPTIONS), DSN(SYS1.DAESH2), GLOBAL(DSN, OPTIONS) |

**Figure 236. Example: An ADYSETxx Member with GLOBAL**
None of the changes made using operator commands are kept across an IPL of a system. At IPL, each system will again use the member specified in IEACMD00 or the COMMNDxx member being used. To make the changes permanently effective, do one of the following:

- Make the changes in ADYSET00 and the default IEACMD00 will start DAE.
- Make the changes in the ADYSETxx member and update a COMMNDxx member to start the ADYSETxx using the SET DAE=xx statement. Then update the appropriate IEASYSxx member to include the CMD=xx statement. Once complete, remove the SET DAE=00 within the IEACMD00 member to ensure that the two commands do not complete out of sequence.

**Defining a DAE data set**

Define a DAE data set when defining system data sets. When the system is IPLed or if DAE is stopped and restarted, DAE should continue using the DAE data set previously used.

1. **Define the DAE data set in a DD statement.** Use the default name of SYS1.DAE for a single system; use a different name for a DAE data set shared by systems in a sysplex.

   The sample DD statement shown in Figure 237 on page 652 is for a DAE data set used by a single system.

   ```
   //DAE    DD  DSN=SYS1.DAE,DISP=(,CATLG),VOL=(,RETAIN,SER=SG2001),
          DCB=(RECFM=FB,LRECL=255,DSORG=PS,BLKSIZE=0),
          UNIT=3390,SPACE=(TRK,(6,2))
   Figure 237. Example: DAE Data Set for Single System
   ```

   In a sysplex, each system can have its own DAE data set, but IBM recommends that all systems in a sysplex share a DAE data set.

   The sample DD statement in Figure 238 on page 652 is for a DAE data set shared by the systems in a sysplex. The statement will catalog the DAE data set in the shared master catalog or in the master catalog on each system that uses it.

   ```
   //DAE    DD  DSN=SYS1.DAESHARE,DISP=(,CATLG),VOL=(,RETAIN,SER=SG1055),
          DCB=(RECFM=FB,LRECL=255,DSORG=PS,BLKSIZE=0),
          UNIT=3390,SPACE=(TRK,(12,2))
   Figure 238. Example: DAE Data Set Shared by Sysplex Systems
   ```

   If you manage your dumps with the hierarchical storage manager (HSM), consider using an HSM purge time of 60 days to correspond to the DAE record aging of 60 days.

2. **Provide DAE data set integrity through a serialization component,** such as global resource serialization.

   For a single system, the DAE data set is a local resource. The default DAE data set, SYS1.DAE, is defined as a local resource in the default global resource serialization resource name list (RNL). If you give the DAE data set another name, add the name to the SYSTEMS exclusion RNL to avoid contention when more than one system uses the same DAE data set name for physically different data sets.

   For systems in a sysplex, the shared DAE data set is a global resource. To make global resource serialization treat it as a global resource, do one of the following:

   - Give the DAE data set a name other than SYS1.DAE. For example, SYS1.DAESHARE.
   - If you use the name SYS1.DAE, delete the DAE data set entry from the default SYSTEMS exclusion RNL. The DAE data set entry is SYSDSN SYS1.DAE.

   For information, see [z/OS MVS Planning: Global Resource Serialization](https://www.ibm.com).
3. **Control access to the DAE data set.** On a single system or on all systems sharing the DAE data set in a sysplex, use Resource Access Control Facility (RACF) to control access. Enter a RACF ADDSD command to define a data set profile for the DAE data set.

**Accessing the DAE data set**

A DAE data set that is used by one system or is shared by systems in a sysplex is accessed by:

- Invoking the IPCS DAE Display panel
- Generating a suppressed dump
- Editing the DAE data set

**Invoking the IPCS DAE display panel**

For the ways to invoke the panel, see IPCS option 3.5 in the *z/OS MVS IPCS User's Guide*. On the panel, you can:

- View the symptom strings the data set contains by entering:
  - The date of the dump,
  - The last date for the string,
  - The number of times the dump has been requested,
  - And the last system that requested the dump.
- Search the Entry list for symptoms, system names, dates, etc.
- Navigate through the sysplex dump directory (or whatever dump directory is active) for the symptom string.
- View the dump title for a symptom string.

