MVS Diagnosis:
Tools and Service Aids
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    Documentation Upload Utility ......................... 646
About this information

This information covers the tools and service aids that IBM provides for use in diagnosing MVS™ problems. This edition supports z/OS® (5694-A01).

The first chapter, 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 chapters vary, the following topics are generally 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 intended to characterize the tool or service aid covered in the chapter.

Who should use this information

This information is for anyone who diagnoses software problems that occur while running 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 problem reporting data bases
- Understands the techniques for reporting problems to IBM

Where to find more information

Where necessary, this information references information in other documents, using shortened versions of the information title. For complete titles and order numbers of the documents for all products that are part of z/OS, see z/OS Information Roadmap.

Information updates on the web

For the latest information updates that have been provided in PTF cover letters and Documentation APARs for z/OS, see the online information at:
http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ZDOCAPAR.

This information is updated weekly and lists documentation changes before they are incorporated into z/OS publications.
The z/OS Basic Skills Information Center

The z/OS Basic Skills Information Center is a Web-based information resource intended to help users learn the basic concepts of z/OS, the operating system that runs most of the IBM mainframe computers in use today. The Information Center is designed to introduce a new generation of Information Technology professionals to basic concepts and help them prepare for a career as a z/OS professional, such as a z/OS system programmer.

Specifically, the z/OS Basic Skills Information Center is intended to achieve the following objectives:

• Provide basic education and information about z/OS without charge
• Shorten the time it takes for people to become productive on the mainframe
• Make it easier for new people to learn z/OS.

To access the z/OS Basic Skills Information Center, open your Web browser to the following Web site, which is available to all users (no login required):

http://publib.boulder.ibm.com/infocenter/zos/basics/index.jsp
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  GA22-7589-19
• The topic and page number related to your comment
• The text of your comment.

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Summary of changes

This document contains terminology, maintenance, and editorial changes to improve consistency and retrievability. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Changes made in z/OS Version 1 Release 13, as updated September 2012

This document contains information previously presented in z/OS MVS Diagnosis: Tools and Service Aids, GA22-7589-18, which supports z/OS Version 1 Release 13.

New information:
- “OPTIONS parameter” on page 455 is updated for storage-class memory (SCM), 1 MB pageable large pages and 2 GB fixed large pages.

Changed information:
- “RCVY trace entries” on page 195 is updated with a RCVY SRBT trace entry.

Changes made in z/OS Version 1 Release 13, as updated April 2012

This document contains information previously presented in z/OS MVS Diagnosis: Tools and Service Aids, GA22-7589-17, which supports z/OS Version 1 Release 13.

Changed information:
- “Procedure A: Initialize and run stand-alone dump” on page 109 is updated to mention that a DASD output device must be in the same subchannel set as the device from which the stand-alone dump is IPLed.
- Information about the format of PSW addresses in system trace entries has been modified in the following topics:
  - “CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185
  - “DSP, SRB, SSRB, and WAIT trace entries” on page 190
  - “PGM, SPER and SPR2 trace entries” on page 193
  - “SVC, SVCE, and SVCR trace entries” on page 213
- “TCW trace records” on page 299 is updated for the extension of the Transport-Command Area (TCA).

Changes made in z/OS Version 1 Release 13

This document contains information previously presented in z/OS MVS Diagnosis: Tools and Service Aids, GA22-7589-16, which supports z/OS Version 1 Release 12.

New information:
- New name pattern guidelines for the dump data set when the system name begins with a numeric. See “Establishing a name pattern” on page 10.
- “Procedure A: Initialize and run stand-alone dump” on page 109 is updated to mention that a DASD output device must be in the same subchannel set as the device from which the stand-alone dump is IPLed.
• “Requesting a SYSLOGR trace” on page 423 is updated to include alternatives for specifying the CTrnLOGxx parmlib member.

• The DUMP|DUMPT member in Chapter 16, “SPZAP,” on page 593 contains a new example.

• AMASPZAP does not support load modules assembled with GOFF. See Chapter 16, “SPZAP,” on page 593.

• A new chapter for Chapter 18, “Problem Documentation Upload Utility,” on page 637. This utility is now integrated into z/OS and contains additional parameters to consider before first use. See Chapter 18, “Problem Documentation Upload Utility,” on page 637.

**Changed information:**

• In “Generating the stand-alone dump program” on page 96, the section on “One-stage generation” on page 96 is updated to include new information about migrating and JCL samples for using multiple formats (DASD, tape) and z/OS releases.

• “TCW trace records” on page 299 is updated for the extension of the Transport-Command Area (TCA).

• The sub-options in “SYSIETAL component trace” on page 394 are changed. For details, see “OPTIONS parameter” on page 396.

• The SYSRSM component of CTRACE now uses a more flexible single-buffer system. For details, see “SYSRSM component trace” on page 453.

• For SPZAP, in the DUMP|DUMPT member, the default for the class-name parameter is B_TEXT, with TEXT capitalized. The DUMP|DUMPT member now indicates it can also be used for a z/OS UNIX file. See Chapter 16, “SPZAP,” on page 593.

• “Coding rules for SPZAP control statements” on page 613 contains additional guidance for continuation support.

**Deleted information:**

• The topic on “GTF and indexed VTOC processing” is obsolete and removed from this publication.

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**Changes made in z/OS Version 1 Release 12**

This document contains information previously presented in z/OS MVS Diagnosis: Tools and Service Aids, GA22-7589-15, which supports z/OS Version 1 Release 11.

**New information:**

• In Chapter 4, “Stand-Alone dump,” on page 65, the following new information has been added:

  – Dump tailoring options can be specified on the new keyword ADDSUMM of the AMDSADMP macro to dump the additional address spaces in prioritized order.
  – The AMDSADDD utility supports a new option EATTR.
  – The DSNTYPE option of the AMDSADDD utility supports a new keyword EXTREQ.

• A new system trace SSRV entry with ssid X’1050’ for CPU reconfiguration has been added. See “SSRV trace entries” on page 203.

• Both AMBLIST and SPZAP support the following dynamic allocation (DYNALLOC or SVC 99) options for all data sets: S99TIOEX(XTIOT),
S99ACUCB (NOCAPTURE), and S99DSABA (DSAB above the line). See Chapter 15, “AMBLIST,” on page 529 and Chapter 16, “SPZAP,” on page 593.

- SETIOS component trace supports a new option HPAV. See “SYSIOS component trace” on page 400.
- SETRSM component trace supports multiple new options. See “SYSRSM component trace” on page 453.

Changed information:

- Chapter 4, “Stand-Alone dump,” on page 65 is updated with the following information:
  - The REALLOC option of AMDSADDD utility is updated. See “Using the AMDSADDD utility” on page 89.
  - The procedures to run the stand-alone dump program are updated. See “Running the stand-alone dump program” on page 108.
  - The default value for TRK0TEXT is changed in Table 14 on page 97.
  - “Using EREP” on page 510 contains updated examples of JCL jobs.
- The CD/D, PSW--ADDRESS, and UNIQUE-1 descriptions of the SVC, SVCE, and SVCR trace entries are updated. See “SVC, SVCE, and SVCR trace entries” on page 213.
- The restrictions of using AMATERSE are updated. See Chapter 17, “AMATERSE,” on page 631.
- Chapter 11, “Component trace,” on page 331 is updated with the following information:
  - SETGRS component trace has updated default buffer size and FLOW options. See “SYSGRS component trace” on page 385.
  - The default buffer size for SYSXCF component trace and the CTIXCF00 content are changed. See “SYSXCF component trace” on page 477.
  - The default buffer size for SYSXES component trace is changed. See “SYSXES component trace” on page 481.
- Chapter 15, “AMBLIST,” on page 529 is updated with the following information:
  - For LISTOBJ control statement, the restriction of 8-byte member name on the MEMBER= statement is removed. See “Controlling AMBLIST processing” on page 530.
  - The z/OS UNIX file output that AMBLIST prints is updated. See “Examples for z/OS UNIX System Services file support” on page 542.
- SPZAP control statement is updated. Use 28-bit cylinder address when SYSLIB DD points to an EAV data set. See Chapter 16, “SPZAP,” on page 593.
- AMBLIST and SPZAP (AMASPZAP or IGWSPZAP) support all data sets allocated in the extended addressing space (EAS) of an extended address volume (EAV). See Chapter 15, “AMBLIST,” on page 529 and “Running SPZAP” on page 608.
- AMBLIST and SPZAP (AMASPZAP or IGWSPZAP) support the following dynamic allocation (DYNALLOC or SVC 99) options for all data sets: S99TIOEX(XTJOT), S99ACUCB (NOCAPTURE), and S99DSABA (DSAB above the line). See Chapter 15, “AMBLIST,” on page 529 and “Running SPZAP” on page 608.
- When DUMPSRV is cancelled or restarted, DAE is restarted without dump suppression. You must manually reactivate dump suppression. See “Stopping, starting, and changing DAE” on page 656.
- The “Readers’ Comments - We’d Like to Hear from You” section at the back of this publication has been replaced with a new section “How to send your
Comments to IBM” on page xv. The hardcopy mail-in form has been replaced with a page that provides information appropriate for submitting readers comments to IBM.

Changes made in z/OS Version 1 Release 11

This document contains information previously presented in z/OS MVS Diagnosis: Tools and Service Aids, GA22-7589-14, which supports z/OS Version 1 Release 10.

New information:

- The following data sets are in support of placement in cylinder-managed space:
  - Formatted print files including ABEND dumps, SNAP dumps, and the print files from AMBLIST, SPZAP, and AMATERSE.
  - Unformatted dump data sets.
  - Unformatted external traces from component trace and GTF trace.
- A new trace entry, SPIN has been added. See “SPIN trace entries” on page 199 for details.
- New OPTIONS parameters, AXRWAIT, AXRINFO, and GETRXLIB, have been added. See “OPTIONS parameter” on page 401 for details.
- A new CTRACE OPTION, KERNINFO, and a sample output of it have been added. See “Formatting a SYSOMVS trace” on page 431 and “Output from a SYSOMVS trace” on page 433 in “SYSOMVS component trace” on page 428 for details.
- A new trace option, COMMAND has been added. See “OPTIONS parameter” on page 442 and “Formatting a SYSOPS trace” on page 443 in “SYSOPS component trace” on page 440 for details.

Changed information:

- In “Obtaining SVC dumps” on page 17, the introduction has been updated with AUXMGMT parameter.
- Update bit 1 to the statement of the procedure to initialize and run a stand-alone dump. See “Procedure A: Initialize and run stand-alone dump” on page 109 for details.
- Update descriptions of extended format sequential data sets for abend dumps, SNAP dumps and trace data sets. See “Obtaining ABEND dumps” on page 139 in Chapter 5, “ABEND dump,” on page 137, “Obtaining SNAP dumps” on page 161 in Chapter 6, “SNAP dump,” on page 161 and “Request writing component trace data to trace data sets” on page 344 in “Obtaining a component trace” on page 341.
- Update DD name SYSUT3 to the JCL statements. See “Invoking AMATERSE” on page 632 for details.
- The description of ATTRIBUTES OF MODULE in the section of Module summary has been updated. See “Reading AMBLIST output” on page 543 in Chapter 15, “AMBLIST,” on page 529 for details.
- The description of Operational considerations has been updated. See “Running SPZAP” on page 608 in Chapter 16, “SPZAP,” on page 593 for details.
- The topic “Alphabetical map” on page 580 is updated with a note on preset order.
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.

Major topics

There are major two topics:

- "How do I know which tool or service aid to select?" - 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?" - 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 provides criterion for selecting a tool or service aid, depending on the problem or need. There are three tables:

- Selecting a dump, Table 1
- Selecting a trace, Table 2 on page 2
- Selecting a service aid, Table 3 on page 2

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. Selecting a dump

<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&lt;br&gt;See Chapter 3, “Transaction dump,” on page 55 for detailed information.</td>
</tr>
<tr>
<td>Testing of a problem program while it is running</td>
<td>SNAP dump&lt;br&gt;See Chapter 6, “SNAP dump,” on page 161 for detailed information.</td>
</tr>
<tr>
<td>Abnormal end of an authorized program or a problem program</td>
<td>ABEND dump&lt;br&gt;See Chapter 5, “ABEND dump,” on page 137 for detailed information.</td>
</tr>
<tr>
<td>System problem when the system continues processing</td>
<td>SVC dump&lt;br&gt;See Chapter 2, “SVC dump,” on page 7 for detailed information.</td>
</tr>
</tbody>
</table>
### Selecting tools and service aids

**Table 1. Selecting a dump (continued)**

<table>
<thead>
<tr>
<th>What is the problem or need?</th>
<th>Type of dump to use</th>
</tr>
</thead>
<tbody>
<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&lt;br&gt;See Chapter 4, “Stand-Alone dump,” on page 65 for detailed information.</td>
</tr>
</tbody>
</table>

**Table 2. Selecting a trace**

<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&lt;br&gt;See Chapter 11, “Component trace,” on page 331 for detailed information.</td>
</tr>
<tr>
<td>System problem: diagnosis requires detailed checking of one or two system events</td>
<td>Generalized trace facility (GTF) trace&lt;br&gt;See Chapter 10, “The Generalized Trace Facility (GTF),” on page 225 for detailed information.</td>
</tr>
<tr>
<td>System or authorized program problem: diagnosis requires the messages related to a dump</td>
<td>Master trace&lt;br&gt;See Chapter 9, “Master trace,” on page 219 for detailed information.</td>
</tr>
<tr>
<td>System problem: diagnosis requires checking many system events</td>
<td>System trace&lt;br&gt;See Chapter 8, “System trace,” on page 175 for detailed information.</td>
</tr>
<tr>
<td>System or problem program: diagnosis requires information about allocation of virtual storage.</td>
<td>GETMAIN, FREEMAIN, STORAGE (GFS) trace&lt;br&gt;See Chapter 13, &quot;GETMAIN, FREEMAIN, STORAGE (GFS) trace,” on page 495 for detailed information.</td>
</tr>
</tbody>
</table>

**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&lt;br&gt;See Chapter 14, “Recording logrec error records,” on page 501 for detailed information.</td>
</tr>
<tr>
<td>Information about the content of load modules and program objects or problem with modules on system.</td>
<td>AMBLIST&lt;br&gt;See Chapter 15, “AMBLIST,” on page 529 for detailed information.</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&lt;br&gt;See Chapter 16, “SPZAP,” on page 593 for detailed information.</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&lt;br&gt;See Chapter 17, “AMATERSE,” on page 631 for detailed information.</td>
</tr>
<tr>
<td>Need to eliminate duplicate or unneeded dumps.</td>
<td>DAE&lt;br&gt;See Chapter 19, “Dump suppression,” on page 647 for detailed information.</td>
</tr>
</tbody>
</table>
### Selecting tools and service aids

#### Table 3. Selecting a service aid (continued)

<table>
<thead>
<tr>
<th>What is the problem or need?</th>
<th>Type of service aid to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis requires a trap to catch problem data while a program is running.</td>
<td>SLIP</td>
</tr>
<tr>
<td></td>
<td>See [z/OS MVS System Commands](z/OS MVS System Commands) for detailed information.</td>
</tr>
<tr>
<td>Diagnosis requires formatted output of problem data, such as a dump or trace.</td>
<td>IPCS</td>
</tr>
<tr>
<td></td>
<td>See [z/OS MVS IPCS User's Guide](z/OS MVS IPCS User's Guide) for detailed information.</td>
</tr>
</tbody>
</table>

### What tools and service aids are available?

This topic provides an overview of the tools and service aids in a little 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:

- Description of Dumps, Table 4 on page 4
- Description of Traces, Table 5 on page 5
- Description of Service Aids, Table 6 on page 5

Dumps, traces, or service aids are listed in order by frequency of use in the following tables.

#### Dumps

**Table 4. Description of dumps**

<table>
<thead>
<tr>
<th>Type of dump</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABEND Dump</td>
<td>Use an ABEND dump when ending an authorized program or a problem program because of an uncorrectable error. These dumps show:</td>
</tr>
<tr>
<td></td>
<td>• The virtual storage for the program requesting the dump.</td>
</tr>
<tr>
<td></td>
<td>• System data associated with the program.</td>
</tr>
<tr>
<td></td>
<td>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:</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• SYSUDUMP dumps - The smallest of the ABEND dumps, containing data and areas only about the failing program.</td>
</tr>
<tr>
<td></td>
<td><strong>Reference:</strong> See [Chapter 5, “ABEND dump,” on page 137](Chapter 5, “ABEND dump,” on page 137) for detailed information.</td>
</tr>
</tbody>
</table>

**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 55](Chapter 3, “Transaction dump,” on page 55) for details.
### Selecting tools and service aids

**Table 4. Description of dumps (continued)**

<table>
<thead>
<tr>
<th>Type of dump</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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 161](#) 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 65](#) 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. |

### Traces

**Table 5. Description of traces**

<table>
<thead>
<tr>
<th>Trace</th>
<th>Description</th>
</tr>
</thead>
</table>
| Component Trace | 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 11, “Component trace,” on page 331](#) for detailed information. |
| GFS Trace       | Use GFS trace to collect information about requests for virtual storage through the GETMAIN, FREEMAIN, and STORAGE macro.  

**Reference:** See [Chapter 13, “GETMAIN, FREEMAIN, STORAGE (GFS) trace,” on page 495](#) for detailed information. |
## Selecting tools and service aids

### Table 5. Description of traces (continued)

<table>
<thead>
<tr>
<th>Trace</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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.</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>required to diagnose your system problem. GTF can be run to an external data set as well as a buffer.</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</td>
</tr>
<tr>
<td></td>
<td>pertinent to your problem than the messages accompanying the dump itself.</td>
</tr>
<tr>
<td></td>
<td>Reference: See <a href="#">Chapter 9, “Master trace,” on page 219</a> 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</td>
</tr>
<tr>
<td></td>
<td>continuously. It records many system events, with minimal detail about each. The events traced are predetermined, except for branch tracing.</td>
</tr>
<tr>
<td></td>
<td>This trace uses fewer resources and is faster than a GTF trace.</td>
</tr>
<tr>
<td></td>
<td>Reference: See <a href="#">Chapter 8, “System trace,” on page 175</a> for detailed information.</td>
</tr>
</tbody>
</table>

### Service aids

### 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</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Reference: See <a href="#">Chapter 15, “AMBLIST,” on page 529</a> for detailed information.</td>
</tr>
<tr>
<td>Common Storage Tracking</td>
<td>Use common storage tracking to collect data about requests to obtain or free storage in CSA, ECSA, SQA, and ESQA. This useful to identify jobs or address spaces</td>
</tr>
<tr>
<td></td>
<td>using an excessive amount of common storage or ending without freeing storage.</td>
</tr>
<tr>
<td></td>
<td>Use RMF™ or the IPCS VERBEXIT VSMDATA subcommand to display common storage tracking data.</td>
</tr>
<tr>
<td></td>
<td>References:</td>
</tr>
<tr>
<td></td>
<td>• See <a href="#">z/OS MVS Initialization and Tuning Guide</a> for detailed information on requesting common storage tracking.</td>
</tr>
<tr>
<td></td>
<td>• See the VSM chapter of <a href="#">z/OS MVS Diagnosis: Reference</a> for information on the IPCS VERBEXIT VSMDATA subcommand.</td>
</tr>
</tbody>
</table>
## Table 6. Description of service aids (continued)

<table>
<thead>
<tr>
<th>Service Aid</th>
<th>Description</th>
</tr>
</thead>
</table>
| **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 19, “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 14, “Recording logrec error records,” on page 501 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.  
**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 16, “SPZAP,” on page 593 for detailed information. |
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.

**Major topics**

This 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 13
- “Choosing SVC dump data sets” on page 15
- “Obtaining SVC dumps” on page 17
- “Printing, viewing, copying, and clearing a pre-allocated or SYS1.DUMPxx data set” on page 26
SVC dump

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 15.

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 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 15 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. Stripping 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.
**SVC dump**

**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.

For more information, see the following references:

- See [z/OS Security Server RACF System Programmer’s Guide](#) for information about the RACF STARTED general resource class, and the RACF Started Procedures Table.
- See [z/OS Security Server RACF Security Administrator’s Guide](#) for information on using the RACF STARTED general resource class, and on controlling creation of new data sets.

**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 S&SYSNAME convention when the system name begins with numeric and is less than 8 characters long. For example:

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

The following describes the default name pattern:
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 following output 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
```

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 11](#).

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 through 3 requesting dump status would result in the following:

```
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: DUMPDA
```
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.

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 contains the syntax of the DUMPDS ADD, DEL, and ALLOC=ACTIVE commands.

For more information about SMS, see z/OS DFSMSdfp Storage Administration.

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”
- “Specifying SYS1.DUMPxx data sets” on page 16
- “Controlling SYS1.DUMPxx data sets” on page 17

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.
- 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
SVC dump

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:

\[
\text{Bytes of SDATA options} + \text{bytes in largest region size} = \text{Result1}
\]
\[
\text{Result1} \times \text{number of address spaces in dump} = \text{Result2}
\]
\[
\text{PLPA} \times 20\% = \text{Result3}
\]
\[
\text{Bytes of requested data space storage} = \text{Result4}
\]

\[
\text{Result2} + \text{Result3} + \text{Result4} = \text{Bytes in SVC dump}
\]

Where:
- Result1, Result2, Result3, Result 4: Intermediate results
- SDATA options: Described in [Contents of SVC dumps on page 27]
- 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.

---

**Example: Calculating the largest amount of storage**

For example, to calculate the largest amount of storage required for a 3390 DASD, assume that, from the above 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.

For more information, see the following references:

- 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 compression

Greater capacity

Some dump data sets are quite large compared with other data sets generated by a system. An extended 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 DSNTYPE=LARGE In z/OS V1R7 and later releases, sequential data sets that use DSNTYPE=LARGE are allowable for SVC 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...
SVC dump

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.

  Example: Adding a SYS1.DUMP data set

  To specify 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 reused 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.

See the following references for more information:
- 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 SVC dumps**

Obtain an SVC dump by issuing a SDUMP or SDUMPX macro in an authorized program, issuing a DUMP operator command, issuing a SLIP operator command, or using a SLIP command in the IEASLPxx parmlib member.

An SVC dump begins as a snapshot of volatile system data into DUMPSRV owned virtual storage, which is represented by DUMPSRV data spaces and DUMPSRV high virtual storage within the DUMPSRV address space. As such, the collection of data can represent an unusually heavy load upon the storage resources. The virtual storage burden remains until the dump is written out to a target data set on DASD, which can be an SVC dump data set that is specified on the DCB parameter of the SDUMP or SDUMPX macro, a pre-allocated SYS1.DUMPxx data set, or an automatically allocated dump data set. The DUMPDS operator command allows the installation to manage the pre-allocated and automatically allocated data sets.
If normal auxiliary storage utilization is above 30%, the system might be subject to severe performance impacts. The system might even experience a WAIT03C state when SVC dumping occurs, which indicates that the system ran out of available paging slots. You can specify the MAXSPACE and AUXMGMT options on the CHNGDUMP SET, SDUMP command to manage the burden of taking SVC dumps on a system, though using them might not be sufficient to eliminate all problems associated with restricted auxiliary (paging) storage availability.

- 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 13 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 for.
  - The paging resources for the affected systems must also be increased to accommodate the additional load represented by the MAXSPACE value. The minimum value for defining the additional auxiliary storage capacity should be three times of the MAXSPACE value. This is in line with the guideline of maintaining utilization within 30%.

- The AUXMGMT=ON parameter allows the installation to sacrifice the 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 are allowed again only after the auxiliary storage usage drops below 35%.
  - Current SDUMP data capture stops when auxiliary storage usage exceeds 68%, generating a partial dump.

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

In a sysplex, you probably need dumps from more than one system to collect all of the problem data. These dumps need to be requested at the same time. To request these multiple dumps, do one of the following on any of the systems that might be involved in 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. Because you may not be able to predict which system will first have the problem, use a ROUTE operator command to activate the traps on all systems that are similar. Each trap should include a REMOTE parameter to dump all the other systems that might be involved.

To help you set up these requests, the commands and macro 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.

This section describes each of these topics, as follows:

- “Issuing a macro for SVC dump” on page 19
- "Operator activities" on page 19
**SVC dump**

- “Making a dump data set available” on page 22
- “Determining current SVC dump options and status” on page 23
- “Finding SVC dumps” on page 23

## 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.

**Example: Dumping default contents**

To dump the default contents listed in “Contents of SVC dumps” on page 27 to a SYS1.DUMPxx data set:

```
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.

**Example: Requesting a synchronous dump**

To write a synchronous dump to a data set whose DCB address is in register 3:

```
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.
Example: Using the DUMP command

The following operator command will write an SVC dump:
- 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 27
- For a job named MYJOB1
  
  DUMP COMM=(MYDUMP1 5-9-88)

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, SYNCVSVC, or TRDUMP.

Example: Using the SLIP command

The following 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 27

  SLIP SET, ACTION=SVCD, ERTYP=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.

The following references contain more information:

- See z/OS MVS System Commands for the DUMP and SLIP operator commands.
- See z/OS MVS Initialization and Tuning Reference for 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. They may be used as a base for further modification, to deal with installation specific requirements, such as system names, address space names, and so on. Additionally, an attempt was made to provide substitution variables where names can vary by installation. So, in order to take advantage of these members, they must be modified and saved into a data set in your parmlib concatenation.

**Note:** The substitution variable length may not be sufficient for the values used at a particular site. For example, &job in IEADMCAS can only accommodate job names that are 4 characters or less. For this example, after copying it to a parmlib member, change &job to a longer variable which can accommodate up to eight characters, like &thisjob.

The following table summarizes the sample dump commands that z/OS R2 supplies in SYS1.SAMPLIB.

### Table 7. Sample operator DUMP command members 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>IEADMCCN</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>
<tr>
<td>IEADMJC2</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, DFHSM, 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>IEADMCRL</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>IEADMCRR</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/1 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>
</tbody>
</table>
### SVC dump

**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>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>IEDMVCVC</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>IEDMVCVG</td>
<td>VTAM GR</td>
<td>VTAM Generic Resources environment, with its CF structure</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>IEDMVCVT</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>IEDMVV</td>
<td>VTAM</td>
<td>VTAM and the VIT data space</td>
<td>&amp;net</td>
<td></td>
</tr>
<tr>
<td>IEDMCWL</td>
<td>WLM</td>
<td>WLM on all systems in the sysplex</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>IEDMCWS</td>
<td>Web server</td>
<td>HTTP web server with OMVS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEDMCWT</td>
<td>Web server</td>
<td>HTTP web server and TCP/IP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEDMCI</td>
<td>IRLM</td>
<td>XCF and IRLM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEDMCX1</td>
<td>IRLM</td>
<td>XCF and IRLM on all systems in the sysplex</td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
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.

**Example: Using the DUMPDS command**

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
```
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.

References

- 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.

Example: Determining the mode and options

To ask for the mode and options, enter:

```sh
DISPLAY DUMP,OPTIONS
```

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

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.

Example: Determining the status

To ask for the status of SYS1.DUMPxx data sets, enter:

```sh
DISPLAY DUMP,STATUS
```

References

- See z/OS MVS System Commands for the CHNGDUMP and DISPLAY commands.
- For a description of these messages, use LookAt or 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.

Example: Finding title and time using DISPLAY

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.

Example: Finding the title and time using IPCS

To see 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 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

Example: Viewing 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
```

Example: Output from DISPLAY,DUMP ERRDATA command

Using the DISPLAY DUMP,ERRDATA command, 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.

```
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=SEQ00010 CPU0000 ASID0010 TIME=13.00.55
SYSTEM ABEND CODE=0C1 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 023FFF6 023F2BF8
GPR 4-7 008F0D88 023F3FF7 823FDF8 7F6EC090
GPR 8-11 00000048 7F6EC938 7F6EB6A8 7F6EBA68
GPR12-15 7F6E8538 7F6E8538 00000000 00000000
NO DUMP DATA AVAILABLE FOR THE FOLLOWING EMPTY SYS1.DUMP DATA SETS: 01
```

See z/OS MVS System Commands for 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.

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

For a pre-allocated data set or a SYS1.DUMPxx data set, this JCL 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 DSNAME 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,DYNAMNBR=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=*  
//SYSTSPRINT DD SYSOUT=*  
//SYSSTSPRT DD SYSOUT=*  
//SYSTSIM 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
/*
```
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”
- “Contents of summary dumps in SVC dumps” on page 30
- “Customizing contents through operator commands” on page 33

Customized contents using the SDATA parameter

The IBM-supplied default contents and the contents available through customization are detailed in Table 8 on page 28. 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:
**SVC dump**

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>SVC Dump for SDUMP or SDUMPPX Macro or DUMP Command with SDATA Parameter</th>
<th>SVC Dump for DUMP Command without SDATA Parameter</th>
<th>SVC Dump for SLIP Command ACTION=SVCD or SYNCVCD</th>
<th>SVC Dump for SLIP Command ACTION=STDUMP</th>
<th>SVC Dump for SLIP Command ACTION=TRDUMP</th>
<th>SVC Dump for DUMP Command SVCDUMPRGN=YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALLNUC</td>
<td>The DAT-on and DAT-off nucleuses</td>
<td>M X X</td>
<td>C</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>COUPLE</td>
<td>Data on cross-system coupling</td>
<td>M C X</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> COUPLE cannot be specified on an SDUMP macro. It can, however, be specified on an SDUMPPX macro.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSA</td>
<td>Common service area (CSA) (that is, subpools 227, 228, 231, 241)</td>
<td>M C X</td>
<td>D</td>
<td>D C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>DEFAULTS</td>
<td>Default areas</td>
<td></td>
<td></td>
<td></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>M C X</td>
<td>X</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>• Global queue control blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Local queue control blocks</td>
<td></td>
<td></td>
<td></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>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• EXCPD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• UCB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPA</td>
<td>Active link pack area (LPA): module names and contents</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>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>
<td>D M C X</td>
<td>D X</td>
<td>D C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>NOALL</td>
<td>No ALLPSA</td>
<td>M X X</td>
<td>X</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

**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 8. Customizing SVC dump contents through the SDATA parameter**

Available on the command that requests the dump

IBM-supplied default contents

Available on the macro that requests the dump

Available in the parmlib member that controls the dump options

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

**blank** No symbol indicates that the area cannot be obtained.
### Table 8. Customizing SVC dump contents through the SDATA parameter (continued)

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>SVC Dump for SDUMP or SDUMPP Command with SDATA Parameter</th>
<th>SVC Dump for DUMP Command without SDATA Parameter</th>
<th>SVC Dump for SLIP Command ACTION=SVC or SYNC SVC</th>
<th>SVC Dump for SLIP Command ACTION=STDUMP</th>
<th>SVC Dump for DUMP Command SVCDUMPRGN=YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOALLPSA</td>
<td>No ALLPSA</td>
<td>M X X X C D C D C C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NODEFAULTS</td>
<td>Minimum default areas needed for IPCS dump analysis Areas requested on the SDUMP or SDUMPP macro</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOSQA</td>
<td>No SQA</td>
<td>M C X X C D C D C C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOSQA</td>
<td>No SQA</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOSUM</td>
<td>No SUM</td>
<td>M C X X C D C D C C</td>
<td></td>
<td></td>
<td></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 CVT, LSQA, PSA, SQA</td>
<td>M C X X D C C D C C C</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 D X D C C C C</td>
<td></td>
<td></td>
<td></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, 201 - 205, 215 - 217, 221 - 225, 229, 230, 236, 237, 244, 249, 251 - 255. Also, allocated eligible storage above the 2-gigabyte address.</td>
<td>M C X X D C C D C C C</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>
</tr>
<tr>
<td>SQA</td>
<td>System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248)</td>
<td>D M C X D X D C C C C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUM</td>
<td>Summary dump (see Contents of summary dumps in SVC dumps on page 30)</td>
<td>D M C X D X D C C C C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWA</td>
<td>Scheduler work area (SWA) (that is, subpools 236 and 237)</td>
<td>M C X D X C C C C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRT</td>
<td>System trace, generalized trace facility (GTF) trace, and master trace, as available</td>
<td>D M C X D X D C C D C D C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default system data</td>
<td>Instruction address trace, if available</td>
<td>D D D D D D</td>
<td></td>
<td></td>
<td></td>
<td></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.

---

**Table 8. Customizing SVC dump contents through the SDATA parameter (continued)**

<table>
<thead>
<tr>
<th>SDATA Parameter Option</th>
<th>Dump Contents</th>
<th>SVC Dump for SDUMP or SDUMPX Macro or DUMP Command with SDATA Parameter</th>
<th>SVC Dump for DUMP Command without SDATA Parameter</th>
<th>SVC Dump for SLIP Command ACTION=SVCD or SYNCSVCD</th>
<th>SVC Dump for SLIP Command ACTION=STDUMP</th>
<th>SVC Dump for DUMP Command ACTION=TRDUMP</th>
<th>SVC Dump for DUMP Command SVDUMPRGN=YES</th>
</tr>
</thead>
</table>
| 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 | D |
| Default system data    | DFP problem data, if DFP Release 3.1.0 or a later release is installed | D | 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 | 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 | D |
| Default system data    | SUBTASKS: Storage for the task being dumped and program data for all of its subtasks | D | D | D | D | D | D | D |
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 9] an S indicates that the area is included in the summary dump for the dump type. For information about control blocks listed, see z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)

<table>
<thead>
<tr>
<th>Summary dump contents</th>
<th>Disabled summary dump</th>
<th>Suspend summary dump</th>
<th>Enabled summary dump</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></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></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>S</td>
</tr>
<tr>
<td>– SDWA used for dump</td>
<td></td>
<td></td>
<td></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>
</tbody>
</table>
## SVC dump

**Table 9. Customizing SVC dump contents through summary dumps (continued)**

<table>
<thead>
<tr>
<th>Summary dump contents</th>
<th>Disabled summary dump</th>
<th>Suspend summary dump</th>
<th>Enabled summary dump</th>
</tr>
</thead>
<tbody>
<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>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Dump header</strong>, mapped by AMDDATA</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>

For the AMDDATA mapping, see [z/OS MVS Data Areas in z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)

| **Functional recovery routine (FRR) stack** for the current processor                | S                     |                     |                     |
| **Interrupt handler save area (IHSA)** for the home address space or, if a CML is held, for the address space whose local lock is held | S                     | S                   |                     |
| **Logical communication area (LCCA)** for each active processor                     | S                     | S                   |                     |

In dumps requested by AR-mode callers, the LCCA includes the AR mode control blocks

| **Physical configuration communication area (PCCA)** for each active processor       | S                     | S                   |                     |
| **Program call link stack elements (PCLINK) stack elements:**                       | S                     |                     |                     |
| • Pointed to by PSASEL                                                            | S                     |                     |                     |
| • Pointed to by the XSB associated with the IHSA in the dump                       | S                     | S                   |                     |
| • Pointed to by the SSRB and XSB for the SRB-mode dump requester                   | S                     | S                   |                     |
| • Associated with the suspended unit of work                                       | S                     |                     |                     |
| **Prefixed save area (PSA)** for each active processor                            | S                     | S                   |                     |
| **Save areas of register contents**                                               | S                     |                     |                     |
| **SDWA associated with the failure of a system routine**                           | S                     |                     |                     |
| **Storage:** The storage ranges and ASIDs requested in parameters on the SDUMP or SDUMPX macro | S                     | S                   | S                   |
| **Storage:** 4 kilobytes before and 4 kilobytes after:                             | S                     |                     |                     |
| • The address in the program status word (PSW)                                     | S                     |                     |                     |
| • All valid unique addresses in the registers saved in the IHSA shown in the dump  | S                     |                     |                     |
| • All valid unique addresses in the registers saved in the SDWA shown in the dump  | S                     |                     |                     |
| • 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 | S                     |                     |                     |
| **Storage:** 4 kilobytes before and 4 kilobytes after:                             | S                     |                     |                     |
| • All valid unique addresses in the registers saved in the SDWA shown in the dump  | S                     |                     |                     |
| • All valid unique addresses in the registers in the dump requester's register save area | S                     |                     |                     |
| • All valid unique addresses in the PSWs in all SDWAs shown in the dump           | S                     |                     |                     |
Table 9. Customizing SVC dump contents through summary dumps (continued)

<table>
<thead>
<tr>
<th>Summary dump contents</th>
<th>Disabled summary dump</th>
<th>Suspend summary dump</th>
<th>Enabled summary dump</th>
</tr>
</thead>
</table>
| **Storage**: 4 kilobytes before and 4 kilobytes 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 | | | S |
| **Storage**: When a PSWREGS parameter is specified on the SDUMP or SDUMPX macro, 4 kilobytes before and 4 kilobytes after:  
• The address in the PSW, if supplied in the PSWREGS parameter  
• The address in the general purpose registers, if supplied in the PSWREGS parameter  
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. | S | S | S |
| **Supervisor control blocks**:  
• Current linkage stack  
• Primary address space number (PASN) access list  
• Work unit access list | S | S | S |
| **Vector Facility control blocks**: Global, CPU, and local work/save area vector tables (WSAVTG, WSAVTC, and WSAVTL) and work/save areas pointed to by addresses in the tables | S | | |
| XSB associated with the IHSA in the dump | S | S | |

**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 10 on page 34.

**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 10. 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 27 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) |
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.