**Generating a suppressed dump**

You may want to obtain a dump that is being suppressed. Perhaps the first dump was ignored and thrown out, but since then the dump has been requested often enough so that you would like to analyze the dump. Do the following to obtain the suppressed dump through the IPCS TAKEDUMP option:

1. Customize the TSO user ID that will invoke the TAKEDUMP action. Make sure it:
   - has authority to issue an MVS operator SET command and, if DAE is active in a sysplex, the ROUTE command
   - has RACF UPDATE access to the DAE data set.
2. Ensure that the ADYSET01 member(s) contains DAE=STOP (or DAE=STOP,GLOBALSTOP in a sysplex).
3. Check that the active IKJTSOxx member includes the program name ADYOPCMD in the AUTHCMD NAMES section.
4. In a sysplex, the maximum benefit is realized when DAE is started using ADYSETxx members which contain at least SHARE(DSN) — enabling shared data set activities.
5. Use the IPCS DAE dialog Panel to issue action code T (the TAKEDUMP option) on the line showing the symptom string of interest.

To process the TAKEDUMP option of the IPCS DAE dialog, DAE processing is stopped, dialog processing occurs, and DAE processing is restarted on the systems involved. There are some cases where a particular system may end up using different DAE parameters from those it was previously using. Table 76 on page 654 illustrates possible results.

For this discussion there are two systems (SY1 and SY2), and five ADYSETxx members involved. Members ending with G1 and G2 include GLOBAL(DSN,OPTIONS) parameters. Members ending with S1 and S2 have SHARE(DSN,OPTIONS) without GLOBAL options. The center column in Table 76 on page 654 indicates the system where the TSO user is issuing the TAKEDUMP request.
Table 76. Examples of when DAE parameters may change.

<table>
<thead>
<tr>
<th>Start State</th>
<th>TSO</th>
<th>Final State</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY1</td>
<td></td>
<td>SY1</td>
</tr>
<tr>
<td>G1</td>
<td>G1</td>
<td>G1</td>
</tr>
<tr>
<td>S1</td>
<td>S2</td>
<td>S1</td>
</tr>
<tr>
<td>S1</td>
<td></td>
<td>S2</td>
</tr>
<tr>
<td>G1</td>
<td>S1</td>
<td>S1</td>
</tr>
<tr>
<td>S1</td>
<td>G2</td>
<td>G2</td>
</tr>
<tr>
<td>S1</td>
<td></td>
<td>G2</td>
</tr>
<tr>
<td>S1</td>
<td></td>
<td>S2</td>
</tr>
<tr>
<td>G2</td>
<td>S2</td>
<td>G2</td>
</tr>
<tr>
<td>S2</td>
<td></td>
<td>S2</td>
</tr>
</tbody>
</table>

Note:

1. GLOBAL(DSN) systems remain synchronized.
2. When all systems are NOT in GLOBAL(DSN) mode, the system will be started using the member last active on the system where the IPCS TAKEDUMP dialog runs.
3. No change to other systems if all work is done on a system which is not sharing the DAE data set. Here, ADYSET00 contains the default IBM—supplied values.
4. The commands necessary to accomplish the task are issued by the TSO user at their dispatching priority. It is possible that the system may not dispatch the TSO user due to that dispatching priority, and therefore the action may not complete in a timely manner.

The system will generate the next dump for the symptom string. After that dump, DAE resumes suppressing dumps for the symptom string.

Note: Despite specifying action code T, the dump might still be suppressed. See “Determining why a dump was suppressed” on page 657 for the reasons, other than DAE suppression.