The server code provider can create these SVC dump exits without modifying
module IEAVTSXT. The CSV/DYNEX 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 SUMDUMP). 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 VERBX SUMDUMP command, is displayed as
"----tttttt 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.

---

Example: Format of IPCS VERBX SUMDUMP command

The following is an example format using the IPCS VERBX SUMDUMP
command.

```
    STORAGE TYPE    RANGE START    RANGE END    ASID ATTRIBUTES
REGISTER AREA--  0135F000  01363FFF  001E (COMMON)
REGISTER AREA--  00000001_7F5AD000  00000001_7F5B0FFF  001E
```

The summary dump is formatted by the IPCS VERBEXIT SUMDUMP
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.
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.

Example: IPCS VERBX SUMDUMP command
The following 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</th>
<th>ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMLSTA RANGE</td>
<td>017E8000</td>
<td>017E8FFF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>SUMLSTA RANGE</td>
<td>01F98000</td>
<td>01F9CFFF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>SUMLSTA RANGE</td>
<td>02160000</td>
<td>02167FFF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>PSA</td>
<td>00000000</td>
<td>00001FFF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>PCCA</td>
<td>00F43000</td>
<td>00F4324F</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>LCCA</td>
<td>00F82000</td>
<td>00F82A47</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>LCCX</td>
<td>021C7000</td>
<td>021C771F</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>INT HANDLER DUCT</td>
<td>02232FC0</td>
<td>02232FFF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>I.H. LINKAGE STK</td>
<td>02262000</td>
<td>0226202F</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER AREA</td>
<td>0000E000</td>
<td>00001FFF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER Area</td>
<td>00FC4000</td>
<td>00FC40FF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER AREA</td>
<td>00FC4000</td>
<td>00FC40FF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER AREA</td>
<td>00FC4000</td>
<td>00FC40FF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER AREA</td>
<td>00FC4000</td>
<td>00FC40FF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
<tr>
<td>REGISTER AREA</td>
<td>00FC4000</td>
<td>00FC40FF</td>
<td>001E</td>
<td>COMMON</td>
</tr>
</tbody>
</table>

To examine the storage shown above, invoke the list command as follows:

```plaintext
IPCS LIST 00FC4000. SUMDUMP LEN(256) DISPLAY
```

******************************** TOP OF DATA ***********************************
**LIST 00FC4000 ASID(X'001E') SUMDUMP LENGTH(X'0100')
**AR
**AREA
**ASID(X'001E') SUMDUMP ADDRESS(FC4000.) KEY(00)
**00FC4000. 7F6F8FD0 7F6F6FD0 0225bad0 00000000 |",.}"........|
**00FC4010. 0225d000 02259010 00000004 00000001 |..}.............|
**00FC4020. 00000000 00FC3F10 00000000 00000000 |................|
**00FC4030. 00000000 00000000 00000000 00800000 |................|
**00FC4040. 061C9000 00000000 00000000 00000000 |................|
**00FC4050 LENGTH(X'10')==>All bytes contain X'00'
**00FC4060. 00000000 02247868 00000000 00000000 |........0.........|
**00FC4070. 02258000 00000000 00000000 00000000 |........*........|
**00FC4080 LENGTH(X'80')==>All bytes contain X'00'
**00FC4090 LENGTH(X'80')==>All bytes contain X'00'
**00FC40A0 LENGTH(X'80')==>All bytes contain X'00'
**00FC40B0 LENGTH(X'80')==>All bytes contain X'00'
**00FC40C0 LENGTH(X'80')==>All bytes contain X'00'
**00FC40D0 LENGTH(X'80')==>All bytes contain X'00'
**00FC40E0 LENGTH(X'80')==>All bytes contain X'00'
**00FC40F0 LENGTH(X'80')==>All bytes contain X'00'
**00FC4100 LENGTH(X'80')==>All bytes contain X'00'
**00FC4110 LENGTH(X'80')==>All bytes contain X'00'
**00FC4120 LENGTH(X'80')==>All bytes contain X'00'
**00FC4130 LENGTH(X'80')==>All bytes contain X'00'
**00FC4140 LENGTH(X'80')==>All bytes contain X'00'
**00FC4150 LENGTH(X'80')==>All bytes contain X'00'
**00FC4160 LENGTH(X'80')==>All bytes contain X'00'
**00FC4170 LENGTH(X'80')==>All bytes contain X'00'
**00FC4180 LENGTH(X'80')==>All bytes contain X'00'
**00FC4190 LENGTH(X'80')==>All bytes contain X'00'
**00FC41A0 LENGTH(X'80')==>All bytes contain X'00'
**00FC41B0 LENGTH(X'80')==>All bytes contain X'00'
**00FC41C0 LENGTH(X'80')==>All bytes contain X'00'
**00FC41D0 LENGTH(X'80')==>All bytes contain X'00'
**00FC41E0 LENGTH(X'80')==>All bytes contain X'00'
**00FC41F0 LENGTH(X'80')==>All bytes contain X'00'
**00FC4200 LENGTH(X'80')==>All bytes contain X'00'
**00FC4210 LENGTH(X'80')==>All bytes contain X'00'
**00FC4220 LENGTH(X'80')==>All bytes contain X'00'
**00FC4230 LENGTH(X'80')==>All bytes contain X'00'
**00FC4240 LENGTH(X'80')==>All bytes contain X'00'
**00FC4250 LENGTH(X'80')==>All bytes contain X'00'
**00FC4260 LENGTH(X'80')==>All bytes contain X'00'
**00FC4270 LENGTH(X'80')==>All bytes contain X'00'
**00FC4280 LENGTH(X'80')==>All bytes contain X'00'
**00FC4290 LENGTH(X'80')==>All bytes contain X'00'
**00FC42A0 LENGTH(X'80')==>All bytes contain X'00'
**00FC42B0 LENGTH(X'80')==>All bytes contain X'00'
**00FC42C0 LENGTH(X'80')==>All bytes contain X'00'
**00FC42D0 LENGTH(X'80')==>All bytes contain X'00'
**00FC42E0 LENGTH(X'80')==>All bytes contain X'00'
**00FC42F0 LENGTH(X'80')==>All bytes contain X'00'
**00FC4300 LENGTH(X'80')==>All bytes contain X'00'
**00FC4310 LENGTH(X'80')==>All bytes contain X'00'
**00FC4320 LENGTH(X'80')==>All bytes contain X'00'
**00FC4330 LENGTH(X'80')==>All bytes contain X'00'
**00FC4340 LENGTH(X'80')==>All bytes contain X'00'
**00FC4350 ** *** END OF DATA ***********************************************

For the record ID values, see the SMDLR and SMDXR control blocks in z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)

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 SUMLIST/SUMLSTA/SUMLSTL/SUMLIST64 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/SUMLSTL/SUMLIST64 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...
SVC dump

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 41
• "Looking at the dump title" on page 41
• "Displaying the incident token, time and type of dump" on page 43
• "Locating error information" on page 44
• "Analyze TCB structure" on page 47
• "Examining the LOGREC buffer" on page 48
• "Examining the system trace" on page 50
• "Looking at the registers" on page 51
• "Other useful reports for SVC dump analysis" on page 53
• "Reading the SDUMPX 4K SQA buffer" on page 54

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 choose option 0 (DEFAULTS) and specify the
name of the SVC dump data set on the "Source" line.

--------------- IPCS Default Values -------------------------------
COMMAND ==> 0

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.
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 DSNAME('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:
Then choose option 3 (WORKSHEET) from the analysis of dump contents menu:

--- z/OS 01.02.00 IPCS PRIMARY OPTION MENU ---

Option ==> 2

Enter END command to end the IPCS dialog.

IPCS displays a new panel with information similar to that in [Figure 2 on page 43](#).
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.
STATUS WORKSHEET also displays the error ID. In Figure 2, 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 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

The IPCS dialog does not have a menu option for STATUS SYSTEM. Instead you must enter the subcommand.

Figure 3 on page 44 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 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 and enter the following command:

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

==> STATUS FAILDATA
```

Use the PF keys to scroll up and down through the report. The following sections describe parts of the report.

**Identifying the abend and reason codes**

Under the heading “SEARCH ARGUMENT ABSTRACT”, you will find the abend code and, if provided, an abend reason code.
In Figure 4, 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

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: 0000  AX: 0001  EAX: 0000

   RTM was entered because a task requested ABEND via SVC 13.
   The error occurred while an SRB was in control.
   No locks were held.
   No super bits were set.

   :  

Figure 5. 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 5, the error occurred while an SRB was in control, which means you need to look under the heading SEARCH ARGUMENT ABSTRACT (see Figure 4) 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 47.

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 6, 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.

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 7 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.

NAME..... IEFSD060  ENTPT.... 00DA6308
PRB: 008FFED0
  WLIK..... 00200006  FLCE.... 00C534A0  OPSW..... 070C2000 00DC766A
  LINK..... 008FFA10
CDE: 00C534A0
  NAME..... IEESB605  ENTPT.... 00DC7000
TCB: 008FF0D0
  CMP...... 00000000  PKF...... 80  LMP...... FF  DSP...... FF
  TSFLG.... 00  STAB..... 008FD210  NDSR..... 00020000
  JSCB..... 008FF4FC  BITS..... 00000000  DAR...... 00
  RTWA..... 00000000  FBYT1.... 00
  Task non-dispatchability flags from TCBFLGS4:
    Top RB is in a wait
  Task non-dispatchability flags from TCBFLGS5:
    Secondary non-dispatchability indicator
  Task non-dispatchability flags from TCBNDS2:
    SVC Dump is executing for another task
PRB: 008E9F20
  WLIK..... 00200001  FLCDE.... 00C4CA38  OPSW..... 070C1000  00DAC66E
  LINK..... 018FF0D0
CDE: 00C4CA38
  NAME..... IEFIIC  ENTPT.... 00DA6000

Figure 7. An example of the SUMMARY TCBERROR report (Part 1 of 2)
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 at the address indicated in the old PSW field (OPSW). The next RB in the chain shows an SVC X’53’ (SMFWTM) 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 50.

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

**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 example in Figure 8 on page 49 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**

SVC dump.

<table>
<thead>
<tr>
<th>TYPE: SOFTWARE RECORD</th>
<th>REPORT: SOFTWARE EDIT REPORT</th>
<th>DAY.YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(PROGRAM INTERRUPT)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCP:</th>
<th>MODEL:</th>
<th>ERROR DATE: 126.91</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS 2 REL 3</td>
<td>3090</td>
<td>126.91</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>272804</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOBNAME:</th>
<th>ERRORID:</th>
<th>CPU=0042 ASID=000C TIME=13:27:59.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSCMSTR</td>
<td>SEQ=01196</td>
<td></td>
</tr>
</tbody>
</table>

**SEARCH ARGUMENT ABSTRACT**

- **PIDS/###SCIC5**
- **RIDS/NUCLEUS#L**
- **RIDS/IEAVEDS0**
- **PRCS/00000021**
- **REGS/0F120**

**SYMPTOM**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROGRAM ID: ###SCIC5</td>
</tr>
<tr>
<td>LOAD MODULE NAME: NUCLEUS</td>
</tr>
<tr>
<td>CSECT NAME: IEAVEDS0</td>
</tr>
<tr>
<td>SYSTEM ABEND CODE: 00D5</td>
</tr>
<tr>
<td>ABEND REASON CODE: 00000021</td>
</tr>
<tr>
<td>REGISTER/PSW DIFFERENCE FOR R0F: 120</td>
</tr>
<tr>
<td>RECOVERY ROUTINE CSECT NAME: IEAVEDSR</td>
</tr>
</tbody>
</table>

**OTHER SERVICEABILITY INFORMATION**

- **RECOVERY ROUTINE LABEL:** IEAVEDSR
- **DATE ASSEMBLED:** 08/23/89
- **MODULE LEVEL:** UY41669
- **SUBFUNCTION:** DISPATCHER

**TIME OF ERROR INFORMATION**

- **PSW:** 440C0000 80FEFC56 **INSTRUCTION LENGTH:** 04
- **INTERRUPT CODE:** 0021
- **FAILING INSTRUCTION TEXT:** 1008B777 1008B225 000007FE
- **TRANSLATION EXCEPTION IDENTIFICATION:** 00000041
- **REGISTERS 0-7**
  - GR: 00000000 00F9A040 00000000 00000000 00000000 008DE188 008E8C78 00000000
- **REGISTERS 8-15**
  - GR: 00F97280 0103AB6A 00FF1B08 008DE188 00000000 000C0041 80FF6510 00FEFB36

**Figure 8. Sample output from the VERBEXIT LOGDATA subcommand (Part 1 of 2)**
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 519 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 9, "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 175 to recognize significant entries in the system trace table.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>TCB-ADDR</th>
<th>IDENT CD/D</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>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>0094</td>
<td>00AF7D18</td>
<td>DSP</td>
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<td>00000000</td>
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<tr>
<td>01</td>
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<td>00AF7D18</td>
<td>SVC 78</td>
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<td>01EA7048</td>
<td>00000002</td>
<td>00000278</td>
<td>00000000</td>
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<td>00AF7D18</td>
<td>SVCR 77</td>
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<td>00000000</td>
<td>00000278</td>
<td>03300000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>0094</td>
<td>00AF7D18</td>
<td>PGM 010</td>
<td>070C0000</td>
<td>01EA704A</td>
<td>00040010</td>
<td>033000BC</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>01</td>
<td>0094</td>
<td>00AF7D18</td>
<td>PGM 011</td>
<td>070C0000</td>
<td>01EA704A</td>
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<td>033000BC</td>
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<td>01</td>
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<td>00050000</td>
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<td>0094</td>
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<td>SVCR 77</td>
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<td>01EA7088</td>
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<td>00000000</td>
<td>40000000</td>
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</tr>
<tr>
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<td>0094</td>
<td>00AF7D18</td>
<td>SVC 77</td>
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<td>01EA7000</td>
<td>00000000</td>
<td>00050000</td>
<td></td>
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<tr>
<td>01</td>
<td>0094</td>
<td>00AF7D18</td>
<td>SVCR 77</td>
<td>070C0000</td>
<td>01EA7088</td>
<td>00000000</td>
<td>00000000</td>
<td>40000000</td>
<td></td>
<td></td>
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<tr>
<td>01</td>
<td>0094</td>
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<td>SVC 77</td>
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<td>01EA7000</td>
<td>00000000</td>
<td>00050000</td>
<td></td>
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<tr>
<td>01</td>
<td>0094</td>
<td>00AF7D18</td>
<td>SVCR 77</td>
<td>070C0000</td>
<td>01EA7088</td>
<td>00000000</td>
<td>00000000</td>
<td>40000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 9. An example of output from the IPCS subcommand SYSTRACE**

**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.
The example output in Figure 10 shows the address in the PSW is X'0FE5CFC', the ASID is X'1B', and the failing instruction is located in offset X'5FC' in the CSECT IEAVESVC in the module IEANUC01 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, but 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.IEAVCVT+0116 IN README/ WRITE NUCLEUS
ASID(X'001E') FC5C96. STRUCTURE(dcb)+0152 IN README/ WRITE NUCLEUS
ASID(X'001E') FC5C96. STRUCTURE(dcb)+015A IN README/ 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_FFFFFFC
10-11 00000000_00000000 00000000_00FDAC58
12-13 00000000_01560410 00000000_01F9B8B8
14-15 00000000_0155E5A8 00000000_0000003C

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 0000001E 02A30780 FE000000 0374C007
8-11 00200000 00000000 00000000 00000000
12-15 0294EE43 0374C007 DF882A2F 7F5CD4B0

Figure 11. 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</td>
<td>Data about the abend, current ASID, and task.</td>
</tr>
<tr>
<td>DATA CONTENTION</td>
<td></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.
SVC 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 11 describes the fields in the SQA buffer and should be used for diagnosis.

<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>
</tbody>
</table>
| 4 (4)  | 4      | RTM/SLIP processing environment indicator:  
|        |        | X'00000001': RTM1  
|        |        | X'00000002': RTM2  
|        |        | X'00000003': MEMTERM 
|        |        | X'00000004': PER |
| 8 (8)  | 4      | The characters, CPU |
| 12 (C) | 4      | Logical processor identifier (CPUID) |
| 16 (10)| 4      | The characters, REGS |
| 20 (14)| 64     | General purpose registers 0 through 15 at the time of the event |
| 84 (54)| 4      | The characters, PSW |
| 88 (58)| 8      | The program status word (PSW) at the time of the event |
| 96 (60)| 4      | The characters, PASD |
| 100 (64)| 2    | The primary address space identifier (ASID) at the time of the event |
| 102 (66)| 4     | The characters, SASD |
| 106 (6A)| 2    | The secondary ASID at the time of the event |
| 108 (6C)| 4    | The characters, ARS |
| 112 (70)| 64   | Access registers 0 through 15 at the time of the event |
| 176 (B0)| 4   | The characters, G64H |
| 180 (B4)| 64   | High halves of general purpose registers 0 through 15 at the time of the event |
| 244 (F4)| variable | One of the following, as indicated by the RTM/SLIP processing environment indicator at offset 4 of the buffer:  
|        |        | The system diagnostic work area (SDWA), if offset 4 is 1 (RTM1)  
|        |        | The recovery termination manager 2 (RTM2) work area (RTM2WA), if offset 4 is 2 (RTM2)  
|        |        | The address space control block (ASCB), if offset 4 is 3 (MEMTERM)  
|        |        | The PER interrupt code and PER address, if offset 4 is 4 (PER) |
| 4076 (FEC)| 4    | The characters, P16 |
| 4080 (FF0)| 16   | The 16-byte program status word (PSW) at the time of the event. |
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.

**Major topics**

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

- “Choices for IEATDUMP Data Sets” on page 56
- “Obtaining transaction dumps” on page 58
- “Printing, viewing, copying, and clearing a dump data set” on page 59
- “Contents of transaction dumps” on page 59

**Reference**

See [z/OS MVS Programming: Authorized Assembler Services Guide](https://www.ibm.com) 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 pre-allocate manually, or that are allocated automatically, as needed.

**Planning data set management for transaction dumps**

IBM recommends using extended format sequential data sets as dump data sets for transaction dumps. Extended format sequential data sets:

- Have a greater capacity than sequential data sets
- Support striping
Transaction dump

- Support compression

For additional information on extended format sequential data sets, see “Choosing SVC dump data sets” on page 15.

Using DSNTYPE=LARGE In z/OS V1R7 and later releases, sequential data sets that use DSNTYPE=LARGE are allowable for transaction dumps when the systems that are involved in processing a DSNTYPE=LARGE data set are migrated to V1R7 before their use. To process a dump created with DSNTYPE=LARGE on a system prior to z/OS V1R7, use the IPCS COPYDUMP service to convert the data set into a format compatible with the older systems.

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. Transaction dump fully supports placement of 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 for 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.

References

See the following:

- [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 gigabytes 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 gigabytes.
    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 date set is reached, IEATDUMP allocates another dump with a higher value for &DS.. Each data set has an extent size of 500M 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 IEATDUMP s 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.

Notes:
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.
The following describes a SPFUSER name pattern:

\[ \text{APPL} \cdot \text{TDUMP} \cdot \text{D} \cdot \text{&DATE} \cdot \text{T} \cdot \text{&TIME} \cdot \text{&SYSNAME} \cdot \text{&JOBNAME} \]

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.

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.

Example: JCL to Print, Copy, and Clear the Dump Data Set

For a pre-allocated data set or a dump data set, this JCL 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
//SYSPROC DD DSN=SYS1.SBLSCLI0,DISP=SHR
//IPCSTDMP DD DSN=APPL.TDUMP00,DISP=SHR
//SYSUDUMP DD SYSOUT=* 
//IPCSTOC DD SYSOUT=* 
//IPCSPRNT DD SYSOUT=* 
//SYSTSPRT DD SYSOUT=* 
//SYSTSIN DD * 
DELETE(DDIR) PURGE CLUSTER
BLSCDDIR VOLUME(VSAM11)
IPCS NOPARM
SETDEF DD(IPCSTDMP) LIST NOCONFIRM
LIST 0
END
/*

Contents of transaction dumps

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

Reference

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”
- “Contents of summary dumps in transaction dumps” on page 62

**Customized contents using the SDATA parameter**

The IBM-supplied default contents and the contents available through customization are detailed in Table 12. 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:

- **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>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>
<tr>
<td>CSA</td>
<td>Common service area (CSA) (that is, subpools 227, 228, 231, 241)</td>
<td>M P X</td>
</tr>
<tr>
<td>DEFS</td>
<td>Default areas LSQA, NUC, PSA, RGN, SQA, SUM, SWA, TRT</td>
<td>M</td>
</tr>
<tr>
<td>ALL</td>
<td>CSA, GRSQ, LPA, NUC, RGN, SQA, SUM, SWA, TRT</td>
<td>X</td>
</tr>
</tbody>
</table>
| 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 |
### Table 12. 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>LPA</td>
<td>Active link pack area (LPA): module names and contents</td>
<td>M P X</td>
</tr>
<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>
<td>D M P X</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: • CVT • LSQA • PSA • SQA</td>
<td>M P X</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 P</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, 249, 251 - 255. Also, allocated eligible storage above the 2-gigabyte address.</td>
<td>M P X</td>
</tr>
<tr>
<td>SQA</td>
<td>System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248)</td>
<td>D M P X</td>
</tr>
<tr>
<td>SUM</td>
<td>Summary dump (See “Contents of summary dumps in transaction dumps” on page 62.)</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: • 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</td>
<td>D</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>
<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

Request a summary dump for the following reason:

- The SUM parameter requests many useful, predefined areas with one parameter.

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.

The Summary Dump contents are as follows:

1. **Address space identifier (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**, mapped by AMDDATA
   - For the AMDDATA mapping, see z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)
4. 4 kilobytes before and 4 kilobytes 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

References

For information about control blocks listed in the above table, see z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)

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 13 on page 63.

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>Updating IEADMR00 parmlib member</td>
<td>Change occurs: 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: SDATA= (LSQA, TRT, LPA)</td>
</tr>
<tr>
<td></td>
<td>What changes: This parmlib member establishes the dump options for Transaction dumps for IEATDUMP macros and SDATA. See “Contents of transaction dumps” on page 59 for the list.</td>
<td></td>
</tr>
<tr>
<td>Adding the CHNGDUMP operator command in IEACMD00 parmlib member</td>
<td>Change occurs: 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: CHNGDUMP SET, SYSMDUMP= (LPA)</td>
</tr>
<tr>
<td></td>
<td>What changes: This command establishes the dump options for Transaction dumps for IEATDUMP macros and SYSMDUMPS. See “Contents of transaction dumps” on page 59 for the list.</td>
<td></td>
</tr>
<tr>
<td>Entering CHNGDUMP operator command with SYSMDUMP parameter on a console with master authority</td>
<td>Change occurs: 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: CHNGDUMP SET, SYSMDUMP= (LPA)</td>
</tr>
<tr>
<td></td>
<td>What changes: For the ADD mode: 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>For the OVER mode: 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>For the DEL option: 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 central storage and parts of paged-out virtual storage on a tape device or a direct access storage device (DASD). The stand-alone dump program, which you create, must reside on a storage device that can be used to IPL.

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 66
- “Creating the stand-alone dump program” on page 70
Planning for stand-alone dump

There are several decisions you need 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 88 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 data sets can span 65,535 tracks, and can hold approximately 3 GB.

- Extended format data sets are supported by z/OS V1R6 and later releases. Extended format sequential data sets can hold 16,777,215 blocks. The maximum size for extended format sequential is approximately 383 GB. 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.

**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.

- 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. The maximum size for large format data sets is 768 GB.

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.
Stand-Alone dump

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 89
- 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.

Notes:

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.
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 ["Syntax of the AMDSADMP macro" on page 75](#).
- For more information on how to use multiple dump data sets with IPCS, see ["Copying from multiple dump data sets" on page 118](#).
- 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"](#).

**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?**
It depends. 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 83](#) 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 83](#) 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.

See z/OS Security Server RACF Security Administrator’s Guide for more information
about protecting a data set.

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. In z/OS V1R7 and above, 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
**Stand-Alone dump**

- 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 96](#) 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 75](#).

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 96](#).

**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:

8 Assembly processing ends

4 Warning
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: 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 Action: The SADMP program will be generated with run-time dump data set prompting active.

Severity Code: 0.

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

Explanation: OUTPUT=(Dunit,ddsname) was specified, however, the data set name (ddsname) had a length greater than 44 characters.

System Action: Generation continues, however, no default dump data set name will be generated.

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. IT MUST CONTAIN
THE TEXT ‘SADMP’.

Explanation: OUPUT=(Dunit,ddsname) was specified, however, the data set name (ddsname) did not contain the text ‘SADMP’ as either part of, or as an entire data set qualifier.

System Action: Generation continues, however, no default dump data set name will be generated.

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: REUSED=reuseds 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: 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: 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.

Coded 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 83
- “Dumping to a DASD data set” on page 88

Syntax of the AMDSADMP macro

Figure 13 on page 76 shows the AMDSADMP macro parameters.
Stand-Alone dump

**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, optionally preceded by a slash (/). Use a slash preceding a 4-digit device number to distinguish it from a device type.

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.
Notes:

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 under "Running the stand-alone dump program" on page 108) 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.

**Note:** The specification of CONSOLE does not affect the availability of the 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.
Stand-Alone dump

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.

Notes:
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 83 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 83 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.

**REUSED={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 AMDSADDD 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 105 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 PGETEXT 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 96 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 105 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 105 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,dsname) 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 83 for more information.

**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.

---

**Example: Accepting All Defaults**

This example shows the AMDSADMP macro coded without explicitly specified parameters to generate a direct access resident dump program.

```
DUMP1 AMDSADMP
```

The defaults are:

- IPL=DSYSDA
- VOLSER=SADUMP
- ULABEL=NOPURGE
- CONSOLE=(01F,3278)
- SYSUT=SYSDA
- OUTPUT=T282
- MSG=ALL
- MINASID=ALL
- COMPACT=YES
- REUSEDS=CHOICE
- DDPROMPT=NO
Example: Generating an unformatted, tape resident dump program

In this example, the IPL parameter specifies tape as the residence volume, and the VOLSER parameter identifies that tape. All other parameters are allowed to default.

AMDSADMP IPL=T3400,VOLSER=SATAPE

The defaults are:
ULABEL=NOPURGE
CONSOLE=(01F,3278)
SYSUT=SYSDA
OUTPUT=T282
MSG=ALL
MINASID=ALL
COMPACT=YES
REUSEDSEQCHOICE
DDSPROMPT=NO

Example: Generating a dump program with output to DASD

In this example, the OUTPUT parameter directs the stand-alone dump output to dump data set SYS1.SADMP on device 450, and the REUSEDS parameter specifies that the operator be prompted about whether to reuse the dump data set.

AMDSADMP OUTPUT=D450,REUSEDS=CHOICE

The defaults are:
IPL=DSYSDA
VOLSER=SADUMP
ULABEL=NOPURGE
CONSOLE=(01F,3278)
SYSUT=SYSDA
MSG=ALL
MINASID=ALL
COMPACT=YES
DDSPROMPT=NO
Example: Generating a dump program with output to DASD

In this example, 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.

```
AMDSADMP OUTPUT=(D450,SADMP.DDS1),DDSPROMPT=YES
```

The defaults are:

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

Recommended specification during build process:

```
SP(ALL) IN ASID(1,'JESXCF')
ALSO DATASPACES OF ASID(1,'JESXCF', 'APPC', 'SMSVSAM', 'CONSOLE', 'SYSMAS')
ALSO PAGETABLES OF DATASPACES
```

If you run JES2, add:

```
ALSO SP(ALL) IN ASID('JES2')
```

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**
  
  Specify the dump tailoring options described in [Dump tailoring options](#) on page 85 within parentheses and single quotation marks as the value of the DUMP keyword on the AMDSADMP macro.

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

  **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.

  Examples:

  ```
  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 85 for the possible dump options.
- **SET** followed by the MINASID 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 85 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 14 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.
> 
AMD060I 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','DUMPERSV','GRS','IEFSCHAS','IOMAS','IXLOGOR','JESXCF','JES2','JES3','OMVS','SMSPOSE','SMSPOSE1','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
```

Figure 14. Sample Console output from the stand-alone Dump Program

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 86.

\{dump-spec-list|SET MINASID(ALL|PHYSIN)|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...]
- DATASAPCES OF domain-spec-list[ ...]
- DSP OF domain-spec-list[ ...]
- PAGETABLES OF DATASAPCES

  **range-spec-list** is one or more of the following:
  - SP(subpool-list)
  - RANGE(address-range-list)
  - LSQA
  - HIGH VIRTUAL

    **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) [ 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.
- *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 86.

- *range-spec-list* is a list of subpools, a list of storage ranges, or both
- *domain-spec-list* is a list of address spaces
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- ‘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:yyyyyyyy,xxxxxxxx:yyyyyyyy...)**

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 storage above 2G.

**ASID(xxx:yyy)**

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.

**Wildcard Characters:** 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)

The following are examples of valid specifications:
DUMP SP(0:7,15),RANGE(0:10000000) IN ASID(SYSKEY),ASID(8)
DUMP (SP(8 TO 7 OR 15),SP(255)) IN AS('TCAM')
DUMP RANGE(ALL) IN ASID(1) ALSO SP(0) IN ASID(SYSKEY,8)
DUMP DAT OF AS(ALL)
DUMP ( SP(0:127) IN ASID('GENER') ALSO SP(0) IN ASID('IMS') )
DUMP LSQA IN AS('MYJOB',14)
DUMP SP(128),LS IN ASID(C,PHYSIN)
DUMP DATASPACES OF ASID('MYJOB??')
DUMP DATASPACES OF ASID('MY*')
DUMP HIGH VIRTUAL IN ASID(C)
ADDSUMM ASID(3F),ASID('DEBBIE')
ADDSUMM ASID('MYOB*'),40,46:48
AD AS('MYOB*?'),AS(26,'REPORT')
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 AMDSADDD 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 15 on page 93 for an example of allocating and initializing the dump data set.
- Clear (reinitialize) the data set. See Figure 17 on page 94 for an example of clearing the dump data set.
- Reallocate and initialize the data set. See Figure 18 on page 95 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 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:
Stand-Alone dump

- 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.

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] {EATTR(OPT|NO)}
```

or

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

**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 SYS1.SADMP dump data set, then
reallocates and reinitializes a new SYS1.SADMP dump data set on the same volume. Use REALLOC, for example, to increase the size of the dump data set. If the existing dump data set does not exist, AMDSADDD converts the function to a DEFINE request and continue using DEFINE processing. If the request to reallocate and reinitialize a new SYS1.SADMP dump data set cannot be satisfied (for example, if you attempt to reallocate SYS1.SADMP using more cylinders than are available), AMDSADDD might delete the existing SYS1.SADMP dump data set.

**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](https://www.ibm.com/support/knowledgecenter/SY6DDU_5.4.0/com.ibm.zos.r5.4.cics.doc/cics utilize Dataplan.html).

**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 sequential dump data set, depending on other options.

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.

BASIC is the default.

**EATTR(OPT|NO)**

Indicates the extended attributes of a dump data set.

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 request that extended attributes are not required.

The EATTR option is not required with the CLEAR parameter. The default value is NO.

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 16 on page 94 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 17 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 17. Using AMDSADDD to Clear an Existing Dump Data Set

***

Stand-Alone dump

Figure 16. Using AMDSADDD to Allocate and Initialize an Extended Dump Data Set

Figure 16 shows an example of using the AMDSADDD REXX utility to allocate and initialize an extended dump data set. In this example, the parameters are part of the invocation of the utility; therefore, AMDSADDD does not prompt for values.

Figure 16. Using AMDSADDD to Allocate and Initialize an Extended Dump Data Set

***

Stand-Alone dump
Figure 18 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 18, 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.

---

**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.

The following example 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.

**Example 1:**

```plaintext
//STEP1 EXEC PGM=IKJEFT01,REGION=64M
//SYSTSPRT DD SYSOUT=* 
//SYSTSIN DD *
EXEC 'SYSL SBL SCLI0(AMDSADDD) ' + 
     'DEFINE ZOSSVA(SYS1.SADMP.A1) 3390 2653 N'
/*
```

The following example 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.
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"
- "Two-stage generation" on page 103

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.

Example: One-stage generation

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
//TRKTEXT DD DSN=&TRKTEXT,DISP=(,PASS),
// SPACE=(4096,(2,1)),UNIT=SYSDA
//DSFSYSIN DD DSN=&DSFSYSIN,DISP=(,PASS),
// SPACE=(80,(4,1)),UNIT=SYSDA
//GENPRINT DD DSN=SADMP.LIST,DISP=OLD
//GENPARMS DD *
// AMDSADMP IPL=DSYSDA,VOLSER=SPPOOL2, X
// CONSOLE=(1A0,3277)
END
/*
//PUTIPL EXEC PGM=ICKDSF,REGION=5M
//IPLDEV DD DISP=OLD,UNIT=SYSDA,
// VOL=(PRIVATE,RETAIIN,SER=SPPOOL2)
//TRKTEXT DD DSN=&TRKTEXT,DISP=(OLD,DELETE)
//SYSIN DD DSN=&DSFSYSIN,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=* 
```
Table 14 contains the DDNAMES AMDSAOSG uses, and the defaults for the DDNAMES. Additional related notes follow this table.

Table 14. DDNAMES and defaults used by AMDSAOSG

<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 AMDSABLD.</td>
</tr>
<tr>
<td>DVITEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSADV1),DISP=SHR</td>
<td>Input for AMDSABLD.</td>
</tr>
<tr>
<td>GENPARMS</td>
<td>Must be preallocated.</td>
<td>Input for AMDSAOOSG, passed to assembler.</td>
</tr>
<tr>
<td>GENPRINT</td>
<td>SYSOUT=A</td>
<td>Output listing from AMDSAOOSG.</td>
</tr>
<tr>
<td>IPITEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSAIPI),DISP=SHR</td>
<td>Input for AMDSABLD.</td>
</tr>
<tr>
<td>IPLDEV</td>
<td>DSN=SYS1.PAGEDUMP,volser,UNIT=iplunit, VOL=(PRIVATE,SER=iplser),</td>
<td>Stand-alone dump program, output from AMDSABLD. 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>Tape IPL volume.</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(AMDSAIPT),DISP=SHR for tape</td>
<td>Input for AMDSABLD.</td>
</tr>
<tr>
<td>PGETEXT</td>
<td>DSN=SYS1.NUCLEUS(AMDSAPGE),DISP=SHR</td>
<td>Input for AMDSABLD.</td>
</tr>
<tr>
<td>SYSPRINT</td>
<td>Must not be pre-allocated</td>
<td>Temporary listings from called programs.</td>
</tr>
<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>

Notes:
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 $\text{SYSLIB TRK0TEXT and DSFSYSIN}$ statements.
Example: One-stage generation of stand-alone dump to a DASD

This JCL 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.