Editing the DAE data set

Edit the DAE data set, using Interactive System Productivity Facility (ISPF) edit. For ISPF edit, see z/OS ISPF Dialog Developer’s Guide and Reference. You must have WRITE access to the DAE data set. Once in ISPF Edit, use the Edit macro ADYUPDAT as described below.

In the edit session, type one of the following on the command line, place the cursor on the symptom string line for the dump, and press ENTER. If the cursor is on the command line, the first symptom string is used. Note that DAE must be stopped before these actions and started again after.

| ADYUPDAT TAKEDUMP |
| ADYUPDAT NODUMP |

ADYUPDAT TAKEDUMP requests that the next dump be generated for this symptom string. SLIP can still suppress the dump.

ADYUPDAT NODUMP undoes the effect of TAKEDUMP, if it was in effect. Otherwise, NODUMP results in no action.

In the edit session, you can also delete every symptom string that has not been updated within a specified number of days. You must SAVE the DAE data set for the deletions to take effect. To request the deletions, enter on the command line:

| ADYUPDAT CLEANUP nnn |

**nnn**

number of days a record has not been updated for it to be selected for deletion. The default is 60 days.
ADYUPDAT always issues a status message reflecting the outcome of the command.

**Stopping, starting, and changing DAE**

If an ADYSET00 parmlib member is used and the DAE data set is allocated, DAE starts during IPL. Normally, DAE runs at the same time as the system. However if DUMPSRV is ever cancelled or restarted, DAE restarts as well albeit with dump suppression inactive. You must manually reactivate dump suppression using the SET DAE=xx command.

An operator can stop and start DAE with the following steps. One reason to use these steps would be to change to a different ADYSETxx parmlib member with different parameters.

**Stopping DAE**

You can stop DAE with a SET DAE command that specifies the ADYSET01 parmlib member, which contains a DAE=STOP statement:

```plaintext
SET DAE=01
```

**Starting DAE**

You can start DAE with a SET DAE command that specifies an ADYSETxx parmlib member that contains the DAE=START parameter, such as an installation-provided ADYSET03 parmlib member:

```plaintext
SET DAE=03
```

**Changing DAE processing in a Sysplex**

The operator can change all DAE processing in a sysplex, if desired. For example, the operator can do the following to make all systems in a sysplex use a different ADYSETxx member:

1. Stop DAE processing using the IBM-supplied ADYSET01 member:

```plaintext
ROUTE *ALL, SET DAE=01
```

   Another way to stop DAE processing on all systems in a sysplex is to specify in the SET DAE command an ADYSETxx member containing a GLOBALSTOP parameter.

2. Start DAE processing using, for example, the ADYSET04 member:

```plaintext
ROUTE *ALL, SET DAE=04
```

**Using a SLIP command to suppress dumps**

Some dumps are almost never needed. For example, some abend codes tell the diagnostician enough to solve the problem. For these codes, place SLIP operator commands in an IEASLPxx parmlib member to suppress the unneeded dumps. The IBM-supplied IEASLP00 member contains the SLIP commands to suppress abend dumps that are seldom needed.

Using SLIP to suppress dumps also suppresses message IEA995I, which contains symptom dump information. The system may document the abend in a LOGREC error record.

To suppress dumps for an abend code, specify a SLIP operator command with one of the following ACTION parameters. Place all the SLIP commands in an IEASLPxx parmlib member and activate the IEASLPxx member with the following command in a COMMNDxx or IEACMDxx member that is always used:

```plaintext
CMD='SET SLIP=xx'
```

<table>
<thead>
<tr>
<th>SLIP Parameter</th>
<th>Dumps Suppressed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dump suppression 655
Dump suppression

ACTION=NODUMP
   All dumps
ACTION=NOSVCD
   SVC dumps
ACTION=NOSYSA
   ABEND SYSABEND dumps
ACTION=NOSYSM
   ABEND SYSMDUMP dumps
ACTION=NOSYSU
   ABEND SYSUDUMP dumps

For example, to suppress SVC dumps and ABEND SYSMDUMP dumps for abend code X'B37', add the following to IEASLPxx:

```
SLIP SET,COMP=B37,ACTION=(NOSVCD,NOSYSM),END
```

For more information about the following topics, see the following references:

- See z/OS MVS Initialization and Tuning Reference for the IEASLPxx member.
- See z/OS MVS System Commands for the SLIP operator command.