```
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
// DD DSN=SYS1.MODGEN,DISP=SHR
//TRK0TEXT DD DSN=BTRK0TEXT,DISP=(,PASS),
// SPACE=(4096,(2,1)),UNIT=SYSDA
//DSFSYSIN DD DSN=DSFSYSIN,DISP=(,PASS),
// SPACE=(80,(4,1)),UNIT=SYSDA
//GENPARMS DD *
AMDSADM CONSOLE=((041,3277),(042,3277),(0A0,3277),
(3E0,3277),(3E1,3277)), X
DUMP='SP(ALL) IN ASID(1,'JES2') ALSO DATASPACES X
OF ASID('DUMPSRV'), X
IPL=D222, X
MINASID=PHYSIN, X
OUTPUT=D450, X
REUSEDS=NEVER, X
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=* 
```
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. AMDSAOSG returns the following codes 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

```c
//SADMPGEN JOB MSGLEVEL=(1,1)
//USG EXEC PGM=AMDSAOSG,REGION=5M
//SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR
//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=(T550,SYS1.SADMP.TAPE),
  REUSED5=NEVER,
  PROMPT
END
/*
```

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. AMDSAOSG returns the following codes in message AMD064I:
Stand-Alone dump

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 19 on page 101
- One-stage generation JCL (any release prior to z/OS V1R12) for a DASD, see Figure 20 on page 102
The following JCL 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.

```
//ASSEMSAD JOB MSGLEVEL=(1,1)
//OSG EXEC PGM=AMDSAOSG,REGION=5M
//STPLIB 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=(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, X
DUMP=('DATASPACES OF ASID('XCFAS', X
'CTTX','APPC')'), X
MINASID=ALL,PROMPT,MSG=ALL, X
CONSOLE=((020,3277),(030,3277), X
(040,3277),(050,3277)), X
OUTPUT=D560, X
NUCLIB=(NEWSYS,3390) X
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)
//SYSIN DD DSN=&DSFSYSIN,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=*
*/
```

Figure 19. One-stage generation JCL for a DASD (beginning with z/OS V1R12)
Stand-Alone dump

The following JCL 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.

```
//ASSEMAD 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
//IPLTEXT DD DSN=SYS1.NUCLEUS(AMDSAIPO),DISP=SHR,
// VOL=SER=NEWSYS,UNIT=3390
//IPITEXT DD DSN=SYS1.NUCLEUS(AMDSAIPI),DISP=SHR,
// VOL=SER=NEWSYS,UNIT=3390
//DVITEXT DD DSN=SYS1.NUCLEUS(AMDSADV1),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=SYSYSDA, VOLSER=SADASD,
// DUMP=('DATASPACES OF ASID('XCFAS',
// 'CTTX', 'APP0'),
// MINASID=ALL, PROMPT, MSG=ALL
// CONSOLE=({(020,3277), (030,3277),
// (040,3277), (050,3277)}),
// OUTPUT=0560

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)
//SYSIN DD DSN=DSFSYSIN,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=* 
```

Figure 20. Example: One-stage generation JCL (any release) for a DASD

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 on page [Figure 21 on page 103]
- One-stage JCL (any release prior to z/OS V1R12) for tape on page [Figure 22 on page 103]
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.
Stand-Alone dump

Use this JCL 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
// // SYSPUNCH DD UNIT=YESDA,SPACE=(1700,(400,50))
//SYSUT1 DD DSN=SYS0A,DISP=SHR
//SYSPRINT DD SYSOUT=(*,STD),HOLD=YES
//SYSPUNCH DD DSN=SYS420.STAGE3.JCL(SADMPST2),DISP=SHR
////SYSLIB DD DSN=SYS1.MODGEN,DISP=SHR
//SYSLIN DD SYSOUT=H
//SYSLIN DD *
//AMDSADMP X
//DUMP=('DATAPACES OF ASID('XCFAS','CTTX','APP')'), X
//VOLSER='XXXXXX', X
//CONSOLE='((020,3277),(030,3277),(040,3277),(050,3277)), X
//PROMPT,MSG=ALL, X
//OUTPUT=T560
END
/*

Figure 23. 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.

To direct the output of the assembly to tape, use the following SYSPUNCH DD statement:

```
//SYSPUNCH DD UNIT=tape,LABEL=(,NL),DISP=(NEW,KEEP),
//VOL=SER=volser
```

To direct the output of the assembly to a new direct access data set, use the following SYSPUNCH DD statement:

```
//SYSPUNCH DD UNIT=dsad,SPACE=(80,(30,10)),DSN=dsname,
//DISP=(NEW,KEEP),VOL=SER=volser
```

**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.
Example: Assembling multiple versions of AMDSADMP Macro

Use this JCL for coding multiple versions of AMDSADMP.

```
//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
/*

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:
Stand-Alone dump

- 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.

Example: Stage-two JCL to assemble the AMDSADMP macro

The following output 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.

```plaintext
//ASSEMBAD 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
```

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.
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.
**Stand-Alone dump**

---

**Example: Stage-Two JCL to assemble the AMDSADMP macro with overrides**

The following output 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.

```plaintext
// EXEC ASMAC,PARM.C='DECK,NOBJECT'
//C.SYSLIB DD DSN=SYS1.MACLIB,DISP=SHR,UNIT=3390,VOL=SER=OVERRIDE
//C.SYSPUNCH DD DSN=SMITH.TEST.CNTL(SADMP#2),DISP=OLD
//C.SYSIN DD *

AMDSADMP IPL=D3390, IPL FROM DASD X
VOLSER=SADIPL, VOL=SER=SADIPL X
OUTPUT=(D330,SYS1,SADMP), DEFAULT OUTPUT DEVICE X
MSG=ALL, ALL MESSAGES TO CONSOLE X
DUMP=('SP(ALL) IN ASID(1) ALSO DATASOURCES OF ASID(1,'JESXCF', 'APPC','SMVSAM', 'CONSOLES','SYBMA5') ALSO PAGETABLES OF DATASOURCES X
ALSO SP(ALL) IN ASID('JES2')'),
MINASID=ALL, INCLUDE SWAPPED OUT SPACES X
REUSED=XCHOICE, PROMPT FOR DATASET REUSE X
DDSPROMPT=NO, OVERRIDE BUILD DATASETS X
ALIB=(OVERRIDE,3390)

END
```

---

**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 109
- "Procedure B: Restart stand-alone dump" on page 112
- "Procedure C: ReIPL stand-alone dump" on page 113
- "Procedure D: Dump the stand-alone dump program" on page 113

**When to use what 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 file-protect ring is in place. 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.

3. IPL stand-alone dump.
   
   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.
Stand-Alone dump

**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.

**0** The `0` 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](https://www.ibm.com/support/knowledgecenter/en/SS9JQD_11.3.0/com.ibm.zos.v1r13.tsa.refstand dump/using_automatic_ipl.html) in `z/OS MVS Planning: Operations`.

The valid values for the `0` 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 only the real address to the stand-alone dump program. If you are dumping to tape, ensure that the tape cartridge is write-enabled. If you are dumping to DASD, ensure that the DASD data set has been initialized using the IPCS SADMP or AMDSADDD 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=NO was specified on the AMDSADMP macro, message AMD002A is issued to prompt the operator for a dump data set. IF DDSPROMPT=YES was specified, message AMD002A is not issued and the stand-alone dump program assumes that the dump data set name is SYS1.SADMP.
Notes:
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 specified on the OUTPUT= keyword of the AMDSADMP macro. If no dump data set name was provided on the OUTPUT= keyword and the DDSPPROMPT=YES keyword was specified, message AMD002A is issued to prompt the operator for a dump data set. If DDSPPROMPT=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.

---

**Example: Using a load parm to perform a stand-alone dump**

In this example, the dump is initialized using a load parm with no console prompts.

```
AMD003I AMDSADMP: STAND-ALONE DUMP INITIALIZED
AMD101I OUTPUT DEVICE: 0330 SADMP1 SYS1.SADMP
  SENSE ID DATA: FF 3990 E9 3390 0A BLOCKSIZE: 24,960
AMD005I DUMPING OF REAL STORAGE NOW IN PROGRESS.
AMD005I DUMPING OF PAGE FRAME TABLE COMPLETED.
AMD005I DUMPING OF REAL STORAGE FOR MINIMAL ASIDS COMPLETED.
AMD005I DUMPING OF REAL STORAGE FOR SUMMARY ASIDS COMPLETED.
AMD005I DUMPING OF REAL STORAGE FOR SWAPPED-IN ASIDS COMPLETED.
AMD005I DUMPING OF REAL STORAGE IN-USE REAL STORAGE COMPLETED.
AMD005I DUMPING OF REAL STORAGE SUSPENDED.
AMD108I DUMPING OF AUXILIARY STORAGE FOR MINIMAL ASIDS COMPLETED
AMD108I DUMPING OF AUXILIARY STORAGE FOR SUMMARY ASIDS COMPLETED
AMD108I DUMPING OF AUXILIARY STORAGE FOR SWAPPED-IN ASIDS COMPLETED
AMD108I DUMPING OF AUXILIARY STORAGE FOR SWAPPED-OUT ASIDS COMPLETED
AMD056I DUMPING OF AUXILLIARY STORAGE COMPLETED.
AMD005I DUMPING OF REAL STORAGE RESUMED.
AMD005I DUMPING OF REAL STORAGE RESUMED.
AMD004I STAND-ALONE DUMP PROCESSING COMPLETED.
```

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>VOLUME</th>
<th>USED</th>
<th>DATA SET NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0330</td>
<td>43%</td>
<td>SYS1.SADMP</td>
</tr>
</tbody>
</table>

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.
Stand-Alone dump

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 "continue here" on page 110.

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 3 on page 109.

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 109 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
Stand-Alone dump

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 where x = 001 - 012:

```plaintext
LIST address COMPDATA(AMDSAxxx)
```

See [z/OS MVS IPCS Commands](https://www.ibm.com/support/knowledgecenter/SSLTBW_2.2.0/com.ibm.zos.v2r2.bk7m710/bk7m710_s003.html) for more information.

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
If there is a time delay between performing the STOP function and IPLing the stand-alone dump program use this method. Using this method expedites the release of resources held by system SYSA while you are preparing to IPL stand-alone dump.

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 already present.
3. Reply DOWN to message IXC402D, IXC102A
   Performing steps 2 and 3 immediately after doing the SYSTEM RESET 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.
4. IPL the stand-alone dump program. (See “Running the stand-alone dump program” on page 108) This step can take place at any time after step 2.

After a SYSTEM RESET is performed, MVS cannot automatically ISOLATE system SYSA through SFM, so message IXC402D or IXC102A will be 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 REUSED=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.
Stand-Alone dump

**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.

**Example: Terminating a stand-alone dump**

In this example, the dump was ended early using the EXTERNAL INTERRUPT key.

```
AMD083I  AMDSADMP: STAND-ALONE DUMP RESTARTED
AMD094I  0330 SADMP1 SYS.SADMP IS VALID, HOWEVER, IT MAY ALREADY CONTAIN DATA FROM A PREVIOUS DUMP. THE INSTALLATION CHOSE TO ALWAYS REUSE THE DUMP DATA SET.
AMD101I  OUTPUT DEVICE: 0330 SADMP1 SYS1.SADMP SENSE ID DATA: FF 3990 E9 3390 0A BLOCKSIZE: 24,960
AMD005I  DUMPING OF REAL STORAGE NOW IN PROGRESS.
AMD005I  DUMPING OF PAGE FRAME TABLE COMPLETED.
AMD005I  DUMPING OF REAL STORAGE FOR MINIMAL ASIDS COMPLETED.
AMD005I  DUMPING OF REAL STORAGE FOR SUMMARY ASIDS COMPLETED.
AMD089I  DUMP TERMINATED DUE TO EXTERNAL KEY
AMD066I  AMDSADMP ERROR, CODE=0012, PSW=040810008101235E, COMPDATA9AMDSA002)
```

**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.
Copy 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.
- 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.

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.

Example: Copying stand-alone dump output from tape to DASD

Use the following JCL 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=SADOUT,LABEL=(,NL),DISP=SHR,
//   DCB=(RECFM=FBS,LRECL=4160,BLKSIZE=29120)
//SYSUT2 DD DSN=SADUMP.COPY,UNIT=dasd,
//   VOL=SADCPY,DISP=(NEW,CATLG),
//   DCB=(RECFM=FBS,LRECL=4160,DSORG=PS),AVGREC=K,
//   SPACE=(4160,(8,4),RLSE)
```

Note: Specifying AVGREC= requires SMS be running, but the data set does not have to be SMS managed.
Stand-Alone dump

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 89

---

Example: Copying stand-alone dump output from DASD to DASD
Use the following JCL to invoke IEBGENER, which will copy the stand-alone dump output from a DASD data set to another DASD data set.

```jcl
//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
//SYSUT2 DD DSN=SYS2.SADMP,UNIT=DASD,
// DISP=(NEW,CATLG),
// VOL=SER=SADMP2,
// DCB=(LRECL=4160,RECFM=FBS,DSORG=PS),
// SPACE=(CYL,(90,0),RLSE)
```

---

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.

---

Example: Copying a stand-alone dump from multiple DASD data sets
Use the following JCL 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.

```jcl
//SADCOPY JOB MSGLEVEL=(1,1)
//COPY EXEC PGM=IKJEFT01
//SYSTSPRT DD SYSOUT=A
//C1 DD DSN=SADMP1.DDS1,DISP=SHR,UNIT=DASD,
// VOL=SER=SADMP1
//C2 DD DSN=SADMP1.DDS2,DISP=SHR,UNIT=DASD,
// VOL=SER=SADMP1
//C3 DD DSN=SYS1.SADMP,DISP=SHR,UNIT=DASD,
// VOL=SER=SADMP2
//COPYTO DD DSN=SADMP1.DDS3,UNIT=DASD,
// VOL=SER=SADMP1,
// DCB=(LRECL=4160,RECFM=FBS,DSORG=PS),
// SPACE=(CYL,(90,0),RLSE)
//SYSTSIN DD *
//IPCS NOPARM DEFER
//COPYDUMP OUTFILE(COPYTO) NOCONFIRM INFILE(C1, C2, C3)
END
/*
```
Example: Copying stand-alone dump output from DASD and tape

Use the following JCL 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.

```plaintext
//SADCOPY JOB MSGLEVEL=(1,1)
//COPY  EXEC PGM=IKJEFT01
//SYSTSPRT DD SYSOUT=A
//C1 DD DSN=SYS1.SADMP.MAIN.DDS1,DISP=SHR,UNIT=DASD,
// VOL=SER=SADMP1
//C2 DD DSN=SYS1.SADMP.ALTERNAT.DDS1,DISP=SHR,UNIT=DASD,
// VOL=SER=SADMP2
//C3 DD DSN=SYS1.SADMP.MAIN.DDS1,DISP=SHR,UNIT=TAPE,
// VOL=SER=SADMP3
//C4 DD DSN=SYS1.SADMP.ALTERNAT.DDS1,DISP=SHR,UNIT=TAPE,
// VOL=SER=SADMP4
//COPYTO DD DSN=SADUMP.COPY,UNIT=DASD,
// VOL=SER=SADCPY,DISP=(NEW,CATLG),
// DCB=(RECFM=FBS,LRECL=4160,DSORG=PS),
// SPACE=(2080,(1600,800),RLSE)
//SYSTSIN DD *
IPCS NOPARM
COPYDUMP OUTFILE(COPYTO) NOCONFIRM INFILE((C1,C2,C3,C4)
END
/*
```

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.

Reference

See [z/OS MVS IPCS Commands](https://www.ibm.com/support/knowledgecenter/SSEPGG_2.3.1/com.ibm.ha_em.dasd.doc_2.3.1/ivm/ivm_ipcs.htm) 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.

Reference
See z/OS MVS IPCS User’s Guide for IPCS panels and the CLIST BLSCBSAP.

Example: Printing an unformatted stand-alone dump

The following example runs an IPCS CLIST that:
- Copies the stand-alone dump from the tape data set defined in an IEFRODER 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.

```
//PRINTJOB JOB MSGLEVEL=1,REGION=800M
//IPCS EXEC IPCS,CLIST=BLSCBSAP,DUMP=SA1DASD
//IEFPROC.IEFRDER DD DSN=SA1,DISP=OLD,UNIT=3490
// VOL=SER=12345,LABEL=(1,NL)
/*
```

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

Reference

For more information about messages on the system console or the operator console, use LookAt or 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:
Stand-Alone dump

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.

U  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

This section describes 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.

The topics in this section are:

- “Collecting initial data” on page 122
- “Analyzing an enabled wait” on page 125
- “Analyzing a disabled wait” on page 129
- “Analyzing an enabled loop” on page 130
- “Analyzing a disabled loop” on page 130
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.

Example: VERBEXIT SYMPTOMS output

In the following output, the explanation of the secondary symptom string indicates an enabled wait state condition.

```
**** SYMPTOM ****
ASR10001I The dump does not contain a primary symptom string.
Secondary Symptom String:
WS/E000  FLDS/ASMIORQR  VALU/CPAGBACKUP  FLDS/IOSCOD  VALU/CLCLC045
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>

Determining the system state

There are several control blocks you can view that describe the state of the system when the stand-alone dump was requested.

<table>
<thead>
<tr>
<th>Control Block</th>
<th>Explanation</th>
</tr>
</thead>
</table>

"Problem data saved by first level interrupt handlers" on page 131
### Stand-Alone dump

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSD</td>
<td>Describes the number of active central processors and whether the alternate CPU recovery (ACR) is active.</td>
</tr>
<tr>
<td>PSA</td>
<td>Describes the current environment of a central processor, its work unit, FRR stack, an indication of any locks held.</td>
</tr>
<tr>
<td>LCCA</td>
<td>Contains save areas and flags of interrupt handlers.</td>
</tr>
<tr>
<td>CVT</td>
<td>Contains pointers to other system control blocks.</td>
</tr>
</tbody>
</table>

Use the IPCS subcommand STATUS WORKSHEET to obtain the data that will help you determine the state of the system.
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

Example: STATUS WORKSHEET output

In the following output, 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 non-zero, the address in PSWSV indicates the save area of the dispatcher.
- The PSAAOLD, which indicates what address space jobs are running in.

MVS Diagnostic Worksheet

Dump Title: SYSIEA01 DMPDSENQ 7/20/93
CPU Model 2064 Version 00 Serial no. 145667 Address 00
Date: 03/20/2001 Time: 05:41:26 Local

SYSTEM RELATED DATA

CUT SNAME (154) ESYS VERID (-18)
CUCB (64) 00FD4B6B PVT (164) 00FE4A10 GDA (230) 01BE1168
RTMCT (23C) 00F81198 ASMVT (2C0) 00FD8030 RCEP (490) 012AA3F0

CSD Available CPU mask: C000 Alive CPU mask: C000 No. of active CPUs: 0002

PROCESSOR RELATED DATA

<table>
<thead>
<tr>
<th>NAME</th>
<th>CPU 00</th>
<th>CPU 01</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSM at time of dump</td>
<td>070E0000 070C0000</td>
<td>00000000 8124EE9C</td>
</tr>
<tr>
<td>CRO Interrupt mask</td>
<td>5EB1EE40 5EB1EE40</td>
<td>5EB1EE40 5EB1EE40</td>
</tr>
<tr>
<td>CR6 I/O class mask</td>
<td>FE FE</td>
<td>FE FE</td>
</tr>
<tr>
<td>IHR1 Recursion</td>
<td>20B</td>
<td>00</td>
</tr>
<tr>
<td>SPN1/2 Spin</td>
<td>20C</td>
<td>0000</td>
</tr>
<tr>
<td>CPUS CPU WSVT</td>
<td>21B</td>
<td>00F4B6B0 00F6F550</td>
</tr>
<tr>
<td>DSFI/2 Dispatcher</td>
<td>21C</td>
<td>0000</td>
</tr>
<tr>
<td>CRFL ACR/LK flgs</td>
<td>284</td>
<td>00000000 00000000</td>
</tr>
<tr>
<td>TOLD Curr TCB</td>
<td>21C</td>
<td>00000000 00000000</td>
</tr>
<tr>
<td>ANEW ASCB</td>
<td>220</td>
<td>00FD3B6B0 00F56180</td>
</tr>
<tr>
<td>AOLD Curr ASCB</td>
<td>224</td>
<td>00FD32B80 00F56180</td>
</tr>
<tr>
<td>SUPER Super Bits</td>
<td>22B</td>
<td>04000000 00000000</td>
</tr>
<tr>
<td>CLHT Lock Table</td>
<td>280</td>
<td>00FD4890 00FD4890</td>
</tr>
<tr>
<td>LOCAL Local lock</td>
<td>2EC</td>
<td>00000000 00000000</td>
</tr>
<tr>
<td>CLHS Locks held</td>
<td>2FB</td>
<td>00000000 00000000</td>
</tr>
<tr>
<td>CSTK FRR stack</td>
<td>380</td>
<td>00F4D4D0 00000000</td>
</tr>
<tr>
<td>SMPSW SRB Disp PSH</td>
<td>420</td>
<td>070C0000 070C0000</td>
</tr>
<tr>
<td>PSWSV PSW Save</td>
<td>468</td>
<td>070E0000 070E0000</td>
</tr>
<tr>
<td>MODE Indicators</td>
<td>49F</td>
<td>08</td>
</tr>
</tbody>
</table>

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:
Example: STATUS CPU REGISTERS output

In the following output, 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’00’) 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: 01CB0008  

+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

To obtain other fields from important control blocks, use the IPCS subcommand CBFORMAT.

Reference

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.

Example: WHERE subcommand output

In the following output, the WHERE subcommand indicates that the address is part of the READONLY nucleus.

NOCPU ASID(X’0001’) 0124E9C. IEANUC01.IGVSLIS1+0ADC IN READ ONLY NUCLEUS

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.

Example: IOSCHECK ACTVUCBS Subcommand output
In the following output, 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.

Example: ANALYZE subcommand output
In the following output, 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.
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.

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'000000' to check if there are any SRBs ready to be dispatched.

- Are there any ready TCBs indicated by ASCBTCBS and ASCBTCBBL?
  ASCBTCBS and ASCBTCBBL contain a count of the number of TCBs containing ready work to be dispatched. To find the TCBs for ASCBTCBBL, look at the WEBs on the ASCBLTCS and ASCBLTCB queues that belong to the home space.
**Stand-Alone dump**

- 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 z/OS Internet Library](http://www.ibm.com/systems/z/os/zos/bkserv/).

- If there is no ready work, are the TCBs in a normal wait (TCBFLGS4, TCBFLGS5, TCBNDSP)?

  A non-zero value in any of these fields indicates that the TCB is non-dispatchable.

---

**Example: SUMMARY FORMAT output**

In the following output, 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.

```
ASCB: 00FD2B80
  +0000 ASCB..... ASCB  FWDP..... 00FC4400  BWDP..... 00000000
  +0008 LTCS..... 00000000  SRVB..... 00F4F8A8  SYNC..... 000727F4
  +0018 IOSP..... 00000000  WQID..... 0000  SAQ..... 00000000
  +0024 ASID..... 0001  LLS..... 00  HLMI..... 01
  +002A DPH..... 01FF  LDA..... 7F74FEB0  RSMF..... C0
  +0038 CASH..... 00000000  TSB..... 00000000
  +0040 EJST..... 00000009F  94659288
  +0048 EWST..... AE0E6377  45A41803  JSTL..... 0001410E
  +0054 ECH..... 00000000  UBT..... 00000000  TLCH..... 00000000
  +0060 DUMP..... 00699090  AFFN..... FFFF  RCTF..... 01
  +0067 FLG1..... 00  TMCH..... 00000000  ASXB..... 00F2EAE8
  +0070 SWCT..... 478E  DSP1..... 00  FLG2..... CE
  +0076 SRBS..... 0000  LLWQ..... 00000000  RCTP..... 00000000
  +0080 LOCK..... 00000000  LSQL..... 00000000  QCBE..... 00000000
  +008C MECB..... 00000000  OUCB..... 015178F0  OUXB..... 015178F0
  +0098 FMCT..... 0000  LEVL..... 03  FL2A..... 00
  +009C XMPQ..... 00000000  IQEA..... 00000000  RTMC..... 00000000
  +00A8 MCC..... 00000000  JN1..... 00000000  JNS..... 00F2D818
  +00B8 SQRQ..... 00  SQRQ2..... 00  SQR3..... 00
  +00C7 SQRQ..... 00  VGT..... 000D748  PCTT..... 1A86F008
  +00C0 SRRB..... 0000  SMCT..... 00  SRBM..... 07
  +00C4 SWTL..... 00000000  SRBT..... 00015D01  SETE32000
  +00D0 LTB......... 00000000  LTRQ..... 00000000  TCBR..... 00000000
  +00DC LTRQ..... 00000000  WPRB..... 00F2E90  NDK..... FF
  +00E5 TNPQ..... FF  NTSQ..... FF  IODP..... FF
  +00E8 LOCI..... 00000000  CMLW..... 00000000  CMLC..... 00000000
  +00F4 SSQE..... 00000000  SSQ4..... 00  ASTE..... 02900040
  +00FC LTOV..... 7F74B040  ATOV..... 7F7FCCAE  PCTT..... 00007
  +0106 ETCN..... 0000  LXR..... 0007  AXX..... 0000
  +010C ETCN..... 000D35C0  GQEL..... 00000000  LQEL..... 00000000
  +0118 GSQ..... 00000000  XTCP..... 006A3D00  CS1..... 00
  +0121 CS1..... 00  DBX..... 02449430
  +0128 EATT..... 00000000  DAC0D75
  +0130 INTS..... AE0B7C7B  0C7C0900  LLI..... 00
  +0139 LL2..... 00  LL3..... 00  LL4..... 00
  +013C SCM..... 00000000  I05C..... 000450A  PKML..... 0000
  +0146 XCNT..... 01F4  NSQA..... 00000000  ASM..... 00F3520
  +0150 ASSB..... 00F2D00  TCMF..... 00000000  GQIR..... 00000000
  +0168 CREQ..... 00000000  RSMF..... 02219120  AVM1..... 00
  +0171 AVM2..... 00  AGEM..... 0000  ARC..... 00000000
  +0178 RSMF..... 02219000  DCITI..... 0066E2EE
```

**Reference**
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.

### Example: Determining 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'06' 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.

Reference

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 PSAPWSV to determine if the dispatcher loaded the wait state PSW because of an overlay. See Chapter 7, “The dump grab bag,” on page 169 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-preemptible loop in SRB mode
- There is a loop in a high priority address space that is in TCB mode

Example: SYSTRACE output

In the following output, 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 80FF0768 00001004 00000000
01 003E 00000000 CLKC 070C0000 80FE4E34 00001004 00000000
```

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 131 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 518 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>
<thead>
<tr>
<th>Offset</th>
<th>Length</th>
<th>Content</th>
</tr>
</thead>
</table>
| 0(0)   | 1      | RTM/SLIP processing environment indicator:  
  X'01': RTM1  
  X'02': RTM2  
  X'03': MEMTERM  
  X'04': PER |
| 1(1)   | 2      | Logical processor identifier (CPUID) |
| 3(3)   | 1      | System mask, if offset 0 is 2 (RTM2) |
| 4(4)   | 4      | Pointer to general purpose registers 0 through 15 at the time of the event |
| 8(8)   | 4      | Pointer to the 16-byte program status word (PSW) at the time of the event |
| 12(C)  | 4      | One of the following, as indicated by the RTM/SLIP processing environment indicator at offset 0 of the work area:  
  - Pointer to the system diagnostic work area (SDWA), if offset 0 is 1 (RTM1)  
  - Pointer to the recovery termination manager 2 (RTM2) work area (RTM2WA), if offset 0 is 2 (RTM2)  
  - Pointer to the address space control block (ASCB) being ended, if offset 0 is 3 (MEMTERM)  
  - Pointer to the PER code, if offset 0 is 4 (PER) |
| 16(10) | 4      | Pointer to cross memory information (control registers 3 and 4) at the time of the event |
| 20(14) | 4      | 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. |

**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 one of the FLIH's 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 charts show where each of the FLIH's will save PSW and registers for interrupted tasks or SRB's:  
- "Problem data saved for a program check for task and SRB code" on page 132  
- "Problem data saved by the I/O FLIH for task and SRB code" on page 133  
- "Problem data saved by the external FLIH for task and SRB code" on page 134
### Stand-Alone dump

**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>

**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>
</tbody>
</table>
### Stand-Alone dump

<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 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></td>
</tr>
<tr>
<td></td>
<td>Other status</td>
<td>XSB</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>

### 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>Control registers 0-15</td>
<td>SCFSICR1</td>
<td>SCFS</td>
<td></td>
</tr>
<tr>
<td>Access registers 0-15</td>
<td>SCFSIAR1</td>
<td>SCFS</td>
<td></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>
</tbody>
</table>
**Stand-Alone dump**

<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>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>

**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>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>
</tbody>
</table>
### Stand-Alone dump

<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><strong>If first recursion</strong></td>
<td>General purpose registers 0-15</td>
<td>SCFSXGR1</td>
<td>SCFS</td>
</tr>
<tr>
<td>PSW</td>
<td>SCFSXPS2</td>
<td>SCFS</td>
<td></td>
</tr>
<tr>
<td>Control registers 0-15</td>
<td>SCFSXCR2</td>
<td>SCFS</td>
<td></td>
</tr>
<tr>
<td>Access registers 0-15</td>
<td>SCFSXAR2</td>
<td>SCFS</td>
<td></td>
</tr>
<tr>
<td><strong>If second recursion</strong></td>
<td>General purpose registers 0-15</td>
<td>SCFSXGR3</td>
<td>SCFS</td>
</tr>
<tr>
<td>PSW</td>
<td>FLCEOPSW</td>
<td>PSA</td>
<td></td>
</tr>
<tr>
<td>Control registers 0-15</td>
<td>SCFSXCR3</td>
<td>SCFS</td>
<td></td>
</tr>
<tr>
<td>Access registers 0-15</td>
<td>SCFSXAR3</td>
<td>SCFS</td>
<td></td>
</tr>
</tbody>
</table>
Stand-Alone dump
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, IEAVADF, 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.

Major Topics

This covers the following topics, which describe how to use ABEND dumps:

- “Synopsis of ABEND dumps” on page 138
- “Obtaining ABEND dumps” on page 139
- “Printing and viewing dumps” on page 144
- “Contents of ABEND dumps” on page 145
- “Customizing ABEND dump contents” on page 151
- “Analyzing an ABEND dump” on page 157
## Synopsis of ABEND dumps

Use the following table 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>
<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></td>
<td>Default contents: summary dump for the failing task and other task data. See “Contents of ABEND dumps” on page 145.</td>
</tr>
<tr>
<td>Assembler macro in any program:</td>
<td>Formatted dump in a data set with the ddname of SYSABEND:</td>
<td>Customized by all of the following:</td>
</tr>
<tr>
<td>• ABEND with DUMP</td>
<td>• In SYSOUT; print in the output class or browse at a terminal</td>
<td>• IEAADB00 parmlib member</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>• Parameter list on the requesting ABEND, CALLRTM, or SETRP macro</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>• Recovery routines invoked by the recovery termination manager (RTM)</td>
</tr>
<tr>
<td>• ABEND with DUMP</td>
<td>For full information, see “Obtaining ABEND dumps” on page 139</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 IEAVTASKX, IEAVADF, and IEAVADUS exits</td>
</tr>
<tr>
<td>• SETRP with DUMP=YES</td>
<td></td>
<td>For full information about customization, see “Customizing ABEND dump contents” on page 151.</td>
</tr>
<tr>
<td>Operator command on a console with master authority:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CANCEL with DUMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For full information, see “Obtaining ABEND dumps” on page 139</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| SYSMDUMP: |              | Default contents: summary dump and system data for the failing task. See “Contents of ABEND dumps” on page 145. |
|-----------|--------------| Customized by all of the following: |
| Assembler macro in any program: | Unformatted dump in a data set with the ddname of SYSMDUMP: | • IEADM000 parmlib member |
| • ABEND with DUMP | • On tape or direct access; use IPCS to format and print/view the dump | • Parameter list on the requesting ABEND, CALLRTM, or SETRP macro |
| • SETRP with DUMP=YES | For full information, see “Obtaining ABEND dumps” on page 139 | • Recovery routines invoked by the recovery termination manager (RTM) |
| Assembler macro in an authorized program: | | • Cumulative from all CHNGDUMP operator commands with SYSMDUMP |
| • ABEND with DUMP | | • Installation-written routines at the IEAVTASKX exit |
| • CALLRTM with DUMP=YES | | For full information about customization, see “Customizing ABEND dump contents” on page 151. |
| • SETRP with DUMP=YES | | |
ABEND dumps

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:

- For SYSABEND dumps:
  
  //SYSABEND DD ...

- For SYSUDUMP dumps:
  
  //SYSUDUMP DD ...

- For SYSMDUMP dumps:
  
  //SYSMDUMP DD ...

For more information about these statements, see "z/OS MVS JCL Reference">

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.DUMPAUTH

For access to programs that are protected by the PROGRAM facility.
**ABEND dumps**

**IEAADBD.DMFAKEY**

For programs that execute in authorized keys.


For details on the SDUMPX macro, see

- [z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDL](https://www.ibm.com)
- [z/OS MVS Programming: Authorized Assembler Services Guide](https://www.ibm.com)

**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, SYSDUMP, 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 SYSDUMP DD statement must specify a virtual input/output (VIO) data set if the job or step to be dumped is running in non pageable virtual storage, that is, the JCL JOB or EXEC statement specifies ADDRSPC=REAL.

**Preallocate data sets for SYSDUMP dumps**

You may use any dataset name you wish for the SYSDUMP dataset. However, the dataset name SYSL.SYSDMPxx will be treated specially. If you use the data set naming convention of SYSL.SYSDMPxx for a DSIP=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.
ABEND dumps

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
- **References** 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
**ABEND dumps**

- Printer (Not recommended; printer cannot be used for anything else for duration of job step.)

**Example: Direct access SYSMDUMP DD statement**
The following example places a dump on direct access. In the example, SYSDA is an installation group name for direct access storage devices (DASD). Like the tape DD statement, the system deletes or keeps the data set depending on how the step ends.

The presence of the DCB attributes shown 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](https://www.ibm.com/support/knowledgecenter/SSG47H_9.1.0/com.ibm.zos.access/zbsh1das26000.html). Your installation may make specification of these attributes unnecessary through local SMS class selection routines.

**Example: SYSOUT SYSABEND DD statement**
The following example 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
```

**Example: Tape SYSUDUMP DD statement**
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 userid.

**Example: SYSABEND DD statement in logon procedure**
The following example shows a SYSABEND DD statement in the logon procedure for a TSO/E userid. A dump statement must appear in the logon procedure in order to process a dump in the foreground.

```
//SYSABEND DD DSN=MYID3.DUMPS,DISP=(OLD,,KEEP)
```
ABEND dumps

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

   **Example: ABEND macro dump request**
   The following example shows a 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

   **Example: SETRP macro dump request**
   The following example shows a 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

   **Example: CALLRTM macro dump request**
   The following example shows a macro in an authorized program. The 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.

   **Example: Canceling a job and requesting a dump**
   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
   ```
Example: Canceling a userid and requesting a dump

To cancel a userid and request a dump, ask the operator to use either of the following:

```
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.

**Example: Using IEBPTPCH to print a dump**

The following JCL 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.

```
//PRINT EXEC PGM=IEBPTPCH
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=DUMPDS,UNIT=TAPE,DISP=(OLD,DELETE)
//SYSUT2 DD SYSOUT=A
//SYSIN DD *
PRINT PREFORM=A,TYPORG=PS
/*
```

**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.


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.

Hiperspaces

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.

Adding areas

If some needed areas are not included by default, see “Customizing ABEND dump
contents” on page 151 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.