Using an ABEND macro to suppress dumps

A program can suppress a dump by issuing an ABEND macro without a DUMP parameter. Application programmers should not specify a DUMP parameter when a symptom dump can provide enough information for diagnosis.

See z/OS MVS Programming: Assembler Services Reference ABE-HSP for more information about the ABEND macro.

Using installation exit routines to suppress dumps

An installation can add installation exit routines, summarized in Table 77 on page 656, to suppress dumps. Use IEAVTABX if you want to suppress abend dumps based on the job name, abend code, or other information in the system diagnostic work area (SDWA). Use IEAVTSEL if you want to discard an SVC or SYSMDUMP dump based on information in the dump header or from DAE. Use JES2 exit 4 or JES3 exit IATUX34 to suppress different types of dumps.

<table>
<thead>
<tr>
<th>Exit</th>
<th>Processing</th>
<th>Dump Suppression</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEAVTABX</td>
<td>Before any ABEND dump</td>
<td>Routine(s) can place a return code of 8 in register 15 to suppress the requested dump.</td>
</tr>
<tr>
<td>IEAVTSEL</td>
<td>After an SVC dump or ABEND SYSMDUMP dump, if the dump was not suppressed by DAE</td>
<td>Routine(s) can clear the dump data set.</td>
</tr>
<tr>
<td>JES2 exit 4 or JES3 IATUX34</td>
<td>For any JCL statement</td>
<td>Can change the DSNNAME parameter on a dump DD statement to DUMMY to suppress the dump.</td>
</tr>
</tbody>
</table>

For more information about the following topics, see the following references:

- See z/OS MVS Installation Exits for IEAVTABX and IEAVTSEL.
- See z/OS JES2 Installation Exits for the JES2 exit 4 routine.
Determining why a dump was suppressed

If an intended dump is missing, use this list to decide why. The list gives reasons why dumps are suppressed, including the ways discussed in this topic. In planning for problem determination, be aware of all of these ways so that your installation does not suppress intended dumps.

- **DAE suppression of dumps.** See “Using DAE to suppress dumps” on page 647.
- **SLIP command that suppresses all dumps for an abend code.** See “Using a SLIP command to suppress dumps” on page 655.
- **An ABEND macro without a DUMP parameter.** See “Using an ABEND macro to suppress dumps” on page 656.
- **An MVS installation exit routine that suppresses the dump.** See “Using installation exit routines to suppress dumps” on page 656.
- **Resource Access Control Facility (RACF) control of programs in an address space to be dumped:** Beginning with RACF 1.8.1, the installation can protect ABEND dumps of programs using the FACILITY class. The protection can keep you from accessing a dump.
- **Dump on another system blocked by SYSDDCOND in the PROBDESC area and the IEASDUMP.QUERY routine.** A dump on another system in a sysplex is requested by a DUMP command or SDUMPX macro with a REMOTE parameter. If the area specified by the PROBDESC parameter contains SYSDDCOND, the dump on the other system is not written because of either of the following on the other system:
  - No IEASDUMP.QUERY routine exists
  - No IEASDUMP.QUERY routine returns a code of 0
- **Dump suppressed by CHNGDUMP command.** If a CHNGDUMP command specifies NODUMP for SVC dumps:
  - All SVC dumps on the system are suppressed.
  - If a DUMP command or SDUMPX macro includes a REMOTE parameter, the dump on the local system and the dumps on other systems in the sysplex are suppressed.
- **Dump on another system suppressed by CHNGDUMP command on the other system.** If a DUMP command or SDUMPX macro includes a REMOTE parameter and a CHNGDUMP command previously entered on another system in the sysplex specifies NODUMP for SVC dumps, the SVC dump on the other system is suppressed. The dump on the local system is written.