Example: Determining the mode and options

To request the mode and options, enter:

DISPLAY DUMP,OPTIONS

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

References

• See z/OS MVS System Commands for the DISPLAY and CHNGDUMP operator
commands.
• For a description of these messages, use LookAt or see MVS System Messages.

Default contents of ABEND dumps

The contents of the three ABEND dumps are detailed in the following two tables.
The table below 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
- **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>
<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>
</tbody>
</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 | M P X | D M P X | M |
| ALLPDATA  | All the program data areas | P X | P X | |
| ALLSDATA  | All the system data areas | P X | P X | P |
| ALLVNUC   | The entire virtual control program nucleus, including:  
- Prefixed save area (PSA)  
- System queue area (SQA)  
- Local system queue area (LSQA) | M P X | M P X | M |
| CB        | Control blocks for the task being dumped | M P X | D M P X | M |
| CSA       | Common service area (CSA) (that is, subpools 227, 228, 231, 241) | | | P X |
## ABEND dumps

<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>
</table>
| DM        | Data management control blocks for the task being dumped:  
  - Data control block (DCB)  
  - Data extent block (DEB)  
  - Input/output block (IOB) | M P X | D M P X | M |
| ENQ       | Global resource serialization control blocks for the task being dumped:  
  - Global queue control blocks  
  - Local queue control blocks | P X | D P X | |
| 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) | M P X | D M P X | M |
| GRSQ      | Global resource serialization control blocks for the task being dumped:  
  - Global queue control blocks  
  - Local queue control blocks | P X | | |
| IO        | Input/output supervisor (IOS) control blocks for the task being dumped:  
  - Execute channel program debug area (EXCPD)  
  - Unit control block (UCB) | M P X | D M P X | M |
| JPA       | Job pack area (JPA): module names and contents | M P X | | M |
| LPA       | Active link pack area (LPA): module names and contents | M P X | M P X | M P X |
## ABEND dumps

<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 SYMDUMP</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>
<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 IEA995I)</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-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)</td>
<td>M P X</td>
<td>M P X</td>
<td>D M P X</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: • Global queue control blocks • Local queue control blocks</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>REGS</td>
<td>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</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
</tbody>
</table>
## ABEND dumps

<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>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</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td>SA or SAH</td>
<td>Save area linkage information, program call linkage information, and backward trace of save areas</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td>SPLS</td>
<td>Storage allocated in user subpools 0 - 127, 129 - 132, 244, 251, and 252 for the task being dumped</td>
<td>M P X</td>
<td>D M P X</td>
<td>M</td>
</tr>
<tr>
<td>SQA</td>
<td>System queue area (SQA) allocated (that is, subpools 226, 239, 245, 247, 248)</td>
<td>M P X</td>
<td>M P X</td>
<td>D M P X</td>
</tr>
<tr>
<td>SUBTASKS</td>
<td>Storage for the task being dumped and program data for all of its subtasks</td>
<td>M P X</td>
<td>M P X</td>
<td>D M</td>
</tr>
<tr>
<td>SUM</td>
<td>Summary dump, see &quot;Default contents of summary dumps in ABEND dumps&quot; on page 150</td>
<td>D M P X</td>
<td>D M P X</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>
<td>M P X</td>
<td>D M P X</td>
</tr>
</tbody>
</table>
**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 the following table, 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><strong>Completion code:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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><strong>Control blocks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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></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><strong>Control blocks</strong> for the recovery termination manager (RTM):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• EED (extended error descriptor) for RTM</td>
<td>S</td>
<td>S</td>
<td>S</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><strong>Dump header</strong>, mapped by the AMDDATA macro</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td><strong>Dump index</strong></td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Dump title</strong>: 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><strong>Load module</strong>, 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></td>
</tr>
</tbody>
</table>
### ABEND dumps

<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>Offset</strong> into the load module of the failing instruction</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Module pointed to in the last PRB</strong> (program request block)</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>PSW</strong> (program status word) at entry to ABEND, that is, when the dump was requested</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>The PSW includes the instruction length code and the interrupt code for the failing instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Registers</strong> at entry to ABEND, that is, when the dump was requested</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td><strong>Save areas</strong> of register contents</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td><strong>Storage:</strong> 4 kilobytes before and 4 kilobytes after the addresses in the PSW and the registers</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>The dump shows, by ascending address, only the storage that the user is authorized to access. Duplicate addresses are removed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System trace table</strong> entries for the dumped address space</td>
<td>S</td>
<td>S</td>
<td></td>
</tr>
<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.

### References

- See [z/OS MVS Initialization and Tuning Reference](https://www.ibm.com/support/knowledgecenter/SSEPGG_2.4.0/com.ibm.zos.v2r4.mcexpref/ncsicore/000d6157.html) for parmlib members.
- See [z/OS MVS System Commands](https://www.ibm.com/support/knowledgecenter/SSEPG2_2.4.0/com.ibm.zos.v2r4.mcexpref/ncsicore/000d611j.html) for the CHNGDUMP operator command.
ABEND dumps

- 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:

**Dump option**

Nucleus aArea
## Customizing SYSABEND dump contents

<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                           | 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.**                           | **Change occurs:** At dump request                                       | To add program call data and the link pack area to this SYSABEND dump, code in the program:  
  ABEND 76,DUMP, DUMPOPT=PARMS
  PARM SNAP SDATA=PCDATA, PDATA=LPA,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                                  | To add program call data and the link pack area to this SYSABEND dump, code in the recovery routine:  
  SETRP ,DUMP=YES, DUMPOPT=PARMS
  PARM SNAP SDATA=PCDATA, PDATA=LPA,MF=L |
### ABEND dumps

<table>
<thead>
<tr>
<th>SYSABEND Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| Entering CHNGDUMP operator command with SYSABEND parameter on a console with master authority. | 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 |
| Through IEAVTABX installation exit name list. | 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 Exit](https://www.ibm.com) |
| Through IEAVADFm or IEAVADUS installation exits. IEAVADFm is a list of installation routines to be run. IEAVADUS is one installation routine. | 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 Exit](https://www.ibm.com) |

### Customizing SYSMDUMP dump contents

<table>
<thead>
<tr>
<th>SYSMDUMP Customization</th>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
</table>
| Replacing IEADMR00 parmlib member (by using the IEBUPDTE utility). | Change occurs: At system initialization  
What changes: IEADMR00 contains the IBM-supplied default dump options. Replacing IEADMR00 changes the dump options for SYSMDUMP. | 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:  
SDATA=(NUC,SQA,LSQA,SWA,TRT,RGN,SUM,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. | To add the link pack area to this SYSMDUMP dump, code in the program:  
ABEND 76,DUMP,  
DUMPOPT=PARMS  
PARMS SNAP PDATA=LPA, MF=L |
### ABEND dumps

<table>
<thead>
<tr>
<th>SYSMDUMP 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  
  - ARR (associated recovery routines)  
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:** 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 the link pack area to this SYSMDUMP dump, code in the recovery routine:  
```plaintext  
SETRP,DUMP=YES,  
DUMPOPT=PARMS  
PARMS SNAP PDATA=LPA,MF=L  ``` |
| **Entering CHNGDUMP operator command with SYSMDUMP parameter on a console with master authority.** | **Change occurs:** Immediately when entered  
**What changes:**  
**For ADD:** CHNGDUMP options are added to the IEADMRO0 options, previous CHNGDUMP options, and macro parameter list options. The options remain added until a CHNGDUMP DEL, SYSMDUMP 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 IEADMRO0 are used again.  
When more than one CHNGDUMP operator command with SYSMDUMP is entered, the effect is cumulative. | To add the link pack area to all SYSMDUMP dumps until changed by CHNGDUMP DEL, SYSMDUMP, enter:  
```plaintext  
CHNGDUMP SET,ADD,SYSMDUMP=(LPA)  ```  
To return to the IEADMRO0 options, enter:  
```plaintext  
CHNGDUMP DEL,SYSMDUMP  ``` |
| **Through IEAVTABX installation exit name list.** | **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](https://www.ibm.com/docs/en/zos/2.4.0?topic=mvsinstallation-exits) |
## 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.**  
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 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)  
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: 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 |
### SYSUDUMP Customization

<table>
<thead>
<tr>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change occurs: Immediately when entered</td>
<td>To add program call data and user subpool storage to all SYSUDUMP dumps until changed by CHNGDUMP DEL,SYSUDUMP, enter: CHNGDUMP SET,ADD,SYSUDUMP, SDATA=PCDATA,PDATA=SPLS</td>
</tr>
<tr>
<td>What changes:</td>
<td>To return to the IEADMP00 options, enter: CHNGDUMP DEL,SYSUDUMP</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>For OVER: CHNGDUMP options override all other dump options.</td>
<td></td>
</tr>
<tr>
<td>For DEL: All CHNGDUMP options are deleted and the dump options in IEADMP00 are used again.</td>
<td></td>
</tr>
<tr>
<td>When more than one CHNGDUMP operator command with SYSUDUMP is entered, the effect is cumulative.</td>
<td></td>
</tr>
</tbody>
</table>

### Through IEAVTABX installation exit name list.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change occurs: Just before dumping</td>
<td>See z/OS MVS Installation Exits</td>
</tr>
<tr>
<td>What changes: The routine can add or delete options from the dump options, but only for the current dump.</td>
<td></td>
</tr>
</tbody>
</table>

### Through IEAVADFM or IEAVADUS installation exits. IEAVADFM is a list of installation routines to be run and IEAVADUS is one installation routine.

<table>
<thead>
<tr>
<th>Effect</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change occurs: During dumping. The routine runs during control block formatting of a dump with the CB option.</td>
<td>See z/OS MVS Installation Exits</td>
</tr>
<tr>
<td>What changes: The routine can add control blocks to the dump.</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 40.

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

---

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ABEND dumps

- An erroneous control block queue
- Not valid input to a system service

- 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](http://www.ibm.com/systems/z/os/zos/) 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.

   **References** For the RTM2WA, SDWA, and TCB data areas, see [z/OS MVS Data Areas](http://www.ibm.com/systems/z/os/zos/bkserv/) in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/).
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 SYCH 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 intervention 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:
ABEND dumps

• 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 175 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 XSBLSLCP 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.

**Reference** For the STKE and XSB data areas, see z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)
Chapter 6. SNAP dump

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.

Major Topics

This covers the following topics, which describe how to use SNAP dumps:
- "Obtaining SNAP dumps"
- "Customizing SNAP dump contents" on page 165

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, SYSMDUMP, 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)
   ```

   **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`
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:

\[ \text{DSORG=PS, RECFM=VBA, MACRF=(W), BLKSIZE=nnn, LRECL=xxx, and DDNAME=any name but SYSABEND, SYSMDUMP or SYSUDUMP} \]

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:

\[ \text{SNAP DCB=(3), ID=245, STORAGE=((4), (5))} \]

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.
d. Close the DCB with a CLOSE assembler macro.

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.

Reference

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 the following table.

Hiperspaces

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.

Reference

See z/OS MVS Programming: Extended Addressability Guide for more information about manipulating data in Hiperspace storage.
## SNAP Dumps

<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) |
| JPA       | Job pack area (JPA): module names and contents |
| LPA       | Link pack area (LPA) active for the task being dumped: module names and contents |
| 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) |
| 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 |
## SNAP dumps

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dump Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>—</td>
<td>One or more storage areas, identified by beginning and ending addresses on the SNAP or SNAPX macro</td>
</tr>
<tr>
<td>—</td>
<td>One or more subpools, identified by subpool number on the SNAP or SNAPX macro</td>
</tr>
</tbody>
</table>
SNAP dumps
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.

Major topics

This covers the following topics:

- “Problem data for storage overlays”
- “Problem data from the linkage stack” on page 171
- “Problem data for modules” on page 172
- “Problem data from recovery work areas” on page 172
- “Problem data for ACR” on page 173
- “Problem data for machine checks” on page 174

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.
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.

---

**Example: Recognizing a pattern**

In the following output, storage from CSA shows a pattern of allocated blocks.

```
00CFD000 00000000 00000000 E5C7E3E3 080000F1 | .........VGTT...
00CFD010 00000020 00000000 0000E3D8 00000000 | ..........TQ...
00CFD020 008E3D30 00000000 E5C7E3E3 080000F1 | .........VGTT...
00CFD030 00000020 00CFD008 0000E260 00000000 | ......}...S-...
00CFD040 00CA6A60 00000000 17000000 E5E2C90F | .........VSI
00CFD050 00CF8E08 00CFD0B8 C8E2D4D3 4BD4C3C4 | \...\...HSML.MC
00CFD060 E24BC4C1 E3C14040 40404040 40404040 | \.DATA
00CFD070 TO 00CFD07F (X'00000000' bytes)--All bytes contain X'40', C'
00CFD080 40404040 00000000 00000000 | .............
00CFD090 00000000 00000000 00000000 17CA0000 | .........BCT3LI....
00CFD0A0 1FFE0000 C2C3E3F3 D3C90001 00000000 | .........SYS1.UC
00CFD0B0 00000000 40080000 E2E82E2F 4BE4C3C1 | ... ...SYS1.UC
00CFD0C0 E34BC5D5 E5F2F600 000000168 00CFD0C8 | T.ENV26.......}
00CFD0D0 F1000000 00CFD230 00CFD22C 13C9C4C1 | 1.....K..K...ID
00CFD0E0 CBC5C240 00000150 00CFD244 00000160 | HEB ...&;K....
```
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.

Example: Viewing a linkage stack entry

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 shows one entry, as follows:

```
LINKAGE STACK ENTRY 01 LSED: 7F7490B0
LSE: 7F749010
    GENERAL PURPOSE REGISTER VALUES
    00-03.... 7FFEB410 04504DF4 04532000 04541FFF
    04-07.... 04504CE4 81150380 00000028 04504B50
    08-11.... 04503A75 04502A76 04501A77 04504630
    12-15.... 84500A78 00000000 80FD7618 8450FAF8
    ACCESS REGISTER VALUES
    00-03.... 00000000 00000000 00000000 00000000
    04-07.... 00000000 00000000 00000000 00000000
    08-11.... 00000000 00000000 00000000 00000000
    12-15.... 00000000 00000000 00000000 00000000
15/A ON AQFT PER SYSTEM HUNG 22:30 08/30/88 24 09:42:48 10/14/88
PKM..0000 SASN..001A EAX..0000 PASN..001A PSW..070C0000 80F07618
TARG... 8450FB12 MSTA... 0451E300 00000000
TYPE... 84
BAKR STATE ENTRY
    RFS... 0F3B NES... 0000
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 80F07618
    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).
```

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 54 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
Dump grab bag

- 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).

Reference
- See Chapter 14, “Recording logrec error records,” on page 501 for more information.
- For the control blocks, see z/OS MVS Data Areas in z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/.
- For 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 LCCA.
- 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
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 FLMCIC 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 LRBMTERM 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 LRBMTERM is ON to indicate that the machine check old PSW is nonzero but the MCIC is zero.

Hard errors cause FRR and ESTAE processing.

Reference

*See z/Architecture Principles of Operation* for a complete description of the MCIC.
Chapter 8. System trace

System trace provides an ongoing record of hardware events and software events occurring 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 very 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"
- "Receiving system trace data in a dump" on page 177
- "Formatting system trace data in a dump" on page 177
- "Reading system trace output" on page 177

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."
- "Tracing branch instructions" on page 176

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 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:

1. Enter the TRACE ST command to change the size of the system trace table. For example, to restart system tracing and increase the size of the trace table from the default 1 megabytes per processor to 2 megabytes per processor:

   TRACE ST,2M

2. Enter the TRACE ST command with BUFSIZ parameter to change the total size of the system trace table allocated. For example, in a system having 10
processors, to restart system tracing and increase the size of the trace table from the default 10 megabytes (1 megabyte per processor) to 20 megabytes (2 megabytes per processor):

```
TRACE ST,BUFSIZ=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. As of z/OS V1R9, the option of mode tracing is separated 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.

When you want to trace branch instructions such as BALR, BASR, BASSM and BAKR, do the following:

- Restart 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.

- Example 1: To increase the size of the trace tables for each processor from the default 256 kilobytes to 999 kilobytes, issue:

```
TRACE ST,999K,BR=ON
```

- Example 2: 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,BUFSIZ=2M,BR=ON
```

### References

- *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 unformatted entries by manipulating control register bits by the instruction. 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 z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)
Receiving system trace data in a dump

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>
<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>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=SVC, ACTION=STDUMP, ACTION=SYNCSVC, 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

This topic describes system trace table entries (TTE) as they appear in a dump formatted with the IPCS SYSTRACE subcommand. The following topics appear:
- “Example of a system trace in a dump”
- “Summary of system trace entry identifiers” on page 178 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 180 through “USRn trace entries” on page 216 shows the format for each type of trace entry. For the detailed format of TTEs, see z/OS MVS Data Areas in z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/

Example of a system trace in a dump

The following example 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)
System trace

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 the table below to locate the format for a particular entry.

**Example: Finding the format for an SVC entry**

In the following trace entry, the system trace identifier is SVC:

```
01 000C 00AFF090  SVC  1 070C2000 00EB19CC 00000000 00000001 00C13340
```

Look up SVC in Table 16 to find the page 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 213.
### Table 16. 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 180</td>
</tr>
<tr>
<td>ALTR</td>
<td>Alteration of trace option</td>
<td>“ALTR trace entries” on page 181</td>
</tr>
<tr>
<td>BR</td>
<td>Branch through a BAKR, BALR, BASR, or BASSM instruction</td>
<td>“BR trace entries” on page 183</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 183</td>
</tr>
<tr>
<td>CALL</td>
<td>External call external interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>CLKC</td>
<td>Clock comparator external interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>CSCH</td>
<td>Clear subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</td>
</tr>
<tr>
<td>DSP</td>
<td>Task dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 190</td>
</tr>
<tr>
<td>EMS</td>
<td>Emergency signal external interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>EXT</td>
<td>General external interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>HSCH</td>
<td>Halt subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</td>
</tr>
<tr>
<td>I/O</td>
<td>Input/output interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>MCH</td>
<td>Machine check interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>MOBR</td>
<td>Change of addressing mode along with a change of instruction address</td>
<td>“MODE and MOBR trace entries” on page 192</td>
</tr>
<tr>
<td>MODE</td>
<td>Change of addressing mode</td>
<td>“MODE and MOBR trace entries” on page 192</td>
</tr>
<tr>
<td>MSCH</td>
<td>Modify subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</td>
</tr>
<tr>
<td>PC</td>
<td>Program Call control instruction</td>
<td>“BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 188</td>
</tr>
<tr>
<td>PGM</td>
<td>Program interruption</td>
<td>“PGM, SPER and SPR2 trace entries” on page 193</td>
</tr>
<tr>
<td>PR</td>
<td>Program Return control instruction</td>
<td>“BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 183</td>
</tr>
<tr>
<td>PT</td>
<td>Program Transfer control instruction</td>
<td>“BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 183</td>
</tr>
<tr>
<td>RCVY</td>
<td>Recovery event</td>
<td>“RCVY trace entries” on page 195</td>
</tr>
<tr>
<td>RSCH</td>
<td>Resume subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</td>
</tr>
<tr>
<td>RST</td>
<td>Restart interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>SIGA</td>
<td>Signal adapter operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</td>
</tr>
<tr>
<td>SPER</td>
<td>SLIP program event recording</td>
<td>“PGM, SPER and SPR2 trace entries” on page 193</td>
</tr>
<tr>
<td>SPIN</td>
<td>Starting, middle, or stopping of a system spin.</td>
<td>“SPIN trace entries” on page 195</td>
</tr>
</tbody>
</table>
### System trace

**Table 16. 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>SPR2</td>
<td>SLIP program event recording, when STDATA is specified</td>
<td>“PGM, SPER and SPR2 trace entries” on page 193</td>
</tr>
<tr>
<td>SRB</td>
<td>Initial service request block dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 190</td>
</tr>
<tr>
<td>SS</td>
<td>Service signal external interruption</td>
<td>“CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries” on page 185</td>
</tr>
<tr>
<td>SSAR</td>
<td>Set Secondary Address Space Number control instruction</td>
<td>“BSG, PC, PR, PT, PTI, SSAR and SSIR trace entries” on page 183</td>
</tr>
<tr>
<td>SSCH</td>
<td>Start subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</td>
</tr>
<tr>
<td>SSRB</td>
<td>Suspended service request block dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 190</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 203</td>
</tr>
<tr>
<td>SUSP</td>
<td>Lock suspension</td>
<td>“SUSP trace entries” on page 212</td>
</tr>
<tr>
<td>SVC</td>
<td>Supervisor call interruption</td>
<td>“SVC, SVCE, and SVCR trace entries” on page 213</td>
</tr>
<tr>
<td>SVCE</td>
<td>SVC error</td>
<td>“SVC, SVCE, and SVCR trace entries” on page 213</td>
</tr>
<tr>
<td>SVCR</td>
<td>SVC return</td>
<td>“SVC, SVCE, and SVCR trace entries” on page 213</td>
</tr>
<tr>
<td>TIME</td>
<td>Timer services</td>
<td>“TIME trace entries” on page 215</td>
</tr>
<tr>
<td>USRn</td>
<td>User event</td>
<td>“USRn trace entries” on page 216</td>
</tr>
<tr>
<td>WAIT</td>
<td>Wait task dispatch</td>
<td>“DSP, SRB, SSRB, and WAIT trace entries” on page 190</td>
</tr>
<tr>
<td>XSCH</td>
<td>Cancel subchannel operation</td>
<td>“CSCH, HSCH, MSCH, RSCH, SSCH, SIGA and XSCH trace entries” on page 188</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 TCB-ADDR IDENT CD/D PSW----- ADDRESS- UNIQUE-1 UNIQUE-2 UNIQUE-3 UNIQUE-4 UNIQUE-5 UNIQUE-6 PSACLHS- PSALocal PASD SASD TIMESTAMP-RECORD CP**

**PR** fail tcb-addr *ACR* cpu psaeepsw flg-crex psacstk- psasuper psamodew psachs- psalocal timestamp------- CP

**PR**  pr: Identifier of the processor that produced the TTE.

**ASID** fail: Home address space identifier (ASID) of the failing processor.

**TCB-ADDR**

cacb-addr: Address of the task control block (TCB) for the current task for which the TTE was produced.
### IDENT
The TTE identifier, as follows:

- **ACR** Alternate CPU recovery

An asterisk (*) always appears before ACR to indicate an unusual condition.

### 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.
- **psaeepsw**: PSAEEPSW 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.

### TIMESTAMP-RECORD
- **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.

### CP
The CP column contains 2 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.
System trace

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>TCB-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>UNIQUE-4</th>
<th>UNIQUE-5</th>
<th>UNIQUE-6</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>*ALTR</td>
<td></td>
<td>tobtropt</td>
<td>gpr0----</td>
<td>gpr1----</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-</td>
<td></td>
<td>blank</td>
<td>blank</td>
<td>blank</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>record----</td>
<td></td>
<td>blank</td>
<td>blank</td>
<td>blank</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.

**TCB-ADDR**
tcb-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

**PSALOCAL**
Blank

**PASD**
pasd: Primary ASID (PASID) at trace entry.

**SASD**
sasd: Secondary ASID (SASID) at trace entry.

**TIMESTAMP-RECORD**
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.

**CP**
The CP column contains 2 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.
**System trace**

**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.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>TCB-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>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>BR</td>
<td></td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td></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.

**TCB-ADDR**  
tcb-addr: Address of the task control block (TCB) for the current task for which the TTE was produced.

**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-  
PSALOCAL  
PASD  
SASD  
TIMESTAMP-RECORD  
CP

**Addressing mode and location**

<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_xxxxxxxx</td>
</tr>
<tr>
<td>64-bit address with non-zero high order bits</td>
<td>xxxxxxxx_xxxxxxxx</td>
</tr>
</tbody>
</table>

**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
System trace

- 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

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>TCB-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>TIMESTAMP-RECORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>PC</td>
<td>pkey-flg</td>
<td>pc-addr-</td>
<td>pc-flg--</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>PR</td>
<td>psw-key-</td>
<td>pr-addr-</td>
<td>pr-faddr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>PT</td>
<td>psw-key-</td>
<td>pt-addr-</td>
<td>pt-asid-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>PTI</td>
<td>psw-key-</td>
<td>pt-addr-</td>
<td>pt-asid-</td>
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<td></td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>SSAR</td>
<td>newsasid</td>
<td>sasd-</td>
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<td></td>
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<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>SSSR</td>
<td>newsasid</td>
<td>sasd-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>BSG</td>
<td>alet</td>
<td>bsg-addr</td>
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<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**

last: Last home address space identifier (ASID) associated with the TTE.

**TCB-ADDR**

tcb-addr: Address of the task control block (TCB) for the current task for which the TTE was produced.

**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-flg**: 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.
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_xxxxxxxx</td>
</tr>
<tr>
<td>64-bit address with non-zero high order bits</td>
<td>xxxxxxxx_xxxxxxxx</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.

**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.

**TIMESTAMP-RECORD**
Blank

**CP**
Blank

**CALL, CLKC, EMS, EXT, I/O, MCH, RST, and SS trace entries**
These trace entries represent an interruption:

- Five of the 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
System trace

- 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>PSACLHSE-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>S ASD</th>
<th>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr home tcb-addr</td>
<td>CALL</td>
<td>ext-old- psw----</td>
<td>pseepsw pcarph</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>CLKC</td>
<td>ext-old- pswaddr---</td>
<td>pseepsw tge-tcb- tge-asid</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>EMS</td>
<td>ext-old- pswaddr---</td>
<td>pseepsw pccaemsi pccaemsp</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>EXT</td>
<td>code ext-old- pswaddr---</td>
<td>pseepsw</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>I/O</td>
<td>dev i/o-old- pswaddr---</td>
<td>flg-ctl- ccw-addr dvch-cnt</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>MCH</td>
<td>mch-old- pswaddr---</td>
<td>machine- chk-code psasuper</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>RST</td>
<td>rst-old- pswaddr---</td>
<td>gpr15--- gpr0----</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr home tcb-addr</td>
<td>SS</td>
<td>ext-old- pswaddr---</td>
<td>pseepsw pseeparm msf-bcmd</td>
<td>psachls-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-------</td>
<td>06</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**
- tcb-addr: Address of the task control block (TCB) for the current task or the work element block WEB.

**IDENT**
- The TTE identifier, as follows:
  - CALL: External call external interruption
  - CLKC: Clock comparator external interruption
  - EMS: Emergency signal external interruption
  - EXT: General external interruption
  - I/O: I/O interruption
  - MCH: Machine check interruption
  - RST: Restart interruption
  - SS: Service signal external interruption

An asterisk (*) always appears before MCH and RST to indicate an unusual condition.

An asterisk before EXT indicates that the interrupt is a malfunction alert (MFA) or is the result of pressing the External Interrupt key.

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
System trace

- IRBSALRT for alert status

**CD/D**
- 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
- mssftach: 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: PSAEESPW 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.
- psaeaprm: PSAEAPRM field in the PSA, containing the MSSF buffer address
- psamodew: PSAMODEW field in the PSA
- psasuper: PSASUPER field in the PSA
- tge-asid: ASID of the associated timer queue element (TQE)
- tge-tcb-: Address in the TCB for the associated TQE, or the TQE address for a system TQE
- ucb-addr: Unit control block (UCB) address
System trace

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.

TIMESTAMP-RECORD
    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 the logrec data set records.

CP
    The CP column contains 2 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>TCB-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>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>CSCH</td>
<td>dev</td>
<td>cc</td>
<td>di</td>
<td>iosb-addr</td>
<td>ucb-addr</td>
<td>i/oq-addr</td>
<td>asc-iosb</td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>HSCH</td>
<td>dev</td>
<td>cc</td>
<td>di</td>
<td>iosb-addr</td>
<td>ucb-addr</td>
<td>i/oq-addr</td>
<td>asc-iosb</td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>MSCH</td>
<td>dev</td>
<td>cc</td>
<td>di</td>
<td>iosb-addr</td>
<td>ucb-addr</td>
<td>f1f2pmom</td>
<td>mbl-t21b</td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>RSCH</td>
<td>dev</td>
<td>cc</td>
<td>di</td>
<td>iosb-addr</td>
<td>ucb-addr</td>
<td></td>
<td></td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>SSCH</td>
<td>dev</td>
<td>cc</td>
<td>di</td>
<td>iosb-addr</td>
<td>ucb-addr</td>
<td>orb-wrd2</td>
<td>orb-wrd3</td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>XSCH</td>
<td>dev</td>
<td>cc</td>
<td>di</td>
<td>iosb-addr</td>
<td>ucb-addr</td>
<td>orb-wrd4</td>
<td>cap-addr</td>
<td>bdev</td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>asid</td>
<td>tcb-addr</td>
<td>SIGA</td>
<td>dev</td>
<td>cc</td>
<td>fc</td>
<td>qib-addr</td>
<td>subsyid</td>
<td>q-mask-1</td>
<td>q-mask-2</td>
<td>timestamp-</td>
<td></td>
<td></td>
<td></td>
<td>CP</td>
</tr>
</tbody>
</table>

PR
    pr: Identifier of the processor that produced the TTE.

ASID
    asid: Address space identifier (ASID) related to the I/O.
TCB-ADDR
tcb-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
• iosbaddr: I/O supervisor block (IOSB) address associated with the I/O
• qib-addr: 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-addr: 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-addr 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
• ioo-addr: I/O queue (IOQ) address associated with the I/O
• mbi-t2lb:
    mbi- SCHMBI field from the SCHIB
    t2 IOSOPT2 field from the IOSB
System trace

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-addr: Unit control block (UCB) address associated with the I/O

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.

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.

TIMESTAMP-RECORD
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 the logrec data set records.

CP The CP column contains 2 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
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
    redispach

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
**System trace**

**PSACLHS**
- `psaclhs-`: String for the current lock held, from the PSACLHS field of the PSA.
- `psaclhs4`: PSACLHS4 field of the PSA
- `srblhi-`: 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.

**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.

**TIMESTAMP-RECORD**
`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.

**CP**
The CP column contains 2 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>TCB-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>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>MODE</td>
<td>target</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>etc.</td>
<td>etc.</td>
<td>------</td>
<td>------</td>
<td>------------------</td>
<td>----</td>
</tr>
<tr>
<td>pr</td>
<td>last</td>
<td>tcb-addr</td>
<td>MOBR</td>
<td>target</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>address-</td>
<td>etc.</td>
<td>etc.</td>
<td>------</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.

**TCB-ADDR**
`tcb-addr`: Address of the task control block (TCB) for the current task for which the TTE was produced.
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-**

**PSALOCAL**

**PASD**

**SASD**

**TIMESTAMP-RECORD**

**CP** 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>
<tr>
<td>31-bit address</td>
<td>xxxxxxx</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>xxxxxxx_xxxxxx</td>
</tr>
</tbody>
</table>

**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

**PR ASID TCB-ADDR IDENT CD/D PSW----- ADDRESS- UNIQUE-1 UNIQUE-2 UNIQUE-3 PSACLHS- PSALOCAL PASD SASD TIMESTAMP-RECORD CP**

<table>
<thead>
<tr>
<th>pr home tcb-addr PGM code pgm-old- pswaddr- ilc-code tea-----</th>
<th>psaclhs- psalocal pasd sasd timestamp------- CP</th>
<th>pr home tcb-addr SPR2 code pgm-old- pswaddr- var1 var2 var3</th>
<th>psaclhs- psalocal pasd sasd timestamp------- CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr home tcb-addr SPER code pgm-old- pswaddr- ilc-code trap-----</td>
<td>psaclhs- psalocal pasd sasd timestamp------- CP</td>
<td>pr home tcb-addr SPER code pgm-old- pswaddr- var1 var2 var3</td>
<td>psaclhs- psalocal pasd sasd timestamp------- CP</td>
</tr>
<tr>
<td>pr home tcb-addr SPER code pgm-old- pswaddr- ilc-code trap-----</td>
<td>psaclhs- psalocal pasd sasd timestamp------- CP</td>
<td>pr home tcb-addr SPR2 code pgm-old- pswaddr- var1 var2 var3</td>
<td>psaclhs- psalocal pasd sasd timestamp------- CP</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.
System trace

TCB-ADDR
tcb-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
SPER SLIP program event recording
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.

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:
  - pswaddr: Two words, containing the 64-bit address portion of the PSW
  - pswctrl: Two words, containing the 64-bit “control” portion of the PSW

UNIQUE-1/UNIQUE-2/UNIQUE-3
UNIQUE-4/UNIQUE-5/UNIQUE-6
- icl-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.

TIMESTAMP-RECORD
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 the logrec data set records.
The CP column contains 2 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.

**Reentry After Certain RCVY Events:** Five types of recovery events require reentry in a new environment or address space. See the following table to see when an RCVY trace event requires 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></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></td>
<td></td>
</tr>
<tr>
<td>RCVY RCML</td>
<td>Always required</td>
<td>RCVY RCMR</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>
### System trace

| PR | ASID | TCB-ADDR | IDENT | CD/D | PSW | ADDRESS- | UNIQUE-1 | UNIQUE-2 | UNIQUE-3 | UNIQUE-4 | UNIQUE-5 | UNIQUE-6 | PSACLH- | PSALOCAL | PASTD | SASD | TIMESTAMP-RECORD | CP |
|----|------|---------|-------|------|-----|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|----|
| pr | home | tcb-addr | +RCVY ABT | trk |-----| psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY ABT | return | comp | reas | rc | asid | tcb |----- | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY ABT | com | reas | rc | asid | tcb |----- | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY DAT | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY ERR | frr-new | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY ITRM | return | comp | reas | pppp | pppp |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY ITRR | comp | reas | pppp | pppp |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY MCH | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY MEM | return | comp | reas | rc | asid | tcb |----- | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY MEMR | comp | reas | asid | pppp |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY PERC | comp | reas |***** | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY PROG | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY RCM | return | comp | reas | asid | pppp |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY RCMR | comp | reas | pppp |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY RESM retry | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY RSRT | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY RTRY retry | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY SABN | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY SPRC | comp | reas | psasuper | psaclhs- | psalocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY SRBT | return | comp | reas | rc | asid | tcb |----- | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY STRM | return | comp | reas | tcb |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |
| pr | home | tcb-addr | +RCVY STRR | comp | reas | tcb |***** | psaclhs- | psaclhse- | pslocal | pasd | sasd | timestamp- | record | CP |

**PR**  
pr: Identifier of the processor that produced the TTE.

**ASID**  
home: Home address space identifier (ASID) associated with the TTE.

**TCB-ADDR**  
tcb-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
• 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
• PERC: Percolation from RTM1 to RTM2 to continue recovery processing
• 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
• 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-
• return---: Caller's return address
• frr-new- psw-----: New program status word (PSW) to give control to the FRR
• retry--- psw-----: Retry PSW

UNIQUE-1/UNIQUE-2/UNIQUE-3
UNIQUE-4/UNIQUE-5/UNIQUE-6
• 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
System trace

tcb----- field are zero, then no SRB-to-task percolation is performed.
• 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 eeeeeeee
          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
          sssssss
          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
          eeeeeeee
          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.
• pppp------ 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.
• 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
          IEAMSCHD macro and consisting of four unique words on the second line
          for the RCVY SRBT trace entry only.
• psasuper: PSASUPER field in the prefix save area (PSA)
• 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

PSACLHS-
          psaclhs-: String for the current lock held, from the PSACLHS field of the PSA.
System trace

**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.

**TIMESTAMP-RECORD**
- 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 the logrec data set records.

**CP**
- The CP column contains 2 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.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>TCB-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>PSACLHSE-</th>
<th>PASD</th>
<th>SASD</th>
<th>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>SRC/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur holder--</td>
<td>rstrscid</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp--------</td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>ACO/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur holder--</td>
<td>infncode</td>
<td>ascb-add</td>
<td>inp-parm</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>BBR/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur</td>
<td>cpu-spin</td>
<td>infncode</td>
<td>reg1----</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>INT/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur</td>
<td>cpu-spin</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp--------</td>
<td>CP</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>LXX/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur</td>
<td>lockword</td>
<td>lock-add</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp--------</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>RI/</td>
<td>M/P</td>
<td>return--</td>
<td>spin-dur</td>
<td>cpu-spin</td>
<td>req-code</td>
<td>pccaaddr</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
<td>sasd</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>SG/P</td>
<td>P</td>
<td>return--</td>
<td>spin-dur</td>
<td>cpu-spin</td>
<td>para-reg</td>
<td>sigpcode</td>
<td>sigstat</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>SPN/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur</td>
<td>cpu-spin</td>
<td>reg0----</td>
<td>reg1----</td>
<td>reg3----</td>
<td>psaclhse-</td>
<td>psalocal</td>
<td>pasd</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>SPIN</td>
<td>MTC/</td>
<td>P</td>
<td>return--</td>
<td>spin-dur</td>
<td>phycpu--</td>
<td>asid----</td>
<td>psaclhse-</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.

**TCB-ADDR**
- tcb-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:

- **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."

**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."

**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.

**TIMESTAMP-RECORD**
  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 the logrec data set records.

**CP**
The CP column contains 2 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

**BLWRESRC:**

- **CD/D**
  
  **SRC/S**  
  Start spin entry of the BLWRESRC module.

  **SRC/P**  
  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).
System trace

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
- UNIQUE-5
  inp-parm input_parm

IEAVEBBR:
- CD/D
  BBR/S Start spin entry of the IEAVEBBR module.
  BBR/P Stop spin entry of the IEAVEBBR module.
- 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
  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 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.
System trace

LKX/P
- UNIQUE-1
  spin-dur The 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.
- 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
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.

```plaintext
PR ASID TCB-ADDR IDENT CD/D PSM----- ADDRESS- UNIQUE-1 UNIQUE-2 UNIQUE-3 PASCLHS- PSALOCAL PASD SASD TIMESTAMP-RECORD CP
UNIQUE-4 UNIQUE-5 UNIQUE-6
pr home tcb-addr SSRV ssid return-- data---- data---- data---- psaclhs- psalocal pasd sasd timestamp------- 06
```

**PR** pr: Identifier of the processor that produced the TTE.
**ASID**

home: Home address space identifier (ASID) associated with the TTE.

**TCB-ADDR**

tcb-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: SSRV entry identifier. The SSRV entry identifiers are:

<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>
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<tr>
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<td>AXSET</td>
<td>PC/AUTH</td>
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<td>PC/AUTH</td>
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<td>ETDES</td>
<td>PC/AUTH</td>
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<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>LXHR</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>
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<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>IEAVPSE or IEAVXFR</td>
<td>Supervisor Control</td>
</tr>
<tr>
<td>011F</td>
<td>IEAVRLS or IEAVXFR</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>
</tbody>
</table>
### System trace

<table>
<thead>
<tr>
<th>ssid (hexadecimal)</th>
<th>Macro for SSRV Request</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<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>SP1, SPIINT</td>
<td>Service processor interface</td>
</tr>
<tr>
<td>014B</td>
<td>IARV64</td>
<td>Real storage management</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>
</tr>
<tr>
<td>014E</td>
<td>DEQ</td>
<td>Global resource serialization</td>
</tr>
<tr>
<td>014F</td>
<td>SYSCALL</td>
<td>UNIX System Services</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 Unix System Services: the syscall code.
- For real storage management:
  - Bytes as follows:
    - Request type identifier:
      - 01 GETSTOR
      - 02 GETSHARED
      - 03 DETACH
      - 04 PAGEFIX
      - 05 PAGEUNFIX
      - 06 PAGEOUT
      - 07 DISCARDDATA
      - 08 PAGEIN
      - 0A SHAREMEMOBJ
      - 0B CHANGEACCESS
      - 0D CHANGEGUARD
    - GETSTOR GETSHARED Request flags:
      - 1... COND=YES request
      - .1... FPROT=YES request
      - ..1... CONTROL=AUTH request (only applies to GETSTOR)
      - ...1... SVCDUMPRGN=YES request (only applies to GETSTOR)
      - .... 1... CHANGEACCESS = GLOBAL request (only applies to GETSHARED)
      - .... ..1... GUARDLOC=HIGH request (only applies to GETSTOR)
    - DETACH Request flags:
      - 1... COND=YES request
      - .1... MATCH=USERTOKEN request
      - ..1... AFFINITY=SYSTEM request
      - ...1... OWNER=NO request
System trace

1 SHAREMEMOBJ Request flags:
   1... .... COND=YES request
   1... .... SVCDUMPRGN=YES request

1 CHANGEGUARD Request flags:
   1... .... COND=YES request
   1... .... TOGUARD request
   1... .... FROMGUARD request

1 PAGEFIX Request flags:
   1... .... LONG=NO request

1 DISCARDDATA Request flags
   1... .... CLEAR=NO request
   1... .... KEEPREAL=NO request

1 CHANGEACCESS Request flags
   1... .... READONLY request
   1... .... SHAREDWRITE request
   1... .... HIDDEN request

2 Keys Used flag
   1... .... KEY specified
   1... .... USERTOKEN specified
   1... .... TTOKEN specified
   1... .... CONVERTSTART specified
   1... .... GUARDSIZE64 request
   1... .... CONVERTSIZE64 request

3 Miscellaneous Byte
   • Storage Key for GETSTOR and GETSHARED requests
   • Number of ranges in range list for range list requests
   • 0 for all other requests

• For CONFIGURE CPU:
  • Bytes as follows:
    Bytes 0 and 1 Target CPU ID
    Byte 2 Internal flags
    Byte 3 Bits 0-3 Reserved
      Bits 4-7 Direction and source

    | Value | Meaning                      |
    |-------|------------------------------|
    | 0     | Online or Offline at MSI time|
    | 1     | Online Operator request      |
    | 2     | Offline Operator request     |
    | 3     | Online WLM request           |
    | 4     | Offline WLM request          |

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 z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/.

• For an SSRV request to the PC/AUTH component: the PCTR 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>Flags</th>
<th>Bits</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>X...</td>
<td>RESERVED</td>
</tr>
<tr>
<td>.1</td>
<td>CALLRKY=YES was specified</td>
<td></td>
</tr>
<tr>
<td>..1</td>
<td>AR 15 is in use</td>
<td></td>
</tr>
<tr>
<td>..0</td>
<td>AR 15 is not in use</td>
<td></td>
</tr>
<tr>
<td>...1</td>
<td>LOC=(nnn,64) was specified. Storage can be backed above the bar</td>
<td></td>
</tr>
<tr>
<td>.... 1</td>
<td>CHECKZERO=YES was specified</td>
<td></td>
</tr>
<tr>
<td>.... 0</td>
<td>CHECKZERO=NO was specified explicitly, or by default</td>
<td></td>
</tr>
<tr>
<td>.... .1</td>
<td>TCBADDR was specified on STORAGE OBTAIN or RELEASE</td>
<td></td>
</tr>
<tr>
<td>.... ..00</td>
<td>OWNER=HOME was specified explicitly, or by default</td>
<td></td>
</tr>
<tr>
<td>.... ..01</td>
<td>OWNER=PRIMARY was specified</td>
<td></td>
</tr>
<tr>
<td>.... ..10</td>
<td>OWNER=SECONDARY was specified</td>
<td></td>
</tr>
<tr>
<td>.... ..11</td>
<td>OWNER=SYSTEM was specified</td>
<td></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:

<table>
<thead>
<tr>
<th>Request flags</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1...</td>
<td>ALET operand specified</td>
</tr>
<tr>
<td>.1...</td>
<td>Storage can be backed anywhere</td>
</tr>
<tr>
<td>..0...</td>
<td>Storage must have callers residency</td>
</tr>
<tr>
<td>..01...</td>
<td>Storage must have a 24-bit address</td>
</tr>
<tr>
<td>..10...</td>
<td>The request is for an explicit address</td>
</tr>
<tr>
<td>..11...</td>
<td>Storage can have a 24- or 31-bit address</td>
</tr>
<tr>
<td>.... 1...</td>
<td>Maximum and minimum request</td>
</tr>
<tr>
<td>.... .1...</td>
<td>Storage must be on a page boundary</td>
</tr>
<tr>
<td>.... ..0...</td>
<td>Unconditional request</td>
</tr>
<tr>
<td>.... ..1...</td>
<td>OBTAIN request</td>
</tr>
<tr>
<td>.... ..11...</td>
<td>RELEASE request</td>
</tr>
</tbody>
</table>

- 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
System trace

- 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 UNIQUE4 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
        • 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
      - PAGFIX, PAGEUNFIX, PAGEOUT, PAGEIN, DISCARDDATA, CHANGEACCESS
        • 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:
        1 Flags:
        
        01.. .... REQUEST=OBTAIN
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 z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/
System trace

- 3 bytes of flags.
- Byte 1 is:

```
1 Flags:
  0... .... Exclusive request
  .0... .... STEP
  .1... .... SYSTEM
  .0... .... SYSTEM w/UCB
  .0... 1... SYSTEMS w/UCB
  .1... 0... SYSTEMS
  .1... 0... An exit changed the request
  ...1 1... RNLs changed scope
  .... .000 RET=NONE
  .... .001 RET=HAVE
  .... .010 RET=CHNG
  .... .011 RET=USE
  .... .100 RET=ECB
  .... .101 RESERVED
  .... .110 RESERVED
  .... .111 RET=TEST
```

- 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)

- 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.
- 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 through UNIQUE-5
      - Contents of CSD_CPU_ALIVE mask (16 bytes) as updated by the CF
        CPU command. Trailing (unused and invalid) bits are always zero.

**PSACLHS**

`psaclhs-`: 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.

**PSALOCAL**

`psalocal`: 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.

**TIMESTAMP-RECORD**

`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 the logrec
data set records.

**CP**

The CP column contains 2 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>TCB-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>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-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>ssrbaddr</td>
<td>psaclhse-</td>
<td></td>
<td></td>
<td>timestamp--------</td>
<td>02</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.

**TCB-ADDR**
tcb-addr: Address of the task control block (TCB) for the current task

**IDENT**
The TTE identifier, as follows:
SUSP Lock suspension

**CD/D**
Blank

**PSW-----**
return--: Caller's return address

**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
**System trace**

**TIMESTAMP-RECORD**

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 the logrec data set records.

**CP**
The CP column contains 2 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>TCB-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>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-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>timestamp-------</td>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-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>
<td>02</td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-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>timestamp-------</td>
<td>02</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.

**TCB-ADDR**
tcb-addr: Address of the task control block (TCB) for the current task or the work element block (WEB).

**IDENT**
The TTE identifier, as follows:

- SVC: Supervisor call (SVC) interruption
- SVCE: SVC error
- SVCR: SVC return

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.

**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:
System trace

- `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.
- `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

`env-data`: Characteristics of failing environment. 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

`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.

`TIMESTAMP-RECORD`
`timestap------`: 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 the logrec data set records.

`CP` The CP column contains 2 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.

**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></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pr home tcb-addr TIME CODE</td>
<td>word1--- word2--- data----</td>
<td>pasd sasd timestamp--------</td>
<td>CP</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.

**TCB-ADDR**

tcb-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


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

**PSACLHSE-**

Blank

**PSALocal**

Blank

**PASD**

pasd: Primary ASID (PASID) at trace entry.

**SASD**

sasd: Secondary ASID (SASID) at trace entry.

**TIMESTAMP-RECORD**

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 the logrec data set records.

**CP**

The CP column contains 2 hex digits of the processor model dependent
System trace

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.

<table>
<thead>
<tr>
<th>PR</th>
<th>ASID</th>
<th>TCB-ADDR</th>
<th>IDENT</th>
<th>CD/D</th>
<th>PSW----- ADDRESS-</th>
<th>UNIQUE-1/UNIQUE-2/UNIQUE-3</th>
<th>PSACLHS-</th>
<th>PSALOCAL</th>
<th>PASD</th>
<th>SASD</th>
<th>TIMESTAMP-RECORD</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>USRn</td>
<td>return-</td>
<td>data----- data-----</td>
<td>data----- data-----</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-----</td>
<td>CP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pr</td>
<td>home</td>
<td>tcb-addr</td>
<td>USRn</td>
<td>return-</td>
<td>idc- rbc data-----</td>
<td>data----- data-----</td>
<td>pasd</td>
<td>sasd</td>
<td>timestamp-----</td>
<td>CP</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.

**TCB-ADDR**
- tcb-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**
- 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.

**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.
System trace

Text for some SVC, SSRV, and PC trace entries. The descriptive text will not appear in SNAP/SYSUDUMP/SYSABEND output.

**TIMESTAMP-RECORD**

**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 the logrec data set records.

**CP**

The CP column contains 2 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:

1. The first entry contains the 5 fullwords of trace data in registers 2 through 6.
2. The second entry contains the 5 fullwords of trace data in registers 7 through 11.
3. 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:

```
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'.

The following example shows three trace entries from the preceding PTRACE macro.

```
PR ASID TCB-ADDR IDENT CD/D PSM----- ADDRESS- UNIQUE-1 UNIQUE-2 UNIQUE-3 PSACLHS- PSALOCAL PASD SASD TIMESTAMP-RECORD CP
01 000C 00AFF090 USR3 81A007B6 003D 000 00000001 00000002 00000003 00000004 00000005 00000006 00000007 00000008 00000009 0000000A 0000 000C 90A0507461CB3E02 CP
01 000C 00AFF090 USR3 81A007B6 003D 014 00000006 00000007 00000008 00000009 0000000A 0000000B 0000000C 0000000D 0000000E 0000000F 00000010 00000011 00000012 CP
01 000C 00AFF090 USR3 81A007B6 003D 028 0000000B 0000000C 0000000D 0000000E 0000000F 00000010 00000011 00000012 00000013 00000014 00000015 00000016 CP
```
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.

Major topics

The following topics describe master trace:

- "Master trace and the hardcopy log"
- "Customizing master trace"
- "Requesting master trace" on page 220
- "Receiving master trace" on page 221
- "Reading master trace data" on page 221 includes the following topics:
  - "Master trace output formatted in a dump" on page 221
  - "Master trace table in storage" on page 222

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.
Master trace

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
```

Reference

See z/OS MVS Initialization and Tuning Reference for 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
```

Example: TRACE STATUS output

In the following output, master tracing is active with a trace table of 140 kilobytes, as indicated by MT=(ON,140K):

```
TRACE STATUS
IEE839I ST=(ON,0500K,01000K) AS=ON BR=OFF EX=ON MT=(ON,140K)
ISSUE DISPLAY TRACE CMD FOR SYSTEM AND COMPONENT TRACE STATUS
```

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
```

Example: DISPLAY TRACE output

In the following example, master tracing is active with a master trace table of 140 kilobytes, as indicated by MT=(ON,140K):

```
DISPLAY TRACE
IEE843I 16.17.14  TRACE DISPLAY 564
SYSTEM STATUS INFORMATION
ST=(ON,0500K,01500K) AS=ON BR=OFF EX=ON MT=(ON,140K)
COMPONENT MODE COMPONENT MODE COMPONENT MODE COMPONENT MODE
--------------------------------------------------------------
SYSGRS ON  SYSSPI OFF  SYSSMS OFF  SYSDLF MIN
SYSOPS ON  SYSXCF ON  SYSLA MIN  SYSXES ON
SYSAPPC ON  SYSRSM ON  SYSAOM OFF  SYSVLF MIN
CTTX MIN
```

Reference
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. The following table 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>
<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=SYNCVCD, or ACTION=TRDUMP</td>
<td>Default</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 SYSDUMP</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>

Format the master trace data by specifying the IPCS VERBEXIT MTRACE subcommand or using the IPCS Trace Processing selection panel.

Reference

- See z/OS MVS IPCS Commands for the VERBEXIT MTRACE subcommand.
- See z/OS MVS IPCS User’s Guide for 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”
- “Master trace table in storage” on page 222

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 the messages might not have been put into the master trace table in the order the messages were issued.

Example of formatted master trace output

The following output shows master trace data in a dump formatted by IPCS. The subcommand issued on the IPCS Subcommand Entry panel was:

VERBEXIT MTRACE
### 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.

#### Location

---

The meaning of the highlighted text in the preceding example is as follows:

**TAG**

A halfword containing the identity of the caller. TAG can be one of the following:

- **Tag**
- **Caller**
- **Reserved**
- **WTO SVC**
- **Master scheduler**
- **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 following the message indicates the problem.

---

### Master trace table in storage

<table>
<thead>
<tr>
<th>TAG</th>
<th>IMM DATA</th>
<th>MESSAGE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.76</td>
<td>00800000 SHASP468 JES2 INIT DECK PROCESSED</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP469 REPLY PARAMETER STATEMENT, CANCEL, OR END</td>
<td></td>
</tr>
<tr>
<td>N00000009 NRC040000 SCOTT01 03147 21:24:22.77</td>
<td>00000000 IEE6001 REPLY TO 0002 IS;N1 AUTH=(NET=YES),NAME=SCOTT01</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP466 CONSOLIDATE STMT 126 N1 AUTH=(NET=YES), NAME=SCOTT01</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP467 NAME(1) NAME=SCOTT01 AUTH=(DEVICE=YES), JOB=NO,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP468 NET=YES, SYSTEM=YES), TRANSMIT=BOTH,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP469 RECEIVE=BOTH, HOLD=NONE, PENCILNO=YES,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP470 ENMOD=NO, REST=0, SENTREST=ACCEPT,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP471 COMPACT=0, LINE=0, LOGMODE=LOGON=YES,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP472 PASSWORD=(VERIFY=(NOTSET), SEND=(NOTSET)),</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP473 PATHMD=NO, PRIVATE=NO, SUBNET=,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP474 TRACE=NO</td>
<td></td>
</tr>
<tr>
<td>N00000013 W C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 +0003 SHASP469 REPLY PARAMETER STATEMENT, CANCEL, OR END</td>
<td></td>
</tr>
<tr>
<td>N00000009 NRC040000 SCOTT01 03147 21:24:22.77</td>
<td>00000000 IEE6001 REPLY TO 0003 IS;N1 AUTH=(NET=YES),END</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP466 CONSOLIDATE STMT 127 END</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP467 NAME(1) NAME=SCOTT01 AUTH=(DEVICE=YES), JOB=NO,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP468 NET=YES, SYSTEM=YES), TRANSMIT=BOTH,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP469 RECEIVE=BOTH, HOLD=NONE, PENCILNO=YES,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP470 ENMOD=NO, REST=0, SENTREST=ACCEPT,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP471 COMPACT=0, LINE=0, LOGMODE=LOGON=YES,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP472 PASSWORD=(VERIFY=(NOTSET), SEND=(NOTSET)),</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP473 PATHMD=NO, PRIVATE=NO, SUBNET=,</td>
<td></td>
</tr>
<tr>
<td>N00000013 N C040000 SCOTT01 03147 21:24:22.77</td>
<td>00800000 SHASP474 TRACE=NO</td>
<td></td>
</tr>
<tr>
<td>N00000013 N 0000000 SCOTT01 03147 21:24:22.79</td>
<td>00000290 IEF196I IEF285I VOL SER NOS=D72666.</td>
<td></td>
</tr>
<tr>
<td>N00000013 N 0000000 SCOTT01 03147 21:24:22.79</td>
<td>00000290 IEF196I IEF285I SYS1.PARMLIB KEPT</td>
<td></td>
</tr>
<tr>
<td>N00000013 N 0000000 SCOTT01 03147 21:24:22.79</td>
<td>00000290 IEF196I IEF285I VOL SER NOS=D72666.</td>
<td></td>
</tr>
<tr>
<td>N00000013 N 0000000 SCOTT01 03147 21:24:22.79</td>
<td>00000290 IEF196I IEF285I SYS1.PARMLIB KEPT</td>
<td></td>
</tr>
</tbody>
</table>
Master trace

Locate the master trace table from the communication vector table (CVT) as follows:

<table>
<thead>
<tr>
<th>At the following location:</th>
<th>In a field named:</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>BAMITBL</td>
<td>Start of the master trace table</td>
</tr>
</tbody>
</table>

Format

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 z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkser/](http://www.ibm.com/systems/z/os/zos/bkser/).

### 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

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FLGS</td>
<td>TAG</td>
<td>IMM DATA</td>
<td>LEN</td>
<td>CALLER-PASSED DATA</td>
</tr>
</tbody>
</table>

Entry header
10-byte header for the entry.

FLAGS
A halfword containing the flags set by the caller in the parameter list passed to master trace.

TAG
A halfword containing the identity of the caller. TAG can be one of the following:

<table>
<thead>
<tr>
<th>Tag</th>
<th>Caller</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>0001</td>
<td>WTO SVC</td>
</tr>
<tr>
<td>0002</td>
<td>Master scheduler</td>
</tr>
<tr>
<td>0003</td>
<td>Trace command</td>
</tr>
</tbody>
</table>

Current identifiers are defined in the macro, IEZMTPRM, which maps the parameter list.

IMM DATA
A fullword containing 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 containing the length of the caller-passed data.

CALLER-PASSED DATA
A variable-length field containing the data 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.
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.

Reference:

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 175.

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 below:

TRACE=SYSM,USR,TRC,DSP,PCI,SRM

Briefly, these options request that GTF trace the following:

- **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)

For complete descriptions of these trace options, see “GTF trace options” on page 243.

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 25 on page 227 illustrates the content of the IBM supplied 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 228 for detailed information.

**TIME=1440**

The amount of time, in seconds, that GTF will remain active.

**REGION=2880K**

Specifies the maximum size of the storage that GTF requires.

**IEFPROC DD**

Defines the trace output data set, according to the following defaults:

- The trace output data set has the name SYS1.TRACE
- The data set resides on a DASD that is large enough for the data set to contain 20 physical blocks. After completely filling the 20 physical blocks, GTF will overlay previously written records with new trace records, starting at the beginning of the output data set.

**Restrictions to interactions with installation SMS routines:**

- 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.
- A VSAM linear data set with either an extended format or conventional format with a control interval size (CISIZE) of 32K can be substituted.
- Neither extended sequential nor VSAM data sets, other than linear data sets with the required CISIZE, should be used.

**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."
- Set up a cataloged procedure. See "Setting up a cataloged procedure."
- Override the defaults in the IBM supplied GTF cataloged procedure using the START command. See "Using the START command to invoke GTF" on page 235.
- Determine how much storage GTF needs for the trace options you choose. See "Determining GTF's storage requirements" on page 233.
- Specify trace options directly through the console after entering the START command. See "Specifying or changing GTF trace options through system prompting" on page 236.

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 243. 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|8K}
BLOK={nnnnn|nnnnnK|nnnnnM|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|nnnnnM|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|nnnnnM|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={nnnn|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 (nnnnK or nnnnM). The maximum amount is 999999; 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.
Generalized Trace Facility

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 264.

**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:
  - Flagging 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=nnnn**

Specifies unlimited processor time for GTF.

**REGION=nnnnK**

Specifies the maximum size of the storage that GTF requires. Specify any value from 832K to 2880K. See "Determining GTF's storage requirements" on page 233 for information about determining the value for REGION.

**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 232 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 236 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 GTFOUTxx 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 a SMS managed volume you should ensure 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.
- DSNTYPE=LARGE data sets are treated like conventional data sets except they can occupy more than 64K tracks per volume.
- VSAM linear data sets are treated like conventional data sets. The use of a data set is rejected if it does not comply to the 32K control interval size requirement. The VSAM extended addressing option is accepted.

When WRAP processing is requested, the primary space request is consulted and only control intervals 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 have been 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 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 set or data sets

The system computes an optimal block size when it opens each data set.

**EXCEPTION:** 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, 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 235 for more information.

**Determining GTF’s storage requirements**

The storage that GTF requires depends on the trace options you choose. After you have decided which options you want GTF to use, use Figure 26 on page 234 to determine the amount of storage you should specify in the REGION parameter of either your cataloged procedure’s EXEC statement 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 26 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 243.
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

---

**Generalized Trace Facility**

### Extended Pageable Link Pack Area

<table>
<thead>
<tr>
<th>Option</th>
<th>Size Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSM</td>
<td>4K</td>
</tr>
<tr>
<td>SYS with DSP and/or SRM and/or RNIO</td>
<td>7K</td>
</tr>
<tr>
<td>SYSP, SYSP</td>
<td>18K</td>
</tr>
<tr>
<td>PI, DSP, PIP</td>
<td>2.5K</td>
</tr>
<tr>
<td>EXT</td>
<td>2K</td>
</tr>
<tr>
<td>IO, IO, SIO, SIO, SIOP, SSCH, SSCHP</td>
<td>6K</td>
</tr>
<tr>
<td>SVCP, SVC</td>
<td>10K</td>
</tr>
<tr>
<td>SRM, RR, RNIO</td>
<td>3K</td>
</tr>
<tr>
<td>SLIP</td>
<td>8K</td>
</tr>
<tr>
<td>USR, USRP</td>
<td>1.5K</td>
</tr>
<tr>
<td>PCI, TRC</td>
<td>No Requirement</td>
</tr>
<tr>
<td>CCW, CCWP</td>
<td>9.3K</td>
</tr>
</tbody>
</table>

### System Queue Area

<table>
<thead>
<tr>
<th>SQA = 16500 + REG + SAVE + CBLOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQA: System Queue Area storage requirement.</td>
</tr>
<tr>
<td>REG: 232 bytes per processor are required for register save areas, regardless of whether or not GTF is active.</td>
</tr>
<tr>
<td>SAVE: 1352 bytes per processor are required for save/work areas when GTF is active.</td>
</tr>
<tr>
<td>CBLOC: 1700-2200 bytes are needed for control blocks when GTF is active.</td>
</tr>
</tbody>
</table>

### Extended Common Service Area (CSA)

<table>
<thead>
<tr>
<th>ESQA = N</th>
</tr>
</thead>
<tbody>
<tr>
<td>N: Approximately 4500 times the number of blocks specified on the BLOCK = keyword parameter of the GTF START command.</td>
</tr>
<tr>
<td>The default is 45056 bytes.</td>
</tr>
</tbody>
</table>

### Region Storage

| SUBPOOL: GTF uses a default of 1031 kilobytes of storage for true data. |
| REGION: GTF requires a minimum of an 800K virtual region to run. |

### Notes:

1. When you specify more than one event from a line, the size requirement is the same as if you specified only one option. For example, DSP and PI require 2.5K.
2. For the maximum storage requirement round up the storage requirement for each option you specified to the nearest 4K boundary.
3. For the minimum storage requirement, round up the ‘FIX’ value to the nearest 4K boundary.

### Example:

1. Options = PIP, DSP, SLIP
   Fix = 10.5 + 1.5 + 8 = 20K minimum or = 12 + 1.5 + 8 = 21.5 = 24K maximum
2. Options = SYSM, SRM USR, TRC
   Fix = 8.5 + 0 + 8K = 16.5 = 20K minimum or = 12 + 0 + 8K = 20K maximum

---

*Figure 26. GTF storage requirements*
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 238 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 236 for more information.

To invoke GTF, enter the START command shown below:

```
{START|S}{GTF|membername}[.identifier]
```

**Reference**

For information about this START GTF command and parameters you can use to change the GTF cataloged procedure, see z/OS MVS System Commands.

**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 IEFHDR 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 IEFHDR 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.

Example: Altering One Data Set

If you want to alter just one data set using the START command, your cataloged procedure could look like the following:

```
//GTFABC PROC MEMBER=GTFPARM
//IEFPROC EXEC PGM=AHLGTF,REGION=2B80K,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)
```

Enter `START GTFABC,,,UNIT=TAPE` to alter only the data set that IEFRDER defines.

Example: Altering More Than One Data Set

If you want to alter the attributes of more than one data set with the START command, use the following JCL statements in your cataloged procedure:

```
//GTFABC PROC MEMBER=GTFPARM,NAME1='SYS1.TRACE1',
//     NAME2='SYS1.TRACE2',NAME3='SYS1.TRACE3',
//IEFPROC EXEC PGM=AHLGTF,REGION=2B80K,TIME=1440,
//     DEVICE='SYSDA',DSPS='OLD'
//     PARM=('MODE=EXT,DEBUG=NO')
//SYSLIB DD DSN=SYS1.PARMLIB(&MEMBER),DISP=SHR
//GTFOUT1 DD DSNAME=FILENAME1,UNIT=DEVICE,DISP=&DSPS;
//GTFOUT2 DD DSNAME=FILENAME2,UNIT=DEVICE,DISP=&DSPS;
//GTFOUT3 DD DSNAME=FILENAME3,UNIT=DEVICE,DISP=&DSPS;
```

Enter `START GTFABC,,,DEVICE=TAPE` to override the default value of the UNIT parameter for each output data set in your cataloged procedure.

Reference

See [z/OS MVS JCL Reference](#) 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.
Generalized Trace Facility

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=value
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 233.

GTF will accept the trace options listed under "GTF trace options" on page 243.

Examples of starting GTF

In this topic you will find the following examples:

- "Starting GTF with a cataloged procedure and parmlib member"
- "Starting GTF with internal tracking" on page 238
- "Starting GTF with trace output to an existing data set on tape" on page 238
- "Starting GTF with trace options stored in SYS1.PARMLIB" on page 239
- "Starting GTF without trace options in a member" on page 240
- "Starting GTF to trace VTAM remote network activity" on page 240

Starting GTF with a cataloged procedure and parmlib member

This example 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.
Starting GTF with internal tracking

This example 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.

Example: Starting GTF with internal tracking

```
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
```

Starting GTF with trace output to an existing data set on tape

This example 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 DSN=SYS1.TRACE to DISP=(OLD,KEEP) and DSN=OUTPUT. 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.
Starting GTF with trace options stored in SYS1.PARMLIB

This example 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.

Example: Starting GTF with trace options stored in SYS1.PARMLIB

This example shows the job control statements and utility JCL statements needed to add trace options to SYS1.PARMLIB using IEBUPDTE:

```jcl
/GTFPARM JOB MSGLEVEL=(1,)
// EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSNAME=SYS1.PARMLIB,DISP=SHR
//SYSLIB DD DSN=SYS1.PARMLIB(GTFA),DISP=SHR
/**
 .ADD NAME=GTFA,LIST=ALL,SOURCE=0
 TRACE=SYSP,USR
 SVC=(1,2,3,4,10),10=(034,DOC),SSCH=ED8,PI=15
 .ADD NAME=GTFB,LIST=ALL,SOURCE=0
 TRACE=IO,SSCH,TRC
 .ADD NAME=GTFC,LIST=ALL,SOURCE=0
 TRACE=SYS,PCI
/**
```

References

- See z/OS DFSMSdfp 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.

A sample SYSLIB DD statement to be included in a GTF cataloged procedure might look like this:

```jcl
//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:

```golang
S GTF,,,(MODE=EXT,TIME=YES),MEMBER=GTFB
```
Starting GTF without trace options in a member

The following example 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.)

```
Example: Starting GTF without trace options in a member
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
```

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 the following example, 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.
Example: Starting GTF to trace VTAM remote network activity

```
START MYPROC.EXAMPLE8,,,(MODE=EXT)
00 AHL100A SPECIFY TRACE OPTIONS
REPLY 00,TRACE=RNIO,10,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
```

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
```

Example: DISPLAY A,LIST output

```
In the following example of DISPLAY A,LIST output, the identifier for GTF is EVENT1.
IEE114I 14.51.49 1996.181 ACTIVITY FRAME LAST F E SYS=SY1
JOBS M/S TS USERS SYSAS INITS ACTIVE/MAX VTAM OAS
00000 00003 00000 0016 00000 00000/00000 00000
LLA LLA LLA NSW S VLF VLF VLF NSW S
JES2 JES2 IEFPROC NSW S
GTF EVENT1 IEFPROC NSW S
```

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
```
Example: Stopping GTF

To stop GTF for the identifier EVENT1, 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.

Example: Stopping GTF

To stop GTF for the identifiers EX1, EX2 and EX3 with trace data sets on the same volume, enter the command:

STOP 1020

Reference

See [z/OS MVS System Commands](#) for more information about the STOP and FORCE ARM commands.

Example of stopping GTF

Example: Stopping GTF using an identifier

This example 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
```

The command to stop the GTF tracing started above is:

```
STOP EXAMPLE
```
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 17 on page 248 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 248.

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 248.

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 17 on page 248.
Generalized Trace Facility

CCW trace record formatting is compatible with z/OS V1R6 and higher. For example, a z/OS V1R4 system can not format CCW trace records generated in z/OS V1R6.

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
- Maximum number of CCWs or device command words (DCW) for each event
- Maximum number of bytes of data for each CCW or DCW
- Optional input/output supervisor block (IOSB), input/output block extension (IOBE, zHPF channel programs 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 248.

CCWP is valid only if the other trace options include SSCH, SSCHP, IO, or IOP. See Table 17 on page 248.

CSCH
Requests recording for all clear subchannel operations. See Table 17 on page 248 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 17 on page 248 for more information on combining this option with other GTF options.

HSCH
Requests recording for all halt subchannel operations. See Table 17 on page 248 for more information on combining this option with other GTF options.

IO
Requests recording of all non-program-controlled I/O interruptions. Unless you also specify the PCI trace option, GTF does not record program-controlled interruptions. See Table 17 on page 248 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. Unless you specify the PCI trace option, GTF does not record program-controlled interruptions.
Table 17 on page 248 for more information on combining this option with other GTF options. For information about responding to GTF prompts, see “Prompting keywords” on page 248.

**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 248.

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, IAMS, IMS, IMSA, IMS0012, 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 IXMSBC, 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 248.

**MSCH**

Requests recording for all modify subchannel operations. See Table 17 on page 248 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.

**PI**

Requests comprehensive recording for all program interruptions (0-255). See Table 17 on page 248 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 248. See Table 17 on page 248 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 17 on page 248 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. See Table 17 on page 248 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. For information about responding to GTF prompts, see “Prompting keywords” on page 248. See Table 17 on page 248 for more information on combining this option with other GTF options.

**SVC**
 Requests comprehensive recording for all SVC interruptions. See Table 17 on page 248 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 248. See Table 17 on page 248 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 17 on page 248 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 "Prompting keywords" on page 248.

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 17 on page 248 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 17 on page 248 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
Generalized Trace Facility

GTRACE macro passes to GTF. The EIDs represent user, program product, or IBM subsystem and component events. See Table 20 on page 254 for a list of EID values.

See Table 17 for more information on combining this option with other GTF options. For information about responding to GTF prompts, see "Prompting keywords."

XSCH
Requests recording all cancel subchannel operations.

See Table 17 for more information on combining this option with other GTF options. For information about responding to GTF prompts, see Table 18 on page 249.