The system can also place the dump in another data set, so that it is not in the original data set specified in a message you received:

- **An installation exit routine at JES2 exit 4 or at JES3 exit IATUX34 can change the dump data set name.**
- **DUMPDS operator command can redirect SVC dump output.** The command can redirect SVC dump output to other SYS1.DUMPxx data sets.

For more information about the following topics, see the following references:

- See [z/OS Security Server RACF Security Administrator’s Guide](https://www.ibm.com) for the FACILITY class to control access to program dumps.
- See [z/OS MVS System Commands](https://www.ibm.com) for the DUMP, DUMPDS, and SLIP commands.
- See [z/OS MVS Installation Exits](https://www.ibm.com) for the IEAVTABX and IEAVTSEL exit routines.
- See [z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDU](https://www.ibm.com) for the SDUMPX macro.
- See [z/OS MVS Programming: Authorized Assembler Services Guide](https://www.ibm.com) for the IEASDUMP.QUERY routine.
- See [z/OS JES2 Installation Exits](https://www.ibm.com) for the JES2 exit 4 routine.
- See [z/OS JES3 Customization](https://www.ibm.com) for the JES3 IATUX34 exit routine.
Dump suppression
Chapter 21. Messages

The system issues messages to do the following:

• Tell the operator or system programmer of progress and problems in system processing
• Ask the operator to take actions and make decisions
• Tell the application programmer how the system ran the application program and of problems in the application program

The system issues messages from the base control program components and a variety of subsystems, products, and applications. Applications running under the system can also issue their own messages.

Producing messages

You can get the system to produce a message by issuing a macro in any program or by asking an operator to enter a command. The macros and command are:

• LOG operator command to write a message to the SYSLOG and OPERLOG
• WTL macro to write a message to the SYSLOG and OPERLOG
  
  Note: Use WTO specifying MCSFLAG=HRDCPY instead of using WTL, which provides additional information with the WTO message that is not with the WTL message.
• WTO macro to write a message to the operator
• WTOR macro to write a message to the operator and request a reply

Use the following for related activities:

• DOM macro to delete an operator message or group of messages from the display screen of a console
• REPLY operator command to answer a message
• WRITELOG operator command to start, stop, or print the SYSLOG and to change the output class for the SYSLOG

For additional information, see the following resources:

• See z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN for DOM and z/OS MVS Programming: Authorized Assembler Services Reference SET-WTO for the WTO, WTOR, and WTL macros.
• See z/OS MVS System Commands for the LOG, REPLY, and WRITELOG commands.

Receiving messages

The system issues messages through WTO and WTOR macros to the following locations. Routing codes determine the display and print location of the messages.

• Console
• Extended console
• Hard-copy log
• Job log
• SYSOUT data set

The system issues messages to the SYSLOG and OPERLOG using the WTL macro.

The access methods issue messages directly to one of the following locations:

• Display terminal
Console

Messages sent to a console with master authority are intended for the operators. The system writes in the hard-copy log all messages sent to a console, regardless of whether the message is displayed.

Hard-Copy log

The hard-copy log is a record of all system message traffic:

- Messages to and from all consoles
- Commands and replies that are entered by the operator.

In a dump, these messages appear in the master trace. With JES3, the hard-copy log is written to the SYSLOG, the OPERLOG, or both. With JES2, the hard-copy log is written to the SYSLOG, the OPERLOG, or both; it can also be viewed using a product like System Display and Search Facility (SDSF). For more information about SDSF, see z/OS SDSF Operation and Customization.