Combining GTF options
Table 17 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 17. Combining GTF options

<table>
<thead>
<tr>
<th>Row</th>
<th>Columns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>A</td>
<td>SYSM SYSP SYS SSCHP SSCH</td>
</tr>
<tr>
<td>B</td>
<td>SYSM SYSP SYS IOP IOXP IO IOX</td>
</tr>
<tr>
<td>C</td>
<td>SYSM SYSP SYS SVCP SVC</td>
</tr>
<tr>
<td>D</td>
<td>SYSM SYSP SYS PIP PI</td>
</tr>
<tr>
<td>E</td>
<td>SYSM SYSP SYS EXT</td>
</tr>
<tr>
<td>F</td>
<td>SYSM SYSP SYS RR</td>
</tr>
<tr>
<td>G</td>
<td>SYSM SYSP SYS CSCH</td>
</tr>
<tr>
<td>H</td>
<td>SYSM SYSP SYS HSCH</td>
</tr>
<tr>
<td>I</td>
<td>SYSM SYSP SYS MSCH</td>
</tr>
<tr>
<td>J</td>
<td>SYSM SYSP SYS XSCH</td>
</tr>
<tr>
<td>K</td>
<td>CCWP CCW</td>
</tr>
<tr>
<td>L</td>
<td>USRP USR</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 18 on page 249, 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 18. 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>PIP, SYSP</td>
<td>PI=</td>
<td>50</td>
</tr>
<tr>
<td>SSCHP, SIO, SYSP</td>
<td>SIO=</td>
<td>Unlimited</td>
</tr>
<tr>
<td>SSCHP, SIO, 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>

**Notes:**
1. The SIO keyword is provided only for compatibility; it is recommended that you use the SSCH keyword instead. The SIOF 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 18 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 233 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:

  ```
  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
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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 254.

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])**

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.
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. 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. 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 DCWs. The value nnnnn is any decimal number from 0 to 32767. The default is 20.

GTF traces nnnnn bytes of data for each CCW on the data chain. GTF traces nnnnn bytes of data for each word in an indirect data addressing word (IDAW) list, a modified indirect addressing word (MIDAW) list, or a transport indirect addressing word (TIDAW) list.

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.

When the data count in the CCW or DCW is equal to or less than nnnnn, GTF traces all data in the data buffer. When the data count in the CCW or DCW is greater than nnnnn, 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 nnnnn, GTF traces all of the transmitted data.
• When the transmitted data count is greater than nnnnn, 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, if available, the error recovery procedure work area (EWA), for all CCW 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.
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**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 [,devnumn... ,devnum])**
Specifies devices for which you want I/O interruptions 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:

<table>
<thead>
<tr>
<th>I/O Device Number</th>
<th>Device Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>230</td>
<td>3390 DASD</td>
</tr>
<tr>
<td>450</td>
<td>3490 Tape Drive</td>
</tr>
<tr>
<td>575</td>
<td>3480 Tape Drive</td>
</tr>
<tr>
<td>663</td>
<td>3380 DASD</td>
</tr>
<tr>
<td>020</td>
<td>3274 Communications Controller</td>
</tr>
</tbody>
</table>

**Example 1:**

IO=(DEVCLASS=DASD,450)

the resulting trace includes information for all DASD devices and one 3490 tape drive at address 450.

**Example 2:**

IO=(DEVCLASS=DASD,DEVCLASS=TAPE,020)

the resulting trace includes information for all DASD and TAPE devices and the communications controller at address 020.
Example 3:

\[ IO=\{(450-663) \} \]

The resulting trace includes information for the devices at addresses 450, 575, and 663.

\[ IO=SSCH=\{(DEVCLASS=xxxx,DEVCLASS=xxxx,devnum1[,devnum2,...,devnumn]} \]  

Specifies devices for which you want both I/O interruptions and start subchannel operations 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 job1 through 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 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.

\[ PI=\{code0[,code1]...[,code50]} \]

Specifies 1 through 50 program interruption codes, in decimal notation, that you want traced. If you specify PI or SYSP, and do not specify PI= in response to this prompting message, GTF traces all program interruptions.

\[ SSCH=\{DEVCLASS=xxxx,DEVCLASS=xxxx,devnum1[,devnum2,...,devnumn]} \]

Specifies devices for which you want start subchannel operations traced.

See the IO= "Prompting keywords" on page 248 for a description of how to specify devices to be traced.

\[ SVC=\{svcnump1[,svcnumpn]...[,svcnump50]} \]

Specifies 1 through 50 SVC numbers, in decimal notation, that you want traced. If you specify SVC 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.
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\[\text{USR}=\{\text{event1}, \ldots, \text{event50}\}\]

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>
<thead>
<tr>
<th>Identifier (Hex)</th>
<th>Type of Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>000-3FF</td>
<td>User</td>
</tr>
<tr>
<td>400-5FF</td>
<td>Reserved for program products</td>
</tr>
<tr>
<td>600-FFF</td>
<td>Reserved for IBM subsystems and components</td>
</tr>
</tbody>
</table>

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,D0C),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--IOP,SVCP,SSCH
AHL103I IO=(D34,D0C),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.
Example: Specifying prompting trace options SYSP and USRP

In this example, 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.

```
Example: Specifying prompting trace options SYSP and USRP
START MYPROC.EXAMPLE7,,, (MODE=EXT)
00 AHL100A SPECIFY TRACE OPTIONS
REPLY 00,TRACE=SYSP,USRP
01 AHL101A SPECIFY TRACE EVENT KEYWORDS--IO=,SSCH=,SVC=,PI=,USR=
01 AHL101A SPECIFY TRACE EVENT KEYWORDS--IO=SSCH=
REPLY 01,SVC=(1,2,3,4,10),IO=(191,192),USR=(10,07A,AB)
02 AHL102A CONTINUE TRACE DEFINITION OR REPLY END
REPLY 02,SSCH=282,END
AHL103I TRACE OPTIONS SELECTED--SYSP,PI,IO=(191,192),SSCH=(282)
AHL103I SVC=(1,2,3,4,10),USR=(010,07A,0AB)
03 AHL125A RESpecify TRACE OPTIONS OR REPLY U
REPLY 03,U
```

Example: Specifying prompting trace options

In this example, 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.
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- 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.

Specifying prompting trace options

```
START USRPROC,,(MOD=EXT)
00 AHL100A SPECIFY TRACE OPTIONS
REPLY 00, TRACE=SSCHP,IOP,PCI,CCWP,SVC,JOBNAMEP
01 AHL101A SPECIFY TRACE EVENT KEYWORDS
   --IO=,SSCH=,CCW=,JOBNAME=,IO=SSCH=
REPLY 01,JOBNAME=(BACKWARD),IO=SSCH=580
02 AHL102A CONTINUE TRACE DEFINITION OR REPLY END
REPLY 02,CCW=(CCWN=100,DATA=40,PCITAB=2,IOSB,S1),END
AHL103I TRACE OPTIONS SELECTED--PCI,SVC,IO=SSCH=(580)
AHL103I CCW=(SI,IOSB,CCWN=100,DATA=40,PCITAB=2)
AHL103I JOBNAME=(BACKWARD)
03 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
REPLY 03,U
```

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>
</tbody>
</table>
## 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.

### Reference

See [z/OS MVS IPCS Commands](https://www.ibm.com/support/docview.wss?uid=swg27046298) 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
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--- Example: Consolidating GTF output from multiple data sets ---

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.

A GTF cataloged procedure with 3 data sets defined for GTF data from system SYS01 might look like the following:

```plaintext
//GTFABC  PROC  MEMBER=GTFPARM
//IEFPROC  EXEC  PGM=AHLGTF,REGION=2880K,TIME=1440,
//            PARM=('MODE=EXT,DEBUG=NO')
//IEFTRDR  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;
```

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)
```

--- Example: Consolidating GTF output from multiple systems ---

In the following example, 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)
```

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 DSNNAME(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
Example: Merging GTF output from multiple systems

In the following example, 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.

MERGE
  GTFTRACE DSNAME(GTF.SYS04)
  GTFTRACE DSNAME(GTF.SYS05)
  GTFTRACE DSNAME(GTF.SYS06)
MERGEEND

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 260 which has information about trace records formatted by the IPCS GTFTRACE subcommand.
- "Unformatted GTF trace output" on page 310 which has information about unformatted trace records.

The figure that follows shows the GTF trace options and the trace records they generate in GTF trace output. Use this figure 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.
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<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</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>
<tr>
<td>IO</td>
<td>EOS, INTG, IO, IOCS</td>
</tr>
<tr>
<td>IOX</td>
<td>IOX</td>
</tr>
<tr>
<td>IOP</td>
<td>EOS, INTG, IO, IOCS</td>
</tr>
<tr>
<td>IOXP</td>
<td>IOXP</td>
</tr>
<tr>
<td>JOBNAMEP</td>
<td>N/A</td>
</tr>
<tr>
<td>MSCH</td>
<td>MSCH</td>
</tr>
<tr>
<td>PCI</td>
<td>PCI</td>
</tr>
<tr>
<td>PI</td>
<td>PGM, PI</td>
</tr>
<tr>
<td>PIP</td>
<td>PGM, PI</td>
</tr>
<tr>
<td>RNIO</td>
<td>RNIO</td>
</tr>
<tr>
<td>RR</td>
<td>FRR, STAE</td>
</tr>
<tr>
<td>SIO</td>
<td>RSCH, SSCH</td>
</tr>
<tr>
<td>SIOP</td>
<td>RSCH, SSCH</td>
</tr>
<tr>
<td>SLIP</td>
<td>SLIP</td>
</tr>
<tr>
<td>SRM</td>
<td>SRM</td>
</tr>
<tr>
<td>SSCH</td>
<td>RSCH, SSCH</td>
</tr>
<tr>
<td>SSCHP</td>
<td>RSCH, SSCH</td>
</tr>
<tr>
<td>SVC</td>
<td>SVC</td>
</tr>
<tr>
<td>SVCP</td>
<td>SVC</td>
</tr>
<tr>
<td>SYS</td>
<td>CSCH, EOS, EXT, FRR, HSCH, INTG, IO, IOCS, MSCH, PGM, PI, SSCH, STAE, SVC</td>
</tr>
<tr>
<td>SYSM</td>
<td>CSCH, EOS, EXT, FRR, HSCH, INTG, IO, IOCS, MSCH, PGM, PI, SSCH, STAE, SVC</td>
</tr>
<tr>
<td>SYSF</td>
<td>CSCH, EOS, EXT, FRR, HSCH, INTG, IO, IOCS, MSCH, PGM, PI, SSCH, STAE, SVC</td>
</tr>
<tr>
<td>TRC</td>
<td>N/A</td>
</tr>
<tr>
<td>USR</td>
<td>USR</td>
</tr>
<tr>
<td>USRP</td>
<td>USR</td>
</tr>
<tr>
<td>XSCH</td>
<td>XSCH</td>
</tr>
</tbody>
</table>

*Figure 27. GTF trace options and associated trace record identifiers*

## 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.
Generalized Trace Facility

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 \( U/\).
- **PPPPPPPP** Unavailable because of a page fault encountered while GTF was gathering the data (SVC only).
- **SSSSSSSS** 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. The following table 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 page</th>
</tr>
</thead>
<tbody>
<tr>
<td>****</td>
<td>Time stamp</td>
<td></td>
<td>264</td>
</tr>
<tr>
<td>****</td>
<td>Lost event</td>
<td></td>
<td>265</td>
</tr>
<tr>
<td>CCW</td>
<td>Non-zHPF channel program</td>
<td>CCW</td>
<td>265</td>
</tr>
<tr>
<td>CSCH</td>
<td>Clear subchannel operation</td>
<td>CSCH, SYS, SYSM, SYSP</td>
<td>267</td>
</tr>
<tr>
<td>DSP</td>
<td>Task dispatch</td>
<td>DSP</td>
<td>269</td>
</tr>
<tr>
<td>EOS</td>
<td>End-of-sense interruption</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td>270</td>
</tr>
<tr>
<td>EXT</td>
<td>General external interruption</td>
<td>EXT, SYS, SYSM, SYSP</td>
<td>274</td>
</tr>
<tr>
<td>FRR</td>
<td>Functional recovery routine return</td>
<td>RR, SYS, SYSM, SYSP</td>
<td>276</td>
</tr>
<tr>
<td>HEXFORMAT</td>
<td>Unformatted trace event</td>
<td></td>
<td>277</td>
</tr>
<tr>
<td>HSCH</td>
<td>Halt subchannel operation</td>
<td>HSCH, SYS, SYSM, SYSP</td>
<td>267</td>
</tr>
<tr>
<td>INTG</td>
<td>Interrogate input/output interruption</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td>270</td>
</tr>
<tr>
<td>IO</td>
<td>Input/output interruption</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td>270</td>
</tr>
<tr>
<td>IOCS</td>
<td>Input/output interruption with concurrent sense</td>
<td>IO, IOP, SYS, SYSM, SYSP</td>
<td>270</td>
</tr>
<tr>
<td>IOX</td>
<td>Input/output interruption summary record format</td>
<td>IOX, IOXP, SYS, SYSM, SYSP</td>
<td>278</td>
</tr>
<tr>
<td>LSR</td>
<td>Local supervisor routine dispatch</td>
<td>DSP</td>
<td>280</td>
</tr>
<tr>
<td>MSCH</td>
<td>Modify subchannel operation</td>
<td>MSCH, SYS, SYSM, SYSP</td>
<td>281</td>
</tr>
<tr>
<td>PCI</td>
<td>Program-controlled input/output interruption</td>
<td>PCI</td>
<td>270</td>
</tr>
<tr>
<td>PGM</td>
<td>Program interruption</td>
<td>PI, PIP, SYS, SYSM, SYSP</td>
<td>283</td>
</tr>
<tr>
<td>PI</td>
<td>Program interruption</td>
<td>PI, PIP, SYS, SYSM, SYSP</td>
<td>283</td>
</tr>
<tr>
<td>RNIO</td>
<td>VTAM remote network input/output event</td>
<td>RNIO</td>
<td>284</td>
</tr>
<tr>
<td>RSCH</td>
<td>Resume subchannel</td>
<td>SSCH, SSCHP</td>
<td>285</td>
</tr>
<tr>
<td>SDSF</td>
<td>Task re-dispatch</td>
<td>DSP</td>
<td>289</td>
</tr>
<tr>
<td>SLIP</td>
<td>SLIP program event interruption</td>
<td>SLIP</td>
<td>286</td>
</tr>
<tr>
<td>SRB</td>
<td>Service request block routine dispatch or re-dispatch</td>
<td>DSP</td>
<td>292</td>
</tr>
</tbody>
</table>

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<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 page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRM</td>
<td>System resources manager return</td>
<td>SRM</td>
<td>292</td>
</tr>
<tr>
<td>SSCH</td>
<td>Start subchannel operation</td>
<td>SSCH, SSCHP, SYS, SYSM, SYSP</td>
<td>294</td>
</tr>
<tr>
<td>STAE</td>
<td>STAE or ESTAE recovery routine return</td>
<td>RR, SYS, SYSM, SYSP</td>
<td>295</td>
</tr>
<tr>
<td>SUBSYS</td>
<td>Unformatted trace event</td>
<td></td>
<td>277</td>
</tr>
<tr>
<td>SVC</td>
<td>Supervisor call interruption</td>
<td>SVC, SVCP, SYS, SYSM, SYSP</td>
<td>296</td>
</tr>
<tr>
<td>SVCR</td>
<td>Supervisor call exit</td>
<td>SVC, SVCP, SYS, SYSM, SYSP</td>
<td>296</td>
</tr>
<tr>
<td>SYSTEM</td>
<td>Unformatted trace event</td>
<td></td>
<td>277</td>
</tr>
<tr>
<td>TCW</td>
<td>zHPF channel program</td>
<td>CCW</td>
<td>299</td>
</tr>
<tr>
<td>USR</td>
<td>User event</td>
<td>USR, USRP</td>
<td>302</td>
</tr>
<tr>
<td>XSCH</td>
<td>Cancel subchannel operation</td>
<td>XSCH, SYS, SYSM, SYSP</td>
<td>307</td>
</tr>
</tbody>
</table>

Example of formatted GTF trace output

The following screens show GTF records. IPCS produced the screens from an example dump. These records are in comprehensive format and are time stamped.

The second screen shows records for the start subchannel operation (SSCH) event.

The third and fourth screens 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.

The subcommand issued on the IPCS Subcommand Entry panel is:

GTFTRACE

IPCS OUTPUT STREAM ------------------------------------------ LINE 0 COLS 1 78
COMMAND ===>
SCROLL ===>
CSR

****************************** TOP OF DATA ****************************

**** GTFTRACE DISPLAY OPTIONS IN EFFECT ****
SSCH=ALL IO=ALL CCW=SI
SVC=ALL PI=ALL
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.B.0 FIMID: HBB7780 System name: FIRST
CPU Model: 2097 Version: FF Serial no.: 170067
SVC CODE.... 002
ASCB.... 00FB0100 CPU.... 0000
PSW..... 07041000 80000002 00000000 0557C000
TCB...... 006F0B0F8 R15..... 00FC8AE0 R0....... 00000000
R1....... 806F2BE0

SVCR CODE.... 002
ASCB.... 00FB0100 CPU.... 0000
PSW..... 07041000 80000002 00000000 0557C000
TCB...... 006F0B0F8 R15..... 8138CFC7C R0....... 8138CFC7C
R1....... 02514607
Generalized Trace Facility

**IPCS OUTPUT STREAM**

**COMMAND ==> SCROLL ==> CSR**

**SRB ASCB.... 00FC1500 CPU.... 0000**

- **PSW.... 70400000 80000000 00000022 0217E07C**
- **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.... 70400000 80000000 00000000 013AB828**
- **TCB..... 006FF1A8 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 D51D.... 006DFEC**
- **CC..... 00 SEEKA... 00000000 15000007**
- **GMSK... 00 OPT..... 00 FMSX..... 00**
- **DVRID... 02 IOSLVL.. 01 UCBLVL.. 01**
- **UCBWGT.. 00 BASE.... 00982**

**ORB..... 00F1D4E0 13C2D081 0F1FDC60 0000FE00 00000000**

**00000000 00000000 00000000**


**IO...... 00982 ASCB.... 00FB8880 CPUID... 0000 JOBN.... JES2**

- **PSW.... 07041000 80000000 00000000 05722F66**
- **IRB..... 10C04007 0FC27360 0C000000 00800002 00000000**
- **TCB..... 006FF368 SENSE... N/A FLA..... 40**
- **OPT..... 00 DVRID... 02 IOSLVL.. 01**

**UCBLVL.. 01 UCBWGT.. 00 BASE.... 00982**

**I/O Statistics:**

- **Connect. 00000000 Pending. 018E0000 Discon. 01A80000**
- **CUQ.... 00000000 DAO..... 00000000 Devsys. 00000000**
- **ICMR.... 00000000 StartCt. 00000000 SampCt. 0BEF0000**
- **ZTdev. 07C20000 ZDefer.... 01310000 ZCUQ.... 00000000**
- **ZDevsy. 00000000 ZDAO.... 00000000 Intrdy. hhhhhhh**


---

**SSCH=ALL IO=ALL CCW=SI**

**SVC=ALL PI=ALL**

**EXT RNIO SMR RR DSP SLIP**

---

**I/O filtering requested**

**CCW trace prompting**

**IO CCW records**

**SSCH CCW records**

**All records timestamped**

**SSCH prompting**

---


---

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Generalized Trace Facility

Formatted trace records for events

**Time stamp records**

**Purpose**

Time stamp records mark the time an event occurred.

**Record Format After Each Trace Record**

```plaintext
GMT-mm/dd/yy hh:mm:ss:dddddd  LOC-mm/dd/yy hh:mm:ss:dddddd
```

**GMT-mm/dd/yy hh:mm:ss**

Month/day/year and Greenwich mean time given in hour:minute:second format.

**LOC-mm/dd/yy hh:mm:ss:dddddd**

Month/day/year and local time given in hour:minute:second.microsecond format. Local time is calculated using a time zone offset established when tracing starts.

**Source index records**

**Purpose**

Source index records are added when GTF trace records are consolidate 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:**

```plaintext
```

---

z/OS V1R13.0 MVS Diagnosis: Tools and Service Aids

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Lost event records

Purpose

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.ddddd

hh.mm.ss.ddddd
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 ***

ddddddddddd
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.ddddd
The time of day (hour.minute.second.microsecond) when GTF placed the first trace record in the current trace buffer.

CCW trace records

Purpose

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.
Generalized Trace Facility

<table>
<thead>
<tr>
<th>CCW CHAIN</th>
<th>FORMAT d</th>
<th>ccc</th>
<th>DEVC...</th>
<th>hhhh</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCB...</td>
<td>hhhhhh</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>Fffhhhhh</td>
<td>---CCW--</td>
<td>---CCW--</td>
<td>ddddddd</td>
<td>ddddddd</td>
</tr>
</tbody>
</table>

 Format (d) and type of trace event (ccc): EOS, IO, IOCS, PCI, RSCH, or SSCH. Format is either zero or 1.

DEV shhhh

DEV snnnn

Device number from the UCBCHAN field of the UCB. This number is qualified with the subchannel identifier (UCBSID).

ASCB hhhhhhh

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.

Fhhhhhhhh

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 oofbbbbb aaaaaaaa

where:

<table>
<thead>
<tr>
<th>oo</th>
<th>op code.</th>
</tr>
</thead>
<tbody>
<tr>
<td>aaaaaa</td>
<td>Real address of data associated with the CCW. If indirect address words (IDAWs) are present, this is the address of the IDAW list.</td>
</tr>
</tbody>
</table>
Generalized Trace Facility

aaaaaaa
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.

dddddddd dddddddd | 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 hhhhhhh_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

Purpose

CSCH and HSCH records represent a clear subchannel operation and a halt subchannel operation.
Generalized Trace Facility

Record Formats

CSCH... shhhh  ASCB.... hhhhhhhh  CPUID... hhhh  JOBN.... cccccc
DEV..... hhhh  SFLS.... hhhh  SID..... hhhhhhhh
CC...... hh  DVRID... hh  ARDID... hh
IOSLVL.. hh  UCBLVL.. hh
UCBWGT.. hh  BASE.... shhhh

HSCH.... shhhh  ASCB.... hhhhhhhh  CPUID... hhhh  JOBN.... cccccc
DEV..... hhhh  SFLS.... hhhh  SID..... hhhhhhhh
CC...... hh  DVRID... hh  ARDID... hh
IOSLVL.. hh  UCBLVL.. hh
UCBWGT.. hh  BASE.... shhhh

CSCH shhhh
HSCH 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 cccccc
One of the following:
ccccccc 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

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.

DSP and SDSPP trace records

Purpose

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 SVCRS 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 SVCR along with SVC number.

Minimal Trace Record Formats

DSP  ASCB.... hhhhhhhh CPU..... hhhh  PSW..... hhhhhhhh hhhhhhhh
      PSW...... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
      TCB..... hhhhhhhh R15..... hhhhhhhh R0...... hhhhhhhh
      R1...... hhhhhhhh

SDSP  ASCB.... hhhhhhhh CPU..... hhhh  PSW..... hhhhhhhh hhhhhhhh
       PSW...... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
       TCB..... hhhhhhhh R15..... hhhhhhhh R0...... hhhhhhhh
       R1...... hhhhhhhh

Comprehensive Trace Record Formats

DSP  ASCB.... hhhhhhhh CPU.... hhh  JOBN.... cccccc
      DSP-PSW. hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
      TCB...... hhhhhhhh MODN.... yyyyyyy R15..... hhhhhhhh
      R0...... hhhhhhhh R1...... hhhhhhhh

SDSP  ASCB.... hhhhhhhh CPU.... hhh  JOBN.... cccccc
     DSP-PSW. hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
     TCB...... hhhhhhhh MODN.... yyyyyyy R15..... hhhhhhhh
     R0...... hhhhhhhh R1...... hhhhhhhh

ASCB  hhhhhhhh
Address of address space control block.

CPU  hhhh
Address of processor on which the task is dispatched.

PSW  hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
DSP-PSW  hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
Program status word under which the task is dispatched.
Generalized Trace Facility

**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**
cccccc is one of the following:

```plaintext
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 ccccccc.

**PPPPPPPP**
A page fault occurred

*******
An internal error occurred

**EOS, INTG, IO, IOCS, and PCI trace records**

**Purpose**

EOS records represent an end of sense interruption, INTG records represent an input/output (I/O) interruption that is used to signal the completion of a zHPF...
interrogate request, IO records represent an I/O interruption, IOCS records represent an I/O interruption that also contains concurrent sense information, for devices that support the concurrent sense facility, and PCI records a program-controlled interruption.

Record Formats

<table>
<thead>
<tr>
<th>EOS.....</th>
<th>ASCB....</th>
<th>CCTV...</th>
<th>CPUID...</th>
<th>hhh</th>
<th>hhh</th>
<th>JOBN....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSW.....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
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</tr>
<tr>
<td>IRB.....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
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</tr>
<tr>
<td>TCB.....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
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</tr>
<tr>
<td>OPT.....</td>
<td>hh</td>
<td>DVRID...</td>
<td>hh</td>
<td>IOSLVL...</td>
<td>hh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UCBVLVL..</td>
<td>hh</td>
<td>UCBWGT..</td>
<td>hh</td>
<td>BASE....</td>
<td>shhhh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I/O Statistics:
- Connect. hhhhhhh
- Pending. hhhhhhh
- Discon.. hhhhhhh
- CUQ..... hhhhhhh
- DAO..... hhhhhhh
- Devbys.. hhhhhhh
- ICMR.... hhhhhhh
- StartCt. hhhhhhh
- Samp1Ct. hhhhhhh
- ZTotdev.. hhhhhhh
- ZDefer.. hhhhhhh
- ZCUQ.... hhhhhhh
- ZDevBsy. hhhhhhh
- ZDAO.... hhhhhhh
- IntrDly. hhhhhhh

<table>
<thead>
<tr>
<th>INTG....</th>
<th>ASCB....</th>
<th>CCTV...</th>
<th>CPUID...</th>
<th>hhh</th>
<th>hhh</th>
<th>JOBN....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSW.....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
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<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>TCB.....</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
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<tr>
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<td>DVRID...</td>
<td>hh</td>
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<td></td>
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<td>UCBVLVL..</td>
<td>hh</td>
<td>UCBWGT..</td>
<td>hh</td>
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I/O Statistics:
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- DAO..... hhhhhhh
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- ICMR.... hhhhhhh
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- Samp1Ct. hhhhhhh
- ZTotdev.. hhhhhhh
- ZDefer.. hhhhhhh
- ZCUQ.... hhhhhhh
- ZDevBsy. hhhhhhh
- ZDAO.... hhhhhhh
- IntrDly. hhhhhhh

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<th>CPUID...</th>
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<th>hhh</th>
<th>JOBN....</th>
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<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>TCB.....</td>
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<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
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</tr>
<tr>
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<td>hh</td>
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<td>BASE....</td>
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I/O Statistics:
- Connect. hhhhhhh
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- DAO..... hhhhhhh
- Devbys.. hhhhhhh
- ICMR.... hhhhhhh
- StartCt. hhhhhhh
- Samp1Ct. hhhhhhh
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- ZDefer.. hhhhhhh
- ZCUQ.... hhhhhhh
- ZDevBsy. hhhhhhh
- ZDAO.... hhhhhhh
- IntrDly. hhhhhhh

<table>
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<tr>
<th>IOCS....</th>
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<th>hhh</th>
<th>JOBN....</th>
<th>cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSW.....</td>
<td>hhhhhhh</td>
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<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
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<td>TCB.....</td>
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<tr>
<td>OPT.....</td>
<td>hh</td>
<td>DVRID...</td>
<td>hh</td>
<td>IOSLVL...</td>
<td>hh</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>hh</td>
<td>UCBWGT..</td>
<td>hh</td>
<td>BASE....</td>
<td>shhhh</td>
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<td></td>
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I/O Statistics:
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- Pending. hhhhhhh
- Discon.. hhhhhhh
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- Devbys.. hhhhhhh
- ICMR.... hhhhhhh
- StartCt. hhhhhhh
- Samp1Ct. hhhhhhh
- ZTotdev.. hhhhhhh
- ZDefer.. hhhhhhh
- ZCUQ.... hhhhhhh
- ZDevBsy. hhhhhhh
- ZDAO.... hhhhhhh
- IntrDly. hhhhhhh
The device number from the UCBCHAN field of the unit control block (UCB), which includes the subchannel set identifier when appropriate.

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 {ccccccccc|N/A|U/A}
One of the following:

ccccccccc 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.

U/A Unavailable because the IOSB control block is unavailable.

SENSE {hhhh|N/A|U/A}
One of the following:
Generalized Trace Facility

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 hhhhhhhh
  The control unit queueing time for this I/O request in units of 0.5 microseconds.

DAO hhhhhhhh
  The device active only time for this I/O request in units of 0.5 microseconds.

Devbsy hhhhhhhh
  The device busy time for this I/O request in units of 0.5 microseconds.

ICMR hhhhhhhh
  The initial command response time for this I/O request in units of 0.5 microseconds.

StartCt hhhhhhhh
  The number of SSCH/RSCH instructions that were issued for the device.

Samp1Ct hhhhhhhh
  The number of SSCH/RSCH instructions for which data was collected for the device.
Generalized Trace Facility

**ZTotdev hhhhhhhh**
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 hhhhhhhh**
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 hhhhhhhh**
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 hhhhhhhh**
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 hhhhhhhh**
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 hhhhhhhh**
The total interrupt delay time for all I/O requests in units of 128 microseconds.

**EXT trace records**

Purpose

An EXT record represents a general external interruption.

**Minimal Trace Record Format**

<table>
<thead>
<tr>
<th>EXT CODE.... hhhh</th>
<th>ASCB.... hhhhhhh</th>
<th>CPU..... hhhh</th>
<th>PSW..... hhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
<th>hhhhhhhh</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCB..... hhhhhhh</td>
<td>cc-TCB. hhhhhhh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Comprehensive Trace Record Format**

<table>
<thead>
<tr>
<th>EXT.... hhhh</th>
<th>ASCB.... hhhhhhh</th>
<th>CPU..... hhhh</th>
<th>hhhh</th>
<th>JOBN.... cccccc</th>
<th>cccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD-PSW. hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>TCB..... hhhhhhh</td>
<td>TQE FIELDS:</td>
<td>FLAGS... hhhh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTADDR. hhhhhhh</td>
<td>TCB..... hhhhhhh</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXT.... hhhh</th>
<th>ASCB.... hhhhhhh</th>
<th>CPU..... hhhh</th>
<th>hhhh</th>
<th>JOBN.... cccccc</th>
<th>cccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD-PSW. hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>TCB..... hhhhhhh</td>
<td>TQE FIELDS:</td>
<td>FLAGS... hhhh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTADDR. hhhhhhh</td>
<td>ASCB.... hhhhhhh</td>
<td>TCB..... hhhhhhh</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXT.... hhhh</th>
<th>ASCB.... hhhhhhh</th>
<th>CPU..... hhhh</th>
<th>hhhh</th>
<th>JOBN.... cccccc</th>
<th>cccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD-PSW. hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
<td>hhhhhhh</td>
</tr>
<tr>
<td>TCB..... hhhhhhh</td>
<td>PARM.... hhhhhhh</td>
<td>SIG-CPU. hhhh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EXT CODE hhhh**

External interruption code.

**ASCB hhhhhhhh**
Address of ASCB for the address space that was current when the interruption occurred.
Generalized Trace Facility

CPU hhhh
Address of the processor on which the interruption occurred.

JOBN ccccccc
One of the following:
ccccccc 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 hhhhhhhh hhhhhhhh hhhhhhhh
OLD-PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
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 TQEFLG field.

EXTADDR hhhhhhhh
The first four hexadecimal digits are the contents of the TQEFLG 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.
PPPPPPPP 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:
hhhhhhhh Contents of the 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.
**Generalized Trace Facility**

**FRR trace records**

**Purpose**

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**

```
FRR ASCB.... hhhhhhhh CPU..... hhh
    PSW..... hhhhhhhh hhhhhhhh hhhhhhhh
    CC..... hhhhhhhh FLG1.... hhhhhhhh FLG2.... hhhhhhhh
    RE... hhhhhhhh
```

**Comprehensive Trace Record Format**

```
FRR ASCB.... hhhhhhhh CPU..... hhhh JOBN.... cccccccc
    NAME.... cccccccc
    PSW..... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
    ABC.... hhhhhhhh ERR.... hhhhhhhh FLG..... hhhhhhhh
    RC...... hh RTRY.... hhhhhhhh
```

**ASCB hhhhhhhh**

One of the following:
- hhhhhhhh 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
- ******* An internal error occurred

**NAME cccccccc**

Name of the FRR routine.

**PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh**

One of the following:
- hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh 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**
HEXFORMAT, SUBSYS, and SYSTEM trace records

HEXFORMAT, SUBSYS, and SYSTEM records represent events for which GTF could not format the records.

Record Formats

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.
Generalized Trace Facility

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

Purpose

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.

Record Formats

IOX shhhh ASCB hhhhhhh CPU hhhh JOBN cccccccc
DEVN hhhh SID hhhh DRID hh
TVSN hh ECNO hhhhhhh DVCLS hh
DSTAT hh AERRC hh FLAGO hh
VOLSER ccccc UCYTP hhhhhhh
DSNAME ccccc ccccc ccccc ccccc
NSSCH hh DSSCH hh SDCON hhhhhhh
SRPEN hh SDISC hh SCUQU hh SCUQU hh
IODTS hh AONLY hh DVBSY hh ICMR hhhhhhh

CCW SECTION
SQNO hh FGS1 hh FGS2 hh
RCNT hh BLKR hh BLKW hh
BTRD hh BTWR hh DCHN hh
CCHN hh DEGA hh DEGE hh
DEEE hh SEEKLOC hh CCHHR hh
LRIP hh LRSECT hh LREXOP hh
LREXPM hh

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 320
    for a description.

FLAG0 hh
    Flag byte

VOLSER ccccccc
    Volume Serial

UCBTYP hhhhhhh
    UCB type

DSNAME cccc.ccccc.ccccc.ccccc
    44-byte data set name

NSSCH hhhhhhh
    Number of SSCH instructions.

DSSCH hhhhhhh
    Number of SSCH instructions for which data was collected.

SDCON hhhhhhh
    Summation of device connect times.

SRPEN hhhhhhh
    Summation of function pending times.

SDISC hhhhhhh
    Summation of device disconnect times.

SCUQU hhhhhhh
    Summation of control unit queuing times

IODTS hhhhhhh
    Time stamp from IOD

AONLY hhhhhhh
    Summation of device active only times

DVBSY hhhhhhh
    Summation of device busy times

ICMR hhhhhhh
    Summation of initial command response times
Generalized Trace Facility

SQNO hh
Orientation Sequence Number

FGS1 hh
Flag byte 1

FGS2 hh
Flag byte 2

RCNT hh
Count of erase

BLKR hhhh
Number of blocks read

BLKW hhhh
Number of block written

BTRD hhhhhhhh
Number of bytes read

BTWR hhhhhhhh
Number of bytes written

DCHN hhhh
Number of data chain CCWs

CCHN hhhh
Number of COM chain CCWs

DEGA hh
Definition of exterior global attribute

DEGE hh
Definition of exterior global attribute extended

DEEE hhhhhhh
Definition of exterior end of extend CCH

SEEKLOCC hh
The command code that performed the seek or locate record operation.

CCHHR hhhhhhhh
CCHHR seek or search address

LROP hh
The locate record operation code.

LRSECT hh
The locate record sector number.

LREXOP hh
The locate record extended operation code.

LREXPM hhhh
The locate record extended parameters.

LSR trace records

Purpose

An LSR record represents dispatching of a local supervisor routine in an address space.
Generalized Trace Facility

Minimal Trace Record Format

<table>
<thead>
<tr>
<th>LSR</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPU..... hhh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PSW.... hhhhhhhh</td>
<td>hhhhhhhh</td>
</tr>
<tr>
<td></td>
<td>TCB.... hhhhhhhh</td>
<td>R15.... hhhhhhh</td>
</tr>
<tr>
<td></td>
<td>R0.... hhhhhhhh</td>
<td>R1.... hhhhhhhh</td>
</tr>
</tbody>
</table>

Comprehensive Trace Record Format

<table>
<thead>
<tr>
<th>LSR</th>
<th>ASCB.... hhhhhhhh</th>
<th>CPU..... hhh</th>
<th>JOBN.... cccccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LSR-PSW. hhhhhhhh</td>
<td>hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSR-PSW. hhhhhhhh</td>
<td>hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCB.... hhhhhhhh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ASCB hhhhhhhh**
Address of the address space control block.

**CPU hhhh**
Address of the processor on which the routine will be dispatched.

**PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh**
Program status word under which the routine receives control.

**JOBN cccccccc**
One of the following:
- cccccccc Name of the job associated with the routine being dispatched
- N/A Not applicable
- PPPPPPPP A page fault occurred
- ******** An internal error occurred

**TCB hhhhhhhh**
One of the following:
- hhhhhhhh Address of the task control block associated with this routine
  (if the routine is run as part of a task)
- N/A Not applicable

**R15 hhhhhhhh**
**R0 hhhhhhhh**
**R1 hhhhhhhh**
One of the following:
- hhhhhhhh Data that will appear in general registers 15, 0, and 1 when the
  local supervisor routine is dispatched
- PPPPPPPP A page fault occurred
- ******** An internal error occurred

**MSCH trace records**

**Purpose**
An MSCH record represents a modify subchannel operation.

**Record Format**
Generalized Trace Facility

MSCH shhhh
Device number from the UCBCCHAN 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 ... hhhhhhhh
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 UCBELEVEL field of the UCB.

SCHIB2 hhhhhhhh ... hhhhhhhh
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 UCBCCHAN field of the UCB, which includes the subchannel set identifier when appropriate.
PGM and PI trace records

Purpose

PGM and PI records represent program interruptions.

Minimal Trace Record Format

<table>
<thead>
<tr>
<th>PI CODE.... hhh</th>
<th>ASCB.... hhhhhhhh CPU..... hhhh</th>
</tr>
</thead>
</table>

Comprehensive Trace Record Format

<table>
<thead>
<tr>
<th>PGM..... hhh</th>
<th>ASCB.... hhhhhhhh CPU..... hhhh</th>
<th>JOBN.... cccccc</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD-PSW.</td>
<td>hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>TCB.....</td>
<td>hhhhhhhh VPH..... hhhhhhhh VPA..... hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>MODN....</td>
<td>cccccc</td>
<td></td>
</tr>
<tr>
<td>R0.......</td>
<td>hhhhhhhh R1....... hhhhhhhh R2....... hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R3.......</td>
<td>hhhhhhhh R4....... hhhhhhhh R5....... hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R6.......</td>
<td>hhhhhhhh R7....... hhhhhhhh R8....... hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R9.......</td>
<td>hhhhhhhh R10..... hhhhhhhh R11..... hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R12.......</td>
<td>hhhhhhhh R13..... hhhhhhhh R14..... hhhhhhhh</td>
<td></td>
</tr>
<tr>
<td>R15.......</td>
<td>hhhhhhhh</td>
<td></td>
</tr>
</tbody>
</table>

PI CODE hhh
PGM hhh
Program interruption code, in decimal.

ASCB hhhhhhhh
Address of ASCB for the address space in which the interruption occurred.

CPU hhhh
Address of the processor on which the interruption occurred.

JOBN cccccc
One of the following:
cccccc Name of the job associated with the interruption
N/A Not applicable
PPPPPPPP A page fault occurred
******* An internal error occurred

PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
OLD-PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
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

VPH hhhhhhhh
VPA hhhhhhhh
Virtual page address high half, in the case of a 64-bit translation exception address (TEA) value greater than X'FFFFFFFF' is stored. Virtual page address, in the case of a translation process exception resulting from a reference to the page. This area is meaningless for other types of program interruptions.

MODN cccccc
cccccc 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.

**IRB***
  Indicates that an asynchronous routine with an associated interrupt request block was interrupted. No module name is available.

*cccccccc
  Indicates that an error recovery module was in control. The last seven characters of the module name are ccccccc.

******
  An internal error occurred

Rdd hhhhhhhh
  Contents of general registers when the interruption occurred.

RNIO trace records

Purpose

An RNIO record represents a VTAM remote network input/output event. For trace information, see z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures.

Minimal Trace Record Format

RNIO ASCB.... hhhhhhhh CPU..... hhhh R0...... hhhhhhhh

Comprehensive Trace Record Format

RNIO ASCB.... hhhhhhhh CPU..... hhhh JOB..... cccccccc
IN..... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh R9...... hhhhhhhh

RNIO ASCB.... hhhhhhhh CPU..... hhhh JOB..... cccccccc
OUT.... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh R9...... hhhhhhhh

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 cccccc
One of the following:
ccclicence Name of the job associated with the I/O event
N/A Not applicable
PPPPPPPP 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.

RO hhhhhhhh
Contents of general register 1 when the event occurred.

RSCH trace records

Purpose
An RSCH record represents a resume subchannel operation.

Record Format

RSCH... shhh ASCB... hhhhhh CPU1... hhhh JOBN... cccccc
RST.... hhhhhhhh VST.... hhhhhh DSID.... hhhhhh
CC...... hh SEEKA... hhhhhhh hhhhhhh
GMSK... hh OPT.... hh FMSK... hh
DVRID... hh IOSVL... hh UCLVL... hh
UCBWGT.. hh BASE... shhh

RSCH shhh
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 cccccc
One of the following:
ccclicence 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.
Generalized Trace Facility

**DSID hhhhhhhh**
Request identifier used by purge. Contents of the IOSDID 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 UCLEVEL 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.

### SLIP trace records

**Purpose**
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

**Purpose**
A SLIP standard (STD) trace record represents a slip trap match when the SLIP command specifies ACTION=TRACE or ACTION=TRDUMP.

**Record Format**
Generalized Trace Facility

| SLIP STD | ASCB..... hhhhhhh CPU..... hhhh JOBN.... cccccccc |
| TID..... cccc ASID.... hhhh JSP..... cccccccc |
| TCB..... hhhhhhhh MFLG.... hhhh EFLG.... hhhh |
| SFLG.... hh DAUN.... hhhh MODN.... cccccccc |
| OFFS.... hhhhhhhh IADR.... hhhhhhhh hhhhhhhh |
| INS..... hhhhhhhh hhhh EXSIAD.. hhhhhhhh hhhhhhhh hhhhhhhh |
| BRNGH... hhhhhhhh BRNGA... hhhhhhhh BRNGD... hhhhhhhh |
| OPSW.... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh |
| PIC/ILC. hhhhhhhh PERC.... hh TYP..... hh |
| PKM..... hhhh SASID... hhhh AX..... hhhh |
| PASID... hhhh ASCII..... c |
| SA-SPACE cccccccc cccc |

ASCB hhhhhhhh
The address of the ASCB for the current address space.

CPU hhhh
The processor identifier (ID).

JOBN cccccccc
One of the following:
ccc
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:
ccccc
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 z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/.

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 z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/.

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.
Generalized Trace Facility

**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 hhhhhhhhh hhhhhhh**
Address of the instruction that caused the interruption.

**INS hhhhhhhh hhhh**
Instruction content: the instruction that caused the PER interruption.

**EXSIAD hhhhhhhh 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 hhhhhhhhh hhhh**
One of the following:
- hhhhhhhhh 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:
- hhhhhhh: 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

**BRNGD hhhhhhh**
One of the following:
- hhhhhhh: Four bytes of storage starting at the beginning range virtual address if SA was specified
- N/A: Not applicable
- U/A: Unavailable

**OPSW hhhhhhhhh hhhhhhh hh hhhhhhh hh hhhhhhh**
The program old PSW.

**PIC/ILC hhhhhhh**
The program interruption code and instruction length 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:

<table>
<thead>
<tr>
<th>c</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Primary addressing mode</td>
</tr>
<tr>
<td>1</td>
<td>Access register addressing mode</td>
</tr>
<tr>
<td>2</td>
<td>Secondary addressing mode</td>
</tr>
<tr>
<td>3</td>
<td>Home addressing mode</td>
</tr>
</tbody>
</table>

SA-SPACE cccccc
Storage alteration space identifier, as follows:
- The ASID, for an address space
- The owning ASID and the data space name, for a data space

**SLIP standard/user trace record**

**Purpose**

The SLIP standard/user trace record represents a slip trap match when the SLIP command specifies ACTION=TRACE or ACTION=TRDUMP and TRDATA=parameters.

**Record Format**
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**

**Purpose**

The SLIP user record represents a SLIP trap match when the SLIP command specifies ACTION=TRACE or ACTION=TRDUMP and TRDATA=parameters.

**Record Format**

```
SLIP S+U ASCB.... hhhhhhhh CPU..... hhhh JOBN.... cccccccc
TID..... cccc ASID.... hhhh JSP..... cccccccc
TCB.... hhhhhhhh MFLG.... hhhh EFLG.... hhhh
SFLG.... hh DAUN.... hhhh MODN.... cccccccc
OFFS.... hhhhhhhh IADR.... hhhhhhhh hhhhhhhh
INS..... hhhhhhhh hhhh EXSIAD.. hhhhhhhh hhhhhhhh
EXSINS.. hhhhhhhh BRNGH... hhhhhhhh BRNGA... hhhhhhhh
BRNDG... hhhhhhhh
OPSW.... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
PIC/ILC. hhhhhhhh PERC.... hh TYP..... hh
PKM..... hhhh SASID... hhhh AX...... hhhh
PASID... hhhh ASC..... c SA-SPACE cCCCCCCC cccc
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 . . . SA-SPACE cCCCCCCC cccc**

This field is the same as the fields in the SLIP standard trace record.
data for the range. GTF would consider the range not valid if, for example, the ending range address precedes the beginning range address.

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**

**Purpose**

The SLIP debug record represents a SLIP trap match when the SLIP command specifies DEBUG.

**Record Format**

```
SLIP S+U        ASCB.... hhhhhhh CPU..... hhhh JOBN.... cccccccc
                 TID..... cccc ASID.... hhhh JSP..... cccccccc
                 TCB..... hhhhhhh MFLG.... hhhh EFLG.... hhhh
                 SFLG.... hh DAUN.... hhhh MODN.... cccccccc
                 OFFS.... hhhhhhh IADR.... hhhhhhh hhhhhhh
                 INS..... hhhhhhh hhhhhhh
                 EXSIAD.. hhhhhhh hhhhhhh EXSINS.. hhhhhhh
                 BRNGH... hhhhhhh BRNGA... hhhhhhh BRNGD... hhhhhhh
                 OPSW.... hhhhhhh hhhhhhh hhhhhhh hhhhhhh
                 PIC/ILC. hhhhhhh PERC.... hh TYP..... hh
                 PKM..... hhhh SASID... hhhh AX..... hhhh
                 PASID... hhhh ASC..... h SA-SPACE hhh
                 hh00
```

**ASCB hhhhhhh . . TYP 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.

<table>
<thead>
<tr>
<th>Byte 1 (decimal)</th>
<th>Keyword That Failed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DATA test failed</td>
</tr>
<tr>
<td>3</td>
<td>ASID</td>
</tr>
<tr>
<td>4</td>
<td>JOBNAME</td>
</tr>
<tr>
<td>5</td>
<td>JSPGM</td>
</tr>
<tr>
<td>6</td>
<td>PVTMOD</td>
</tr>
</tbody>
</table>
Generalized Trace Facility

SRB trace records

Purpose
An SRB record represents dispatching of an asynchronous routine represented by a service request block (SRB).

Minimal Trace Record Format

SRB ASCB.... hhhhhhhh CPU..... hhh

Comprehensive Trace Record Format

SRB ASCB.... hhhhhhhh CPU..... hhh JOBN.... cccccccc
SRB-PSW. hhhhhhhh hhhhhhhh hhhhhhhh
SRB..... hhhhhhhh

ASCB hhhhhhhh
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.

CPU hhh
Address of the processor on which the SRB routine is dispatched.

PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
SRB-PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh

JOBN cccccccc
One of the following:
ccccc Name of the job associated with the SRB being dispatched
N/A Not applicable, as in the case of a global SRB, which is indicated in the TYPE field
******** An internal error occurred

SRB hhhhhhhh
One of the following:
hhhhhhhh Address of the service request block (SRB)
******** An internal error occurred

R15 hhhhhhhh
R1hhhhhhhh
One of the following:
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:

Four-byte parameter or the address of a parameter field to be passed to the SRB routine

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.

SRM trace records

Purpose
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....  cccccc
     R15.....  hhhhhhhh  R0......  hhhhhhhh  R1......  hhhhhhhh

ASCB hhhhhhhh
One of the following:

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.

JOBN cccccc
One of the following:

Name of the job associated with the entry to SRM
Not applicable
An internal error occurred

R15 hhhhhhhh
R0 hhhhhhhh

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Generalized Trace Facility

RI hhhhhhhh
Data that was contained in general registers 15, 0, and 1 when the system resources manager passed control to GTF. The data includes the SYSEVENT code in the low-order byte of register 0.

SSCH trace records

Purpose
An SSCH record represents a start subchannel operation.

Record Format

SSCH.... shhhh ASCB.... hhhhhhh CPUID.... hhhh JOBN.... cccccccc
RST..... hhhhhhh VST..... hhhhhhhhh DSID.... hhhhhhh
CC....... hh SEEKA... hhhhhhh hhhhhhh
GPMSK.... hh OPT..... hh FMSK.... hh
DVRID... hh IOSLVL... hh UCBLVL... hh
UCBWGT... hh BASE..... shhh
DRB..... hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh hhhhhhh

SSCH shhh
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:
ccccc 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
IOSB options byte from the IOSOPT field of the IOSB.
Generalized Trace Facility

**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 shhhh**
Device number from the UCBCHAN field of the UCB, which includes the subchannel set identifier when appropriate.

**ORB hhhhhhhh**
Contents of the operation request block (ORB).

### STAE trace records

**Purpose**
A STAE record represents return to the recovery termination manager (RTM) from a STAE or ESTAE routine.

**Minimal Trace Record Format**

```
STAE PSW..... hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
                   RF...... hhhhhhhh TYCA.... hhhhhhhh hhhhhhhh
```

**Comprehensive Trace Record Format**

```
STAE ASCB.... hhhhhhhh CPU..... hhhh JOBN.... cccccccc
                ESTN.... cccccccc
                ERR-PSW. hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
                ABC.... hhhhhhhh ERRT.... hhhhhhhh FLG...... hhhhhhhh
                RC...... hh RTRY.... hhhhhhhh RTCA.... hhhhhhhh
```

**ASCB hhhhhhhh**
Address of the ASCB for the address space involved in the recovery.

**CPU hhhh**
Address of the processor.

**JOBN cccccccc**
One of the following:
- cccccccc: Name of the job involved in the recovery
- N/A: Not applicable
- ******: An internal error occurred

**ESTN cccccccc**
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**

---

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Generalized Trace Facility

ERR-PSW hhhhhhh
One of the following:

hhhhhhhh hhhhhhh hhhhhhh hhhhhhh
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 hhhhhhh
ABCC hhhhhhh
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 hhhhhhh hhhhhhh
Retry address (see RTRY hhhhhhh following) and an indication of whether the routine was a STAE or ESTAE (see RTCA hhhhhhh following).

RF hhhhhhh
FLG hhhhh
ERRT hhhhhhh
Error flags from the SDWAFLGS field of the SDWA.

RC hh
Return code

RTRY hhhhhhh
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 hhhhhhh
Indicates if the recovery routine was a STAE or ESTAE.

SVC and SVCR trace records

Purpose
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 break down 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**

```
SVC CODE.... hhh ASCB.... hhhhhhhh CPU..... hhhh
                PSW..... hhhhhhhh hhhhhhhh hhhhhhhh
                TCB..... hhhhhhhh R15..... hhhhhhhh R0...... hhhhhhhh
                R1...... hhhhhhhh
```

**Comprehensive Trace Record Format**

```
SVC..... hhh ASCB.... hhhhhhhh CPU..... hhhh JOBNAME. cccccccc
                OLD-PSW. hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
                TCB..... hhhhhhhh MODN.... yyyyyyy R15..... hhhhhhhh
                R0..... hhhhhhhh R1..... hhhhhhhh

SVCR..... hhh ASCB.... hhhhhhhh CPU..... hhhh JOBNAME. cccccccc
                OLD-PSW. hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhh
                TCB..... hhhhhhhh MODN.... yyyyyyy R15..... hhhhhhhh
                R0..... hhhhhhhh R1..... hhhhhhhh
```

**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.
Generalized Trace Facility

**JOBNAME cccccccc**
One of the following:

cccccccc
Name of the job associated with SVC interruption

SSSSSSSS
Unavailable; GTF cannot provide data for the SVC due to security
considerations.

******
An internal error occurred

**PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhhh**
**OLD-PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhhh**
**DSP-PSW hhhhhhhh hhhhhhhh hhhhhhhh hhhhhhhhh**
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.

**TCB hhhhhhhh**
Address of the TCB for the interrupted task, that is, the task that issued the
SVC instruction.

**R15 hhhhhhhh**
**R0 hhhhhhhh**
**R1 hhhhhhhh**
Data in general registers 15, 0, and 1 when the SVC instruction ran.

**MODN cccccccc**
cccccccc is one of the following:

**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.

**ccccccc**
Indicates an error recovery module. The last seven characters of the load
module name are cccccc.

**PPPPPPPPP**
A page fault occurred
**Generalized Trace Facility**

******
An internal error occurred

**DDNAM cccccc**
Name of the DD statement associated with the SVC, if applicable.

**additional fields**
Vary with the SVC number. These fields are described for the SVC in the [z/OS MVS Diagnosis: Reference](#).

### TCW trace records

**Purpose**
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.

**Record Formats**

```plaintext
FORMAT d cccc TCW CHAIN DEV..... hhhh
ASCB..... hhhhhhhh CPU..... hhhh JOBN.... hhhhhh
TCW at rrrrrrrr (vvvvvvvv)
  Format........... hh Flag1............ hh
  Flag2............ hh Flag3............ hh
  TCCBL/R/W........ hh
  Output Address... rrrrrrrr rrrrrrrr
  Input Address.... rrrrrrrr rrrrrrrr
  TSB Address....... rrrrrrrr rrrrrrrr
  TCCB Address..... rrrrrrrr rrrrrrrr
  Output Count..... hhhhhhhhh Input Count...... hhhhhhhhh
  Interrogate TCW.. rrrrrrrr

  tsbtype TSB at rrrrrrrr_rrrrrrr
    Length........ hh Flags........... hh
    DCW Offs...... hhhh Count......... hhhhhhh
    TotalDevTime.... hhhhhhhhh DeferTime...... hhhhhhh
    CUQueueTime..... hhhhhhhhh DevBusyTime.... hhhhhhh
    DevActOnlyTime.. hhhhhhhhh
    Sense Data...... hhhhhhh hhhhhhh hhhhhhh hhhhhhh
                     hhhhhhh hhhhhhh hhhhhhh hhhhhhh

  TCCB TIDAW at rrrrrrrr_rrrrrrr
    Flags... hh Count... hhhhhhhh Addr... rrrrrrrr rrrrrrrr

  TCA Header at rrrrrrrr_rrrrrrr
    Format.......... hh TCALen......... hh
    Serv Act Code... hhhh Priority....... hh

  DCW at rrrrrrrr_rrrrrrr
    Command.. hh Flags.. hh CD Count.. hh Count.. hhhhhhh

  DCW Control Data at rrrrrrrr_rrrrrrr
    dddddddd dddddddd dddddddd dddddddd dddddddd | ................ |
    dddddddd dddddddd dddddddd dddddddd dddddddd | ................ |

  Data TIDAW at rrrrrrrr_rrrrrrr
    Flags... hh Count... hhhhhhh Addr... rrrrrrrr rrrrrrrr
```

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**Generalized Trace Facility**

*Data at rrrrrr_rrrrrrr*

<table>
<thead>
<tr>
<th>ddddddddd dddddddd dddddddd dddddddd</th>
<th>................</th>
</tr>
</thead>
<tbody>
<tr>
<td>ddddddddd dddddddd dddddddd dddddddd</td>
<td>................</td>
</tr>
</tbody>
</table>

**** '0020'X CONSECUTIVE BYTES ARE '00'X
*** Back half of split data ***
<table>
<thead>
<tr>
<th>ddddddddd dddddddd dddddddd dddddddd</th>
<th>................</th>
</tr>
</thead>
<tbody>
<tr>
<td>ddddddddd dddddddd dddddddd dddddddd</td>
<td>................</td>
</tr>
</tbody>
</table>

*TCA Trailer at rrrrrr_rrrrrrr
Transport Count... hhhhhhh
= or =
TCA Trailer at rrrrrr_rrrrrrr
Write Count... hhhhhhh Read Count... hhhhhhh

*TCA X TIDAW at rrrrrr_rrrrrrr
Flags... hh Count... hhhhhhh Addr... rrrrrrr_rrrrrrr

*DCW (TCA) at rrrrrrr_rrrrrrr
Command... hh Flags... hh CD Count... hh Count... hhhhhhh

*DCW Control Data (TCA) at rrrrrrr_rrrrrrr
<table>
<thead>
<tr>
<th>ddddddddd dddddddd dddddddd dddddddd</th>
<th>................</th>
</tr>
</thead>
<tbody>
<tr>
<td>ddddddddd dddddddd dddddddd dddddddd</td>
<td>................</td>
</tr>
</tbody>
</table>

*IOSB at vvvvvvv
formatted iosb data

*IOBE at vvvvvvv
formatted iobe data

*EWA at vvvvvvv
formatted ewa 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 hhhhhhh**
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 cccccc**
Same as the job named (JOBN) field in the INTG, IO, IOCS, SSCH, or XSCH base record.

**TCW at rrrrrrrrr (vvvvvvv)**
The Transport Control Word (TCW) at real address rrrrrrrr and virtual address vvvvvvvv. The formatted TCW follows. Fields designated as "rrrrrrrrr" or "rrrrrrrrrrrrrrr" are real addresses.

**tstsype TSB at rrrrrrrrrrrrrrr**
The Transport Status Block (TSB) at real address rrrrrrrrrrrrrrr. The formatted TSB follows. The TSB is only formatted for I/O interruptions (trace events INTG, IO, and IOCS).

**tstsype**
Describes the type of TSB. It can be one of the following:
Generalized Trace Facility

- 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 hhhhhhh**
  Fullword count of total data transferred.

- **Write Count hhhhhhh**
  Fullword count of total write data transferred.

- **Read Count hhhhhhh**
  Fullword count of total read data transferred.

**TCAX TIDAW at rrrrrrrr_rrrrrrrr**
A Transport Indirect Address Word (TIDAW) for the Transport Control Area Extension (TCAX) at real address rrrrrrrr_rrrrrrrr. The formatted TIDAW follows.
DCW (TCAX) at rrrrrrrrr_rrrrrrrr
A Device Command Word (DCW) in the Transport Control Area Extension (TCAX) at real address rrrrrrrr_rrrrrrrr. The formatted DCW follows.

DCW Control Data (TCAX) at rrrrrrrrr_rrrrrrrr
The control data (command parameters) for the preceding DCW in the TCAX at rrrrrrrr_rrrrrrrr. 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
Purpose
The USR record represents processing of a GTRACE macro. A user-supplied formatting routine (AMDUSRhh) 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 308 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 309 for a list of the FIDs and associated routines.

Unformatted USR trace record
Purpose
An unformatted user trace record represents processing of a GTRACE macro when a formatting routine is not supplied.

Record Format
Formatted USR trace record

Purpose

A formatted user trace record represents processing of a GTRACE macro when an AMDUSRhh formatting routine is supplied.

Record Format

USRhh hhh ASCB hhhhhhhh JOBN cccccccc
xxx ...

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 308 for a list of the EIDs and associated products for USR trace records.

ASCB hhhhhhhh

Address of the ASCB for the address space that created the record.

JOBN cccccc

Name of the job associated with the address space.

xxx ...

User-formatted trace data.

USRF9 trace record for VSAM

Purpose

The USRF9 trace record represents opening or closing of a VSAM data set.
**Generalized Trace Facility**

**Record Format**

```
USRF9  FF5  ASCB hhhhhhhh  JOBN cccccc
   JOB NAME cccccc  STEP NAME cccccc
   TIOT ENT hhhhhhhh  hhhhhhhh  hhhhhhhh  hhhhhhhh
   ACB     hhhhhhhh  hhhhhhhh  hhhhhhhh  hhhhhhhh...
   AMBL    hhhhhhhh  hhhhhhhh  hhhhhhhh  hhhhhhhh...
   AMB     hhhhhhhh  hhhhhhhh  hhhhhhhh  hhhhhhhh...
   AMDSB   hhhhhhhh  hhhhhhhh  hhhhhhhh  hhhhhhhh...
   AMDSB   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](#)" 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**

**Reference**
USRFE trace record for BSAM, QSAM, BPAM, and BDAM

**Purpose**

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).

**Record Format**

```plaintext
USRFE hhh ASCB hhhhhhhh JOBN cccccc

BSAM/QSAM/BPAM/BDAM TRACE RECORD cccccc DDNAME cccccc ABEND CODE hh

ccc...[AT LOCATION hhhhhhh]

hhhhhhhh hhhhhhh hhhhhhh hhhhhhh ... hhhhhhh hhhhhhh hhhhhhh hhhhhhh ...
```

**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 308 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>
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<td>FF9</td>
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<td>FFB</td>
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</tr>
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<td>FCC</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.
Generalized Trace Facility

**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.

**ccc...[AT LOCATION hhhhhhhh]**
Data area name, or name and address, followed by the data area contents.

### USRFF trace record for open/close/EOV abnormal end

**Purpose**
This USRFF trace record represents an abnormal end during open, close, or end-of-volume (EOV).

**Record Format**
```plaintext
USRFF  FFF  ASCB hhhhhhhh JOBN ccccccc
      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 308 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

**Purpose**
This USRFF trace record represents a user request for a work area trace.

**Record Format**
```plaintext
USRFF  FFF  ASCB hhhhhhhh JOBN ccccccc
      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 308 for a list of the EIDs and associated products for user trace records.

**DCB**
Data control block.
**Generalized Trace Facility**

**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 (IOB).

**WKAREA4**

**WKAREA5**
Where-to-go-table used in transferring control among CSECTs of Open/Close/EOV.

**XSCH trace record**

**Purpose**

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.

**Record Format**

```
XSCH sdddd ASCB aaaaaaaa CPUID cccc JOBN jjjjjjjj
SID sssssssss CC cc DVRID dd
IOSLVL 11 UCBVLV 11 UCBWG  ww
BASE sbbbb INTTCW aaaaaaaa
```

**XSCH sdddd**
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 jjjjjjjjjj**
Name of the job associated with I/O operation.

**SID sssssssss**
Subchannel ID from the UCBSID field of the UCB

**CC cc**
The condition code of the XSCH request.

**DVRID dd**
The IOSB driver ID field (IOSDVRID) of the request that is attempting to be cancelled.

**IOSLVL 11**
Function level to provide serialization of I/O requests. This value comes from the IOSLEVEL field of the IOSB.

**UCBLVL 11**
UCB level value from the UCBLEVEL field of the UCB.

**UCBWGT ww**
Flags from the UCBWGT field of the UCB.
**Generalized Trace Facility**

**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.

This table 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 below.

<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>
<tr>
<td>E5F2-E5F3</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>E5F4-E5F5</td>
<td>NetView® System Monitor</td>
<td></td>
</tr>
<tr>
<td>E5F6-EF43</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EF44-EF45</td>
<td>RACF</td>
<td></td>
</tr>
<tr>
<td>EF1D-EF1F</td>
<td>MVS Job Management - Dynamic Allocation (SVC 99)</td>
<td></td>
</tr>
<tr>
<td>EF46-EF47</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EF48</td>
<td>IOS</td>
<td></td>
</tr>
<tr>
<td>EF49</td>
<td>BDT</td>
<td></td>
</tr>
<tr>
<td>EF4F</td>
<td>OSAM</td>
<td></td>
</tr>
<tr>
<td>EF50-EF52</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EF53</td>
<td>OSI</td>
<td></td>
</tr>
<tr>
<td>EF54-EF5D</td>
<td>FSI</td>
<td></td>
</tr>
<tr>
<td>EF5E</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EF5F</td>
<td>DB2</td>
<td></td>
</tr>
<tr>
<td>EF60</td>
<td>JES3</td>
<td></td>
</tr>
<tr>
<td>EF61</td>
<td>VSAM Buffer Manager</td>
<td></td>
</tr>
<tr>
<td>EF62</td>
<td>Dynamic output SVC installation exit</td>
<td></td>
</tr>
<tr>
<td>EF63</td>
<td>Converter/Interpreter installation exit</td>
<td></td>
</tr>
<tr>
<td>EF64</td>
<td>APPC/VM VTAM Support (AVS)</td>
<td></td>
</tr>
<tr>
<td>EF65</td>
<td>GETMAIN FREEMAIN STORAGE trace (MVS)</td>
<td></td>
</tr>
<tr>
<td>EF66-EF6A</td>
<td>VTAM</td>
<td></td>
</tr>
<tr>
<td>EF6C</td>
<td>CICS</td>
<td></td>
</tr>
<tr>
<td>EFAA</td>
<td>VTAM VM/SNA Console Services (VSCS)</td>
<td></td>
</tr>
<tr>
<td>EFAB</td>
<td>DFSMS Media Manager</td>
<td></td>
</tr>
<tr>
<td>EFAC-EFAE</td>
<td>Reserved for IBM use</td>
<td></td>
</tr>
<tr>
<td>EFAF-EFE0</td>
<td>IMDGDPO1-IMDGDPO50</td>
<td>IBM</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>
</tbody>
</table>
Format Identifiers (FIDs) for USR trace records

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.
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
- **'U/A'.** Blanks are added on the right to fill out the field.
- **'*'.** Asterisks are replicated to fill out the field.

There are several types of output records:
- Control records, see "Control records."
- Lost data records, see "Unformatted lost event records" on page 311.
- User data record, see "User data records" on page 312.
- System data records, see "System data records" on page 314.

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 315 through "SVC minimal trace record" on page 329.

### 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.

**Reference**

See **z/OS MVS IPCS Commands** for more information about the COPYTRC subcommand.
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 z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)

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.

**GTWCFCNEW - 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.


**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 29] 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>

(optional)

Figure 29. 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 [311] for the **options** field.

**User data records**

This topic describes the format of user trace records requested using the GTRACE macro.
Generalized Trace Facility

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 30.

<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>sequence</th>
<th>total length</th>
<th>ASCB</th>
<th>job name</th>
<th>... data ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Figure 30. Unformatted User 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 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 309 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 308 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 311 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 31. Individual event record formats The format of individual system data records are shown in "Unformatted trace records for events" on page 315 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</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>(optional)</td>
</tr>
</tbody>
</table>

Figure 31. 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.
Generalized Trace Facility

**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 311 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.”

### 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 314 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 

- **U/A** Unavailable. GTF could not gather the information. In a 2-byte field, unavailable appears as 

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.

### CCW trace record
For a complete mapping of the AHLMCWRC data area, see z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)

### 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.

<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>
</tbody>
</table>
### Generalized Trace Facility

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

For TCB only:

| 34 (22) | 8    | CDE name.                                |

For SRB only:

| 34 (22) | 4    | Parm address.                           |
| 38 (26) | 1    | 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. |

#### 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:

- 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 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, SRB routine type indicator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S for a suspended SRB that is about to be re-dispatched.</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 a 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'.

<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>
</tbody>
</table>
Generalized Trace Facility

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

For SIGP interrupt:

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>PARMFIELD.</td>
</tr>
<tr>
<td>38 (26)</td>
<td>2</td>
<td>CPUID.</td>
</tr>
</tbody>
</table>

For clock comparator interrupt:

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

For CPU timer interrupt:

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 IOCS 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>
<tr>
<td>1 (1)</td>
<td>1</td>
<td>Flag identifiers.</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 320 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>
<tr>
<td>10 (A)</td>
<td>4</td>
<td>Device type.</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:**
## Generalized Trace Facility

### Description of Trace

<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>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 SILI 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>
Generalized Trace Facility

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>IOCPUNAV</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>IONOIDAW</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>IONOTSBI</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>IONODDCW</td>
<td>Failure accessing DCW</td>
</tr>
<tr>
<td>19</td>
<td>IOINCMDML</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.
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.

<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>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>

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>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>Program old PSW.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>4</td>
<td>INT TCB.</td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>Virtual page address low half.</td>
</tr>
<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.

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.

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></td>
<td>1... ..... Supervisor control mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... ..... Disabled for I/O and external interrupts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... ..... Global spin lock held.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...1... ..... Global suspend lock held.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... 1... Local lock held.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... Type 1 SVC in control.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... ..1. SRB mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... TCB mode.</td>
</tr>
<tr>
<td>33 (21)</td>
<td>1</td>
<td>System mode indicators, byte 2:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... ..... Recovery routine in control (always zero if a PER interrupt).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... ..... Problem program state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... ..... Supervisor state.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... System key.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... 1... Problem program key.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... Any global lock held.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... Any lock held.</td>
</tr>
<tr>
<td>36 (24)</td>
<td>1</td>
<td>Error byte 1 (or zeros if a PER interrupt):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... ..... Program check interrupt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... ..... Restart interrupt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>..1... ..... SVC error.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>...1... ..... Abend; task issued SVC 13.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... 1... Paging I/O error.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... Dynamic address translation error.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... Software error caused by machine check.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.... .... Abnormal address space termination.</td>
</tr>
<tr>
<td>35 (23)</td>
<td>1</td>
<td>Error byte 2 (or zeros if a PER interrupt):</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... ..... Memterm.</td>
</tr>
<tr>
<td>36 (24)</td>
<td>1</td>
<td>SLIP flags:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1... ..... DEBUG record.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.1... ..... Registers collected.</td>
</tr>
</tbody>
</table>
### Generalized Trace Facility

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>37 (25)</td>
<td>2</td>
<td>Data unavailable counter (or zeros if DATA was not specified for the trap).</td>
</tr>
</tbody>
</table>

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>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>108 (6C)</td>
<td>1</td>
<td>PER trap mode:</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>118 (76)</td>
<td>13</td>
<td>Storage Alteration Space Identifier</td>
</tr>
<tr>
<td>131 (83)</td>
<td>4</td>
<td>High-half of begin range</td>
</tr>
</tbody>
</table>
Generalized Trace Facility

<table>
<thead>
<tr>
<th>Offset</th>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>135 (87)</td>
<td>1</td>
<td>Reserved.</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'.

<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>
<tr>
<td>136 (88)</td>
<td>2</td>
<td>Length of user-defined data.</td>
</tr>
<tr>
<td>138 (8A)</td>
<td>variable</td>
<td>User-defined data (specified through the TRDATA parameter on the SLIP command).</td>
</tr>
</tbody>
</table>

**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>

**Notes:**

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'.

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## Generalized Trace Facility

<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>
<tr>
<td>through 135</td>
<td></td>
<td>DEBUG byte; indication of which keyword failed:</td>
</tr>
<tr>
<td>136 (88)</td>
<td>1</td>
<td>Decimal 2 indicates COMP keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 3 indicates ASID keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 4 indicates JOBNAME keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 5 indicates JSPGM keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 6 indicates PVTMOD keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 7 indicates LPAMOD keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 8 indicates ADDRESS keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 9 indicates MODE keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 10 indicates ERRTYP keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 13 indicates RANGE keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 14 indicates DATA keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 20 indicates ASIDSA keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 22 indicates REASON CODE keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 23 indicates NUCMOD keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 24 indicates PSWASC keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decimal 26 indicates DSSA keyword</td>
</tr>
<tr>
<td>137 (89)</td>
<td>1</td>
<td>Reserved.</td>
</tr>
</tbody>
</table>

**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>
<tr>
<td>14 (E)</td>
<td>4</td>
<td>Register 1.</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>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>Real address of channel program.</td>
</tr>
<tr>
<td>20 (14)</td>
<td>4</td>
<td>Virtual address of channel program.</td>
</tr>
<tr>
<td>24 (18)</td>
<td>4</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>28 (1C)</td>
<td>1</td>
<td>Condition code.</td>
</tr>
<tr>
<td>29 (1D)</td>
<td>12</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>41 (29)</td>
<td>8</td>
<td>Dynamic seek address.</td>
</tr>
<tr>
<td>49 (31)</td>
<td>1</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>50 (32)</td>
<td>1</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>51 (33)</td>
<td>1</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>52 (34)</td>
<td>1</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>53 (35)</td>
<td>1</td>
<td>Reserved for IBM use.</td>
</tr>
<tr>
<td>54 (36)</td>
<td>1</td>
<td>Reserved for IBM use.</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'.