System log

The SYSLOG is a SYSOUT data set provided by the job entry subsystem (either JES2 or JES3). SYSOUT data sets are output spool data sets on direct access storage devices (DASD). Use SDSF to view the SYSLOG to check for problems. The SYSLOG consists of the following:

- All messages issued through WTL macros
- All messages entered by LOG operator commands
- Usually, the hard-copy logs
- Any messages routed to the SYSLOG from any system component or program

Job log

Messages sent to the job log are intended for the programmer who submitted a job. Specify the system output class for the job log in the MSGCLASS parameter of the JCL JOB statement.

SYSOUT data set

Messages sent to a SYSOUT data set are intended for a programmer. These messages are issued by an assembler or compiler, the binder and loader, and an application program. To make all messages about a program appear in the same SYSOUT listing, specify the same class for the SYSOUT data set and in the MSGCLASS parameter on the JCL JOB statement.

Receiving symptom dumps

A symptom dump is a system message, either message IEA995I or a numberless message, which provides some basic diagnostic information for diagnosing an abend. Often the symptom dump information can provide enough information to diagnose a problem.

The example in Figure 239 on page 661 shows the symptom dump for an abend X'0C4' with reason code X'4'. This symptom dump shows the following information:

- Active load module ABENDER is at address X'00006FD8'.
- The failing instruction was at offset X'12' in load module ABENDER.
- The address space identifier (ASID) for the failing task was X'000C'.
IEA995I SYMPTOM DUMP OUTPUT
SYSTEM COMPLETION CODE=0C4  REASON CODE=00000004
TIME=16.44.42  SEQ=00057  CPU=0000  ASID=000C
PSW AT TIME OF ERROR  078D0000   00006FEA  ILC 4  INTC 04
ACTIVE LOAD MODULE=ABENDER  ADDRESS=00006FD8  OFFSET=00000012
DATA AT PSW  00006FE4 - 00105020  30381FFF  58E0D00C
GPR 0-3  FD000008  00005FF8  00000014  00FD6A40
GPR 4-7  00AEC980  00AFF030  00AC4FF8  FD000000
GPR 8-11 00AFF1B0  80AD2050  00000000  00AFF030
GPR 12-15 40006FDE  00005FB0  80FD6A90  00006FD8
END OF SYMPTOM DUMP

Figure 239. Example: Symptom Dump Output

Symptom dumps appear in the following places:

- For SYSUDUMP and SYSABEND ABEND dumps: in message IEA995I, which is routed to the job log.
- For a SYSMDUMP ABEND dump: in message IEA995I in the job log and in the dump header record.
- For an SVC dump: in the dump header record.
- For any dump in a Time Sharing Option/Extensions (TSO/E) environment: displayed on the terminal when requested by the TSO/E PROFILE command with the WTPMSG option.
- In response to a DISPLAY DUMP,ERRDATA operator command, which displays information from SYS1.DUMPxx data sets on direct access.

If the information in a symptom dump is enough for diagnosis, do not provide a DD statement for a dump.

For additional information, see one of the following resources:

- See Chapter 9, “Master trace,” on page 207 for information on master trace.
- See z/OS MVS JCL Reference for the JOB statement.
- See Chapter 5, “ABEND dump,” on page 123 for information about the ABEND dump header record
- See Chapter 2, “SVC dump,” on page 7 for information about the SVC dump header record
- See z/OS TSO/E Command Reference for the PROFILE command.

Planning message processing for diagnosis

Your installation can change message processing in a number of ways to optimize diagnosis. Your installation can do the following tasks:

- Control message location
- Suppress messages
- Automate message processing
- Not retain action messages
- Suppress the symptom dump message (IEA995I)

This section can help you find the information you need to optimize message processing for your installation.

Controlling message location

An installation can change the following:

- The routing codes for specific messages to control
- On which console to display a message.

Change or specify the routing codes using the following methods:

- A WTO or WTOR macro specifies the routing code for the message that the macro creates.
• A WTO/WTOR installation exit routine changes the routing code for any WTO or WTOR message. This exit routine is the routine named in the USEREXIT parameter in the MPFLSTxx parmlib member or IEAVMIXT.
• The JES3 MSGROUTE initialization statement changes the routing code of JES3 console messages.
• The JES3 CONSOLE initialization statement can control which messages a JES3 console receives.
• Subsystem interface listeners, such as NetView, can change the routing codes.

Suppressing messages

An installation can use the following to suppress messages. Suppressed messages do not appear on a console.

• An MPFLSTxx parmlib member can specify message suppression. A suppressed message does not display on a console, but writes to the hard-copy log.
• A WTO/WTOR installation exit routine can suppress any WTO/WTOR messages or override suppression. This exit routine is the routine named in the USEREXIT parameter in the MPFLSTxx parmlib member or IEAVMIXIT.
• The JES2 installation exit routine, Exit 10, can suppress messages issued by the JES2 main task.
• The JES3 installation exit routine, IATUX31, can suppress messages routed to JES3 consoles.
• The CONTROL V operator command can suppress messages by specifying the message levels to display at a console.
• VARY operator command can change the messages received by a console by specifying the routing codes of messages to be displayed.
• The LEVEL keyword on the CONSOLE statement in the CONSOLxx parmlib member also can suppress messages by specifying the message levels to be displayed at a console. The ROUTCODE keyword can specify the routing codes of messages that are displayed at the console.

Handling message floods

A MSGFLDxx parmlib member can specify the criteria required to recognize that a message flooding situation is occurring and the actions to be taken to handle the message flood. The message flood automation policy can prevent flood messages from being:
• prevent flood messages from being displayed on a console
• prevent flood messages from being queued for automation
• prevent flood messages from being written to the SYSLOG or OPERLOG

Messages are written to the SYSLOG or OPERLOG identifying the job or specific message that is causing the message flood; messages are also written to the logs when action is taken against specific messages or messages from that job.

Automating message processing

An MPFLSTxx parmlib member can specify that a message is to be passed to an automation subsystem, such as NetView. The automation subsystem can perform actions that the operator would have performed without operator intervention.

Not retaining action messages

The MPFLSTxx parmlib member can specify not to retain a message using the Action Message Retention Facility (AMRF). An operator cannot recall to the screen action messages that are not retained.

Suppressing symptom dumps (IEA995I)

Table 78 on page 663 lists ways to suppress symptom dumps for ABEND dumps. These ways suppress only message IEA995I; symptom dumps continue to appear in other locations.
### Table 78. Suppressing symptom dumps

<table>
<thead>
<tr>
<th>Dump Type</th>
<th>CHNGDUMP Operator Command used to Suppress Symptom Dump</th>
<th>Parmlib Member used to Suppress Symptom Dump</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSABEND ABEND</td>
<td>CHNGDUMP SET, SYSABEND, SDATA=(NOSYM)</td>
<td>IEAABD00</td>
</tr>
<tr>
<td>SYSMDUMP ABEND</td>
<td>CHNGDUMP SET, SYSMDUMP=(NOSYM)</td>
<td>IEADMR00</td>
</tr>
<tr>
<td>SYSUDUMP ABEND</td>
<td>CHNGDUMP SET, SYSUDUMP, SDATA=(NOSYM)</td>
<td>IEADMP00</td>
</tr>
</tbody>
</table>

For more information, see one of the following references:

- See [z/OS MVS Planning: Operations](#) for message flood automation, controlling message display, suppressing messages, AMRF, and automating messages in a sysplex.
- See [z/OS MVS Programming: Assembler Services Reference IAR-XCT](#) for the WTO and WTOR macros.
- See [z/OS MVS Initialization and Tuning Reference](#) for the MPFLSTxx and CONSOLxx members.
- See [z/OS MVS Installation Exits](#) for the exit routine named in the USEREXIT parameter and for IEAVMXIT.
- See [z/OS JES3 Initialization and Tuning Reference](#) for the JES3 initialization statements.
- See [z/OS JES2 Installation Exits](#) for Exit 10.
- See [z/OS JES3 Customization](#) for the IATUX31 exit.
- See [z/OS MVS System Commands](#) for the CONTROL V and the CHNGDUMP operator command.
Chapter 22. Hardware Instrumentation Services

Hardware instrumentation services (HIS) is a function that collects hardware event data for IBM System z10 or later machines.

IBM may request that you provide hardware event data for diagnostics. Before you start the HIS data collection, you may first need to authorize the sampling facilities and counter set types you want to use through the support element (SE) console. For each LPAR of interest, you will need to verify each of the following settings:

- Basic counter set authorization control
- Problem state counter set authorization control
- Crypto activity counter set authorization control
- Extended counter set authorization control
- Basic sampling authorization control

The LPAR to be measured may be already activated and running. A dynamic update can be done to enable the CPU Measurement Facility without disrupting this LPAR by selecting the Change LPAR Security icon on the SE or HMC. The Save and Change options on the LPAR security panel will dynamically change the running system and also save the change to the activation profiles. See Figure 240 on page 665 for an example.

Figure 240. Change LPAR Security panel for active LPAR

For LPARs that have not yet been activated, the CPU Measurement Facility can be enabled using the security tab for the activation profile. See Figure 241 on page 666 for an example.
Figure 241. Activation profile security panel for new LPAR

For information about how to set up the authorization of the sampling facilities and counter sets, see Support Element Operations Guide for System z10 machine on the Resource Link home page (www.ibm.com/servers/resourcelink).

In addition, with the enhanced-monitor facility hardware released with z196 machines, the HIS function expands into a z/OS software event data collector that will be used by IBM for improved problem analysis. The z/OS event counters are viewed as an additional counter set, but there is no authorization required to use the hardware. For information on the enhanced-monitor facility hardware, see z/Architecture Principles of Operation.
Appendix A. Accessibility

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features in z/OS can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

Consult assistive technologies

Assistive technology products such as screen readers function with the user interfaces found in z/OS. Consult the product information for the specific assistive technology product that is used to access z/OS interfaces.

Keyboard navigation of the user interface

You can access z/OS user interfaces with TSO/E or ISPF. The following information describes how to use TSO/E and ISPF, including the use of keyboard shortcuts and function keys (PF keys). Each guide includes the default settings for the PF keys.

- z/OS TSO/E Primer
- z/OS TSO/E User's Guide
- z/OS ISPF User's Guide Vol I

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users who access IBM Knowledge Center with a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line because they are considered a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that the screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.
Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol is placed next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 \* FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* \* FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol to provide information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, it indicates a reference that is defined elsewhere. The string that follows the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you must refer to separate syntax fragment OP1.

The following symbols are used next to the dotted decimal numbers.

? indicates an optional syntax element
The question mark (?) symbol indicates an optional syntax element. A dotted decimal number followed by the question mark symbol (?) indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that the syntax elements NOTIFY and UPDATE are optional. That is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

! indicates a default syntax element
The exclamation mark (!) symbol indicates a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicate that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the dotted decimal number can specify the ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In the example, if you include the FILE keyword, but do not specify an option, the default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, the default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP applies only to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

* indicates an optional syntax element that is repeatable
The asterisk or glyph (*) symbol indicates a syntax element that can be repeated zero or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3* , 3 HOST, 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

Notes:
1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you can write HOST STATE, but you cannot write HOST HOST.
3. The * symbol is equivalent to a loopback line in a railroad syntax diagram.

+ indicates a syntax element that must be included

The plus (+) symbol indicates a syntax element that must be included at least once. A dotted decimal number followed by the + symbol indicates that the syntax element must be included one or more times. That is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the + symbol can repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loopback line in a railroad syntax diagram.
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