Basic SVC comprehensive trace record

<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>Job name.</td>
</tr>
<tr>
<td>14 (E)</td>
<td>16</td>
<td>SVC old PSW. The seventh and eighth bytes contain the SVC number.</td>
</tr>
<tr>
<td>30 (1E)</td>
<td>4</td>
<td>Old TCB.</td>
</tr>
<tr>
<td>34 (22)</td>
<td>8</td>
<td>CDE name.</td>
</tr>
<tr>
<td>42 (2A)</td>
<td>4</td>
<td>Register 15.</td>
</tr>
<tr>
<td>46 (2E)</td>
<td>4</td>
<td>Register 0.</td>
</tr>
<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/</td>
<td>10</td>
<td>SUBMIT</td>
<td>100</td>
</tr>
<tr>
<td>FREEMAIN</td>
<td></td>
<td>QTIP</td>
<td>101</td>
</tr>
<tr>
<td>TIME</td>
<td>11</td>
<td>XLATE</td>
<td>103</td>
</tr>
<tr>
<td>SYNCH</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Generalized Trace Facility

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<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>TTIMETER</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/</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FREEMAIN</td>
<td></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>EXCP</td>
<td>0</td>
<td>STIMER</td>
<td>47</td>
</tr>
<tr>
<td>WAIT/WAITR</td>
<td>1</td>
<td>DEQ</td>
<td>48</td>
</tr>
<tr>
<td>POST</td>
<td>2</td>
<td>SNAP</td>
<td>51</td>
</tr>
<tr>
<td>GETMAIN</td>
<td>4</td>
<td>RESTART</td>
<td>52</td>
</tr>
<tr>
<td>FREEMAIN</td>
<td>5</td>
<td>RELEX</td>
<td>53</td>
</tr>
<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>
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<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>ERRREXCP</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>
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<tr>
<td>OPEN</td>
<td>19</td>
<td>BSP</td>
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<tr>
<td>CLOSE</td>
<td>20</td>
<td>GSERV</td>
<td>70</td>
</tr>
<tr>
<td>STOW</td>
<td>21</td>
<td>ASGNBFR/BUFINQ/RLESEBFR</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>
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</tr>
<tr>
<td>CATLG</td>
<td>26</td>
<td>GJP</td>
<td>80</td>
</tr>
<tr>
<td>OBTAIN</td>
<td>27</td>
<td>SETPRT</td>
<td>81</td>
</tr>
<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>
</tbody>
</table>
Generalized Trace Facility

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>6 (6)</td>
<td>16</td>
<td>SVC old PSW. The seventh and eighth bytes contain the SVC number.</td>
</tr>
<tr>
<td>22 (16)</td>
<td>4</td>
<td>Old TCB.</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.</td>
</tr>
<tr>
<td>34 (22)</td>
<td>4</td>
<td>Register 1.</td>
</tr>
</tbody>
</table>

TCW trace record

For a complete mapping of the AHLFCXG (FCX/zHPF channel program) data area, see z/OS MVS Data Areas in z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/
Chapter 11. 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.

Major Topics

The following topics describe tasks for component traces:
• “Planning for component tracing” on page 333 tells you about the tasks needed to plan component tracing.
• “Obtaining a component trace” on page 341 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 341
  – “Request writing component trace data to trace data sets” on page 344
  – “Request component tracing for systems in a sysplex” on page 350
• “Verifying component tracing” on page 352 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 355 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. The topic also describes each BCP component trace that uses the component trace service:
### Component Trace

<table>
<thead>
<tr>
<th>Component</th>
<th>Trace Name</th>
<th>See Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Program-to-Program Communication/MVS (APPC/MVS)</td>
<td>SYSAPPC</td>
<td>357</td>
</tr>
<tr>
<td>Base control program internal interface (BCPii)</td>
<td>SYSBCPII</td>
<td>375</td>
</tr>
<tr>
<td>Common Event Adapter (CEA)</td>
<td>SYSCEA</td>
<td>378</td>
</tr>
<tr>
<td>Cross-system coupling facility (XCF)</td>
<td>SYSXCF</td>
<td>477</td>
</tr>
<tr>
<td>Cross-system extended services (XES)</td>
<td>SYSXES</td>
<td>481</td>
</tr>
<tr>
<td>Data lookaside facility (DLF) of VLF</td>
<td>SYSDLF</td>
<td>381</td>
</tr>
<tr>
<td>Distributed function of SOMobjects®</td>
<td>SYSDSOM</td>
<td>383</td>
</tr>
<tr>
<td>Global resource serialization</td>
<td>SYSGRS</td>
<td>385</td>
</tr>
<tr>
<td>Allocation Component</td>
<td>SYSIEFAL</td>
<td>394</td>
</tr>
<tr>
<td>IOS Component Trace</td>
<td>SYSIOS</td>
<td>400</td>
</tr>
<tr>
<td>JES common coupling services</td>
<td>SYSJES</td>
<td>406</td>
</tr>
<tr>
<td>JES2 rolling trace table</td>
<td>SYSjes2</td>
<td>417</td>
</tr>
<tr>
<td>Library lookaside (LLA) of contents supervision</td>
<td>SYSLLA</td>
<td>419</td>
</tr>
<tr>
<td>z/OS UNIX System Services (z/OS UNIX)</td>
<td>SYSOMVS</td>
<td>428</td>
</tr>
<tr>
<td>Operations services (OPS)</td>
<td>SYSOPS</td>
<td>441</td>
</tr>
<tr>
<td>Resource recovery services (RRS)</td>
<td>SYSRRS</td>
<td>445</td>
</tr>
<tr>
<td>Real storage manager (RSM)</td>
<td>SYSRSM</td>
<td>453</td>
</tr>
<tr>
<td>Service processor interface (SPI)</td>
<td>SYSSPI</td>
<td>470</td>
</tr>
<tr>
<td>System logger</td>
<td>SYSLOGR</td>
<td>420</td>
</tr>
<tr>
<td>System REXX</td>
<td>SYSAXR</td>
<td>371</td>
</tr>
<tr>
<td>Transaction trace (TTRC)</td>
<td>SYSTTRC</td>
<td>470</td>
</tr>
<tr>
<td>Virtual lookaside facility (VLF)</td>
<td>SYSVLF</td>
<td>471</td>
</tr>
<tr>
<td>Workload manager (WLM)</td>
<td>SYSWLM</td>
<td>474</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.

### References

- See [z/OS MVS Initialization and Tuning Reference](#) for the CTnccxx parmlib member.
- See [z/OS MVS System Commands](#) for the TRACE CT command.
Planning for component tracing

Planning for component tracing consists of the following tasks:

- "Create CTnccxx parmlib members for some components"
  - "Specify buffers" on page 336
- "Select the trace options for the component trace" on page 339
- "Decide where to collect the trace records" on page 340

The system programmer performs the tasks.

Create CTnccxx parmlib members for some components

The following table 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.

<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</td>
<td>No</td>
<td>No; cannot turn trace ON or OFF in CTnAPPxx</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See &quot;CTnAPPxx parmlib member&quot; on page 357.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSAXR</td>
<td>CTIAXRnn</td>
<td>CTIAXR00</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See &quot;CTIAXRnn parmlib member&quot; on page 372.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Component Trace

<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>SYSBCPII</td>
<td>CTIHW100</td>
<td>CTIHW100</td>
<td>Yes; when there is a valid CTIHW100 parmib member specified at the time the BCPii address space starts</td>
<td>No</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>CTICEAnn</td>
<td>CTICEA00</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>See “CTICEAnn parmib member” on page 399</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSDFML</td>
<td>None</td>
<td>N/A</td>
<td>Yes; always on when DLF is running</td>
<td>No</td>
</tr>
<tr>
<td>SYSDS0M</td>
<td>None</td>
<td>N/A</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>CTnGRSxx</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>SYSGRS</td>
<td>See “CTnGRSxx parmib member” on page 386</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>CTIEFxx</td>
<td>CTIEFAL</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSIEFAL</td>
<td>See “CTIEFxx parmib member” on page 395</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSLOS</td>
<td>CTnIOSxx</td>
<td>No</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSLOS</td>
<td>See “CTnIOSxx parmib member” on page 402</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSLOS</td>
<td>No</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</td>
<td>CTILOG00, which can be specified in IXGCNFxx member.</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>See “CTnLOGxx parmib member” on page 424</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Component Trace

<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>SYSOMVS</td>
<td>CTnBPXxx</td>
<td>CTIBPX00, which must be specified in BPXPRM00 member</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>See “CTnBPXxx parmlib member” on page 428.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSOPS</td>
<td>CTnOPSxx</td>
<td>CTOPS00, which must be specified in CONSOLxx member</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>See “CTnOPSxx parmlib member” on page 441.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSRMS</td>
<td>CTnRRSxx</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></td>
<td>See “CTnRRSxx parmlib member” on page 446.</td>
<td></td>
<td></td>
<td></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>
<tr>
<td>SYSWLM</td>
<td>None</td>
<td>N/A</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td>SYSCF</td>
<td>CTnXCFxx</td>
<td>CTIXCF00, which can be specified in COUPLE00 member</td>
<td>Yes; minimal; unexpected events</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>See “CTnXCFxx parmlib member” on page 477.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYXES</td>
<td>CTnXESxx</td>
<td>CTIXES00, which can be specified in COUPLE00 member</td>
<td>Yes; minimal; unexpected events</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>See “CTnXESxx parmlib member” on page 484.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For some components, you need to identify the component’s CTncccxx member in another parmlib member; the components with this requirement have the other parmlib member listed in the default member column of the preceding table.

### Example: Specifying the CTncccxx Member

For XCF, specify CTIXCF00 on the CTRACE parameter in the COUPLEExx parmlib member.

```plaintext
COUPLE SYSPLEX( ...  
   CTRACE(CTIXCF00)  
   ...)
```
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. The following table 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>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</td>
<td>CTnAPxx 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>SYSBCPIII</td>
<td>4M 4M</td>
<td>MVS system</td>
<td>No</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>CT1AXRnn parmlib member or REPLY to TRACE CT command</td>
<td>Yes, when restarting a trace after stopping it</td>
<td>AXR private; AXR trace dataspase</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>2MB 1MB - 2GB</td>
<td>CTICEAxx 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>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.CCOFGS0D)</td>
</tr>
<tr>
<td>SYDSOM</td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>Private address space</td>
</tr>
</tbody>
</table>
### Component Trace

#### Table 22. 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><strong>SYSGRS</strong></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 (System rounds size up to nearest 64KB boundary.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SYSIEFAL</strong></td>
<td>4M</td>
<td>CTIIEFxx 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><strong>SYSIOS</strong></td>
<td>324KB</td>
<td>CTnIOSxx member or REPLY for TRACE CT command</td>
<td>Yes</td>
<td>Extended system queue area (ESQA). Note: Full buffers are copied to an IOS data space to allow for more data capture. For information about specifying an IOS data space size at IPL, see “OPTIONS parameter” on page 403.</td>
</tr>
<tr>
<td></td>
<td>324KB-1.5MB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SYSJES</strong></td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td><strong>SYSjes2</strong></td>
<td>N/A</td>
<td>JES2</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td><strong>SYSLLA</strong></td>
<td>N/A</td>
<td>MVS system</td>
<td>No</td>
<td>In the component address space</td>
</tr>
<tr>
<td><strong>SYSLOGR</strong></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 421.</td>
</tr>
</tbody>
</table>
### Component Trace

**Table 22. 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>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></td>
<td>16KB - 64MB</td>
<td></td>
<td></td>
<td></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></td>
<td>64KB - 16MB</td>
<td></td>
<td></td>
<td></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'.ATRTRACE) and SDATA=RGN.</td>
</tr>
<tr>
<td></td>
<td>1MB - 2045MB</td>
<td></td>
<td></td>
<td></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></td>
<td>2 - 7 page-fixed primary buffers, 4 - 262,144 pages per buffer 1 - 2047 MB for secondary buffers</td>
<td></td>
<td></td>
<td></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>
<tr>
<td></td>
<td>16K - 999K</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1MB - 32MB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSVLF</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</td>
<td>MVS system</td>
<td>Yes, when starting a trace</td>
<td>Extended common service area (ECSA)</td>
</tr>
<tr>
<td></td>
<td>64KB - 16M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSXCF</td>
<td>4MB</td>
<td>CTnXCFxx member</td>
<td>No</td>
<td>Extended local system queue area (ELSQA) of the XCF address space</td>
</tr>
<tr>
<td></td>
<td>16KB - 16MB (System rounds size up to a multiple of 72 bytes.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Component Trace

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 358</td>
</tr>
<tr>
<td>SYSAXR</td>
<td>See “OPTIONS parameter” on page 373</td>
</tr>
<tr>
<td>SYSBPII</td>
<td>See “OPTIONS parameter” on page 376</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>See “OPTIONS parameter” on page 380</td>
</tr>
<tr>
<td>SYSLDF</td>
<td>None</td>
</tr>
<tr>
<td>SYSDOM</td>
<td>None</td>
</tr>
<tr>
<td>SYSGRS</td>
<td>See “OPTIONS parameter” on page 387</td>
</tr>
<tr>
<td>SYSEIFAL</td>
<td>See “OPTIONS parameter” on page 396</td>
</tr>
<tr>
<td>SYSSIOS</td>
<td>See “OPTIONS parameter” on page 403</td>
</tr>
<tr>
<td>SYSSIES</td>
<td>None</td>
</tr>
<tr>
<td>SYSSES2</td>
<td>None</td>
</tr>
<tr>
<td>SYSLLA</td>
<td>None</td>
</tr>
<tr>
<td>SYSLOGR</td>
<td>See “OPTIONS parameter” on page 425</td>
</tr>
<tr>
<td>SYSSOMVS</td>
<td>See “OPTIONS parameter” on page 430</td>
</tr>
<tr>
<td>SYSSOPS</td>
<td>See “OPTIONS parameter” on page 442</td>
</tr>
<tr>
<td>SYSSRRS</td>
<td>See “OPTIONS parameter” on page 447</td>
</tr>
<tr>
<td>SYSSRM</td>
<td>See “OPTIONS parameter” on page 455</td>
</tr>
<tr>
<td>SYSTTCR</td>
<td>None</td>
</tr>
<tr>
<td>SYSSPI</td>
<td>None</td>
</tr>
<tr>
<td>SYSLFLF</td>
<td>None</td>
</tr>
<tr>
<td>SYSSWLM</td>
<td>None</td>
</tr>
<tr>
<td>SYSSXCF</td>
<td>See “OPTIONS parameter” on page 478</td>
</tr>
<tr>
<td>SYSSXES</td>
<td>See “OPTIONS parameter” on page 485</td>
</tr>
</tbody>
</table>
Component Trace

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 CTnccxxx member.

Example: XCF Trace Options
For XCF, the IBM Support Center identifies the options needed to diagnose a particular problem as both of the following:
SERIAL
STATUS

Decide where to collect the trace records

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>SYSCFA</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSDDL</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>SYSCEA</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSCEFAL</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSSOS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSSJES</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>SYSOMVS</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSSP5</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>SYSDSOM</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>SYSSPII</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SYSSP5</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSSPL</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SYSSWLM</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
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:

- "Request component tracing to address space or data space trace buffers"
- "Request writing component trace data to trace data sets" on page 344
- "Request component tracing for systems in a sysplex" on page 350

### 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"
- "Perform component tracing to trace buffers" on page 343

### 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 CTnccxxx parmlib member containing the options

   If you do not use a parmlib member, tell the operator the options.
Component Trace

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 333.

Example: CTWXCF03 parmlib member
For XCF, create CTWXCF03 to specify the options.

```
TRACEOPTS
  ON
  OPTIONS('SERIAL', 'STATUS')
```

3. Determine the dump to be used to obtain the trace records: The following table
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>SYSAAPC</td>
<td>By the component when the operator stops SYSAAPC 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 the component when the operator stops SYSBCPII tracing with a TRACE CT,OFF command or by DUMP or SLIP command</td>
</tr>
<tr>
<td>SYSCEA</td>
<td>By DUMP or SLIP command</td>
</tr>
<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>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>SYSRRS</td>
<td>By DUMP or SLIP command</td>
</tr>
</tbody>
</table>
Component Trace

<table>
<thead>
<tr>
<th>Trace</th>
<th>Request of SVC Dump</th>
</tr>
</thead>
</table>
| SYSRSM  | • 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 |
| SYSTTRC | Automatically dumped by the Tailored SVC Dump Exits function |
| SYSSPI  | By the component |
| SYSVLF  | By DUMP or SLIP command or when SYSVLF full tracing is turned off |
| SYSWLM  | By DUMP or SLIP command |
| SYSXCT  | By DUMP or SLIP command |
| SYSXES  | By DUMP or SLIP command |

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 336 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.

   Example: TRACE CT command not specifying a parmlib member
   ```
   trace ct,on,comp=sysxcf
   * 21 ITT006A ....
   r 21,options=(serial,status),end
   ```

   Example: TRACE CT command specifying a parmlib member
   This 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 352

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.
Example: DUMP Command and Responses

The 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.

Example: TRACE CT,OFF Command

trace ct,off,comp=sysxcf

Request writing component trace data to trace data sets

This topic describes only the component traces that can write to trace data sets. The topic contains:
- "Prepare for a specific component trace to trace data sets"
- "Perform component tracing to trace data sets" on page 348

You can also change the trace data sets that are in use without stopping the trace. See "Change trace data sets" on page 349.

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.

---

**Example: Cataloged Procedure for an External Writer**

The procedure 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 DSN=SYS1.CTRACE1,Vol=SER=TRACE6,UNIT=DASD,
// SPACE=(CYL,10),DISP=(NEW,KEEP),DSORG=PS
//TRCOUT02 DD DSN=SYS1.CTRACE2,Vol=SER=TRACE7,UNIT=DASD,
// SPACE=(CYL,10),DISP=(NEW,KEEP),DSORG=PS
```

**Rules for the Source JCL for an External Writer:**

- The name specified on the TRACE CT command or CTnccxx 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:

<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>

In other languages, the codes represent different characters.
Component Trace

- 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 232

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:

```
ITT120I SOME CTRACE DATA HAS BEEN LOST.
LAST nnn BUFFERS NOT WRITTEN.
```
Component Trace

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 CTnccxxx parmlib members for some components" on page 333.

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=wtudas2
trace ct,on,comp=sysxcf
* 44 ITT006A ....
  44,wtr=wtudas2,options=(serial,status),end

Example: TRACE CT command specifying a parmlib member
This example requests the same trace using parmlib member CTWXCF04.

trace ct,on,comp=sysxcf,parm=ctwxcf04

2. Verify that the Trace and the Writer Are Running: See "Verifying component tracing" on page 352

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
  * 56 ITT006A ....
  r 56,end
```

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
  * 56 ITT006A ....
  r 56,wtr=disconnect,end
```

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 do the following:

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. You may lose a few trace records.

You can view the previous data set or sets to check the trace records collected, then continue or stop the trace, as needed.

Example: Changing the Trace Data Sets

The original commands were:

```
trace ct,wtrstart=wtdasd2
trace ct,on,comp=sysxcf
  * 67 ITT006A ...
  r 67 wtr=wtdasd2,options(serial,status),end
```

The commands to change the trace data sets are:

```
trace ct,wtrstart=wtdasd4
trace ct,on,comp=sysxcf
  * 67 ITT006A ...
  r 67 wtr=wtdasd4,options(serial,status),end
```
Component Trace

Request component tracing for systems in a sysplex

This topic describes 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. The topic contains:

- "Prepare for specific component traces on systems in a sysplex"
- "Perform component tracing on the systems in the sysplex" on page 351

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 CTnccxx parmlib members for some components" on page 333.

   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. For XES, IXLCTCAD, a data space associated with the XCF address space, contains the XES 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) and DSPNAME=(asid.IXLCTCAD) on the REPLY for the DUMP command, where asid&osq&csq; is XCFAS or 6.

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 IIT006A 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.
   \[
   \text{route *all,trace ct,on,comp=sysxcf,parm=ctwxcf33}
   \]

   **Example 2: Command to start traces in some systems**
   The command starts the trace in a subset of systems. Both commands specify the C xmlns:XCF33 parmlib member on each system being traced.
   \[
   \text{route subs2,trace ct,on,comp=sysxcf,parm=ctwxcf33}
   \]

   **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.
   \[
   \text{route *all,trace ct,on,comp=sysvlf,parm=ctiitt00}
   \]

2. **Verify that the traces Are running:** See “Verifying component tracing” on page 352

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.

```plaintext
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.

```plaintext
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.

```plaintext
route subs2,trace ct,off,comp=sysxcf
```

Verifying component tracing

The operator should do this task 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. This topic contains:

- “Verify tracing for component traces without sublevels”
- “Verify tracing for component traces with sublevels” on page 353
- “Verify that the writer is active” on page 354

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.

```plaintext
display trace  
IEE843I ...
```
Component Trace

- 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.

Verify a SYSJES Component Trace: The operator enters the following command to verify a SYSJES trace:

display trace,comp=sysjes,sublevel,n=4

The system will show the 4 sublevel traces.

Verify a SYSXES Component Trace: When a SYSXES component trace has multiple sublevel traces, a DISPLAY command shows only one sublevel. 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*
   JOBAMES *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 15.25.00 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*
   JOBAMES *NOT SUPPORTED*
   OPTIONS LOCKMGR
   WRITER *NONE*
   SUBTRACE MODE BUFFER HEAD SUBS
   ------------------------------------------
   LT01 HEAD 1
Component Trace

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
               ---------------------
          ON 0168K HEAD 1
LIKEHEAD
ASIDS  *NOT SUPPORTED*
JOBNAMES *NOT SUPPORTED*
OPTIONS LOCKMGR
WRITER  *NONE*

SUBTRACE
MODE BUFFER HEAD SUBS
--------------------------------------------------------------
ASID(0019)
       HEAD 8
LIKEHEAD
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
               ---------------------
          ON 0168K HEAD 8
LIKEHEAD
ASIDS  *NOT SUPPORTED*
JOBNAMES *NOT SUPPORTED*
OPTIONS CONNECT,RECOVERY
WRITER  *NONE*

SUBTRACE
MODE BUFFER HEAD SUBS
--------------------------------------------------------------
A1
       ON 0100K
LIKEHEAD
ASIDS  *NOT SUPPORTED*
JOBNAMES *NOT SUPPORTED*
OPTIONS LOCKMGR
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.
Component Trace

display trace,wtr=all
  IEE843I ...

display trace,wtr=wtadas2
  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.

Reference

See [z/OS MVS IPCS Commands](https://publib-bpub.boulder.ibm.com/cgi-bin/bookmgr_OS/00Z/00Z/svcs_00Z_055_00Z_055_055_00Z_055_00Z_055_055_055_00Z) 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 following subcommands when formatting the component trace records.** See [z/OS MVS IPCS Commands](https://publib-bpub.boulder.ibm.com/cgi-bin/bookmgr_OS/00Z/00Z/svcs_00Z_055_00Z_055_055_00Z_055_00Z_055_055_055_00Z) 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 361</td>
</tr>
</tbody>
</table>
## Component Trace

<table>
<thead>
<tr>
<th>Trace</th>
<th>IPCS subcommand</th>
<th>CTRACE OPTIONS parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSAXR</td>
<td>CTRACE COMP(SYSAXR)</td>
<td>See “Formatting a SYSAXR trace” on page 373</td>
</tr>
<tr>
<td>SYSBCPII</td>
<td>CTRACE COMP(SYSBCPII)</td>
<td>See “SYSBCPII component trace” on page 375</td>
</tr>
<tr>
<td>SYSCAEA</td>
<td>CTRACE COMP(SYSCAEA)</td>
<td>See “Formatting a SYSCAEA trace” on page 380</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 383</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 391</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 404</td>
</tr>
<tr>
<td>SYSJES</td>
<td>CTRACE COMP(SYSJES)</td>
<td>See “Formatting a SYSJES trace” on page 411</td>
</tr>
<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 426</td>
</tr>
<tr>
<td>SYSOMVS</td>
<td>CTRACE COMP(SYSOMVS)</td>
<td>See “Formatting a SYSOMVS trace” on page 431</td>
</tr>
<tr>
<td>SYSOPS</td>
<td>CTRACE COMP(SYSOPS)</td>
<td>See “Formatting a SYSOPS trace” on page 443</td>
</tr>
<tr>
<td>SYSRRS</td>
<td>CTRACE COMP(SYSRRS)</td>
<td>See “Formatting a SYSRRS trace” on page 449</td>
</tr>
<tr>
<td>SYSRSM</td>
<td>CTRACE COMP(SYSRSM)</td>
<td>None</td>
</tr>
<tr>
<td>SYSSPI</td>
<td>CTRACE COMP(SYSSPI)</td>
<td>None</td>
</tr>
<tr>
<td>SYSTTRC</td>
<td>CTRACE COMP(SYSTTRC)</td>
<td>None</td>
</tr>
<tr>
<td>SYSVLF</td>
<td>CTRACE COMP(SYSVLF)</td>
<td>None</td>
</tr>
<tr>
<td>SYSWLM</td>
<td>CTRACE COMP(SYSWLM)</td>
<td>None</td>
</tr>
<tr>
<td>SYSXCF</td>
<td>CTRACE COMP(SYSXCF)</td>
<td>See “Formatting a SYSXCF trace” on page 480</td>
</tr>
<tr>
<td>SYSXES</td>
<td>CTRACE COMP(SYSXES)</td>
<td>See “Formatting a SYSXES trace” on page 486</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.

### Reference

**Example: IPCS CTRACE Subcommand**

The 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**

**Before using this component trace**

This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

The following summarizes information for requesting a 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</td>
</tr>
<tr>
<td>No default member</td>
<td></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></td>
</tr>
<tr>
<td>Default: 512KB</td>
<td></td>
</tr>
<tr>
<td>Range: 64KB - 32MB</td>
<td></td>
</tr>
<tr>
<td>Size set by: CTnAPPxx member or REPLY for TRACE command</td>
<td></td>
</tr>
<tr>
<td>Change size after IPL: Yes, while a trace is running</td>
<td></td>
</tr>
<tr>
<td>Location: In data space. A TRACE CT,OFF command requests a dump, which includes the trace buffers.</td>
<td></td>
</tr>
<tr>
<td>Trace records location</td>
<td>Data-space 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>
<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**

The following table indicates the parameters you can specify on a CTnAPPxx parmlib member.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnAPPxx?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON or OFF</td>
<td>No</td>
</tr>
</tbody>
</table>
Component Trace

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnAPPxx?</th>
</tr>
</thead>
<tbody>
<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**
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, 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>
<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>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 32 on page 359 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.
SYSAPPC 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 CTnAPPxx parmlib 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

Example 1: CTnAPPxx Member

   The member requests SERVER and VERBS options for the address space or
   spaces for the TSO/E userid JOHNDOE.

   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
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:
Component Trace

- 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.
Component Trace

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

CTRACE COMP(SYSAPPC) SHORT subcommand output
The SHORT parameter shows one line of output for each trace record. An example of SYSAPPC component trace output formatted with the SHORT parameter
follows:

<table>
<thead>
<tr>
<th>Mnemonic</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:

The fields in the SUMMARY report, after the first line, follow. See the SHORT report for the first line.
Component Trace

**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:
FMH-5 trace data

FMH-5 trace data 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 23 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'.

Reference

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 23. FMH-5 trace entries in the SYSAPPC component trace

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Title</th>
<th>Description/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMH5BDSC</td>
<td>FMH5:BAD SECURITY COMBINATION</td>
<td>APPC/MVS found an incorrect security option or security subfields or both. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5ERCV</td>
<td>FMH5:FMH-5 RECEIVE FAILURE</td>
<td>An FMH-5 was not successfully received by the local MVS LU. Contact the IBM Support Center.</td>
</tr>
</tbody>
</table>
### Component Trace

Table 23. 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>FMH5INCD</td>
<td>FMH5:FMH-5 COMMAND IS NOT VALID</td>
<td>APPC/MVS detected an incorrect FMH-5 command. Contact the IBM Support Center.</td>
</tr>
<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:QW RACF REQUEST REJECTED</td>
<td>Internal error. Contact the IBM Support Center.</td>
</tr>
<tr>
<td>FMH5PWR1</td>
<td>FMH5:PW RECEIVE DATA FAILED 1</td>
<td>The SIGNON/Change password TP attempted to perform a ReceiveandWait call</td>
</tr>
<tr>
<td></td>
<td>FMH5:PW RECEIVE DATA FAILED 2</td>
<td>for a GDS variable. See the following KEY fields:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KEY X'007E' contains the status received value returned to the SIGNON/Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>password TP by ReceiveandWait.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KEY X'007F' contains the data received value returned to the SIGNON/Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>password TP by ReceiveandWait.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• KEY X'003F' contains the return code from ReceiveandWait.</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>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>Mnemonic</td>
<td>Title</td>
<td>Description/Action</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| FMH5PWSF     | FMH5:PW SEND MESSAGE FAILED       | A persistent verification signoff flow to the partner LU failed. The __ SIGNEDONTO list in the partner LU may not be in sync with the local __ SIGNEDONFROM list. 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 SIGNOFF failed.  
  If you cannot resolve the problem, contact the IBM Support Center. |
| 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. |
<p>| 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.                                                                                                                                                |</p>
<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Title</th>
<th>Description/Action</th>
</tr>
</thead>
</table>
| 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. |
| FMH5SERF  | FMH5:APPC/MVS SERVICE FAILURE         | APPC/MVS internal failure. Contact the IBM Support Center.                        |
| FMH5SFAL  | FMH5:SEND MESSAGE FAILED             | Persistent verification signoff flow to the partner LU failed. Make sure you have valid sessions established. See the following KEY fields:  

• KEY X'0026' contains the TCB address.  
• KEY X'001A' contains the name of the partner LU. |
| FMH5SOFF  | FMH5:SIGNOFF FLOW                    | Persistent verification signoff flow to the partner LU completed. See the following KEY fields:  

• KEY X'0026' contains the TCB address.  
• KEY X'001A' contains the name of the partner LU. |
| FMH5VFC   | FMH5:ACCEPTED BY SRVR FACILITIES     | APPC/MVS placed the inbound request on an allocate queue to await later processing by an APPC/MVS server. |
| FMH5TEST  | FMH5:FMH5 ACCEPTED FOR TESTING       | An FMH-5 is accepted for testing.                                                  |
| FMH5PAD   | FMH5:TP PROFILE ACCESS DENIED        | TP profile access denied. Request=AUTH failed.                                      |
| FMH5PNA   | FMH5:TP PROFILE IS NOT ACTIVE        | 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. |
| FMH5PRQ   | FMH5:TP PROFILE IS REQUIRED          | 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. |
Table 23. 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>FMH5UINST</td>
<td>FMH5:FMH-5 USERID IS NOT VALID</td>
<td>The FMH-5 userid is incorrect; it is greater than 8 characters.</td>
</tr>
<tr>
<td>FMH5VALD</td>
<td>FMH5:FMH5 SUCCESSFULLY VALIDATED</td>
<td>An FMH-5 has been successfully validated.</td>
</tr>
<tr>
<td>FMH5XLFN</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>

SYAXXR component trace

Before using this component trace

This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

The following summarizes information for requesting a SYAXXR component trace for System REXX component.

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYAXXR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIAXRnn</td>
</tr>
<tr>
<td>Default member:</td>
<td>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(SYAXXR)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Requesting a SYAXXR trace

Specify options for requesting a SYAXXR component trace in a CTIAXRxx parmlib member or on the reply for a TRACE CT command. Changing SYAXXR 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.

### 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>Yes</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>Yes</td>
</tr>
<tr>
<td>OPTIONS</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Component Trace

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on REPLY for Trace?</th>
</tr>
</thead>
<tbody>
<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:

- **DSECT**
- **TracePrefixType**
- **TracePrefixASID**
- **TracePrefixAXREXXInvokersASID**
- **TracePrefixJobname**

- **DS**
- **OD**
- **H** Primary ASID when trace record cut
- **H** Primary ASID when AXREXX invoked
- **D** Jobname when trace record cut
Component Trace

TracePrefixAXREXXInvokersJobname DS D Jobname when AXREXX was invoked
TracePrefixTcb0 DS A TCB Address when AXREXX was invoked
TracePrefixExecName DS D REXX exec name
TracePrefixAXREXXInvokersHomeAsid DS A Home ASID when AXREXX was invoked
TracePrefixAXREXXInvokersJobname CL2 Reserved
TracePrefixReqToken DS 4F Trace request token type

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.

SY1 REXXXVARS 04130006 20:40:59.969289 REXX VAR NAME

00330032 C1E7D9D4 C1C9D540 C1E7D9D4 | ....AXRMAIN AXRM |
C1C9D540 006EAE88 C8C1D9D9 C9E2E540 | AIN .>.HARRIS |
95690DB8 00000000 00000000 00000000 BF8C7970 | 1 |

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.

SY1 REXXXVARS 04130002 20:40:59.969292 REXX VAR BEFORE EXEC

00330032 C1E7D9D4 C1C9D540 C1E7D9D4 | ....AXRMAIN AXRM |
C1C9D540 006EAE88 C8C1D9D9 C9E2E540 | AIN .>.HARRIS |
00320000 00000000 00000000 00000000 BF8C7970 | 1 |

The 1st 4 bytes following the header contains the index of the variable in the variable list (AXRArgLst). The next 4 bytes contain the length of the value. The remainder contains the value of the variable on input to the exec.

SY1 REXXXVARS 04140004 22:01:15.525516 REXX VAR AFTER EXEC

00150032 C1E7D9D4 C1C9D540 C1E7D9D4 | ....AXRMAIN AXRM |
C1C9D540 006EAE88 C8C1D9D9 C9E2E540 | AIN .>.HARRIS |
00320000 00000000 00000000 00000000 BF8C8B61 | 1 |

The 1st 4 bytes following the header contains the index of the variable in the variable list (AXRArgLst). The next 4 bytes should contain the length of the output. The next set of bytes should contain the output variable. If the result was truncated it will contain the truncated result.

The input/output variable contained 1 on entry to the exec and its final value when the exec completed was 101.
Before using this component trace

This topic assumes you have read:
- "Planning for component tracing" on page 333
- "Obtaining a component trace" on page 341
- "Viewing the component trace data" on page 355

The following table summarizes information for requesting a SYSBCPII component trace for base control program internal interface (BCPi).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSBCPII:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTIHWI00</td>
</tr>
<tr>
<td>Default and only member:</td>
<td>CTIHWI00. If no valid</td>
</tr>
<tr>
<td>CTIHWI00 member exists,</td>
<td>SYSBCPII tracing will not</td>
</tr>
<tr>
<td>SYSBCPII tracing will not</td>
<td>automatically activate at BCPii address space initialization.</td>
</tr>
<tr>
<td>Default tracing</td>
<td>If no valid CTIHWI00 member exits, there is no default</td>
</tr>
<tr>
<td>SYSBCPII tracing.</td>
<td></td>
</tr>
<tr>
<td>Trace request OPTIONS</td>
<td>In CTIHWI00 and REPLY for TRACE command</td>
</tr>
<tr>
<td>parameter</td>
<td></td>
</tr>
<tr>
<td>Buffer</td>
<td>• Size: 4M</td>
</tr>
<tr>
<td></td>
<td>• Size set by: BCPii address space</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: No</td>
</tr>
<tr>
<td></td>
<td>• Location: In the component data space</td>
</tr>
<tr>
<td>Trace records location</td>
<td>Data space buffer</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By the component when the operator stops SYSBCPII</td>
</tr>
<tr>
<td></td>
<td>tracing with a TRACE CT,OFF command</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSBCPII)</td>
</tr>
<tr>
<td>Trace format OPTIONS</td>
<td>MIN, ALL</td>
</tr>
<tr>
<td>parameter</td>
<td></td>
</tr>
</tbody>
</table>

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.
Component Trace

The IBM-supplied CTIHWI00 parmlib member initializes minimal error tracing as soon as the HWIBCPII address space starts.

The contents of CTIHWI00 are:
TRACOPTS 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.

**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>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**

- **Example 1: CTIHWI00 member**
  
  The member requests ALL options.
  
  TRACEOPTS
  
  ON
  
  OPTIONS('ALL')

- **Example 2: Trace command Specifying a Parmlib Member:**
  
  trace ct,on,comp=sysbcpii,parm=ctihw100

- **Example 3: Trace command with Options Specified in a REPLY:**
  
  trace ct,on,comp=sysbcpii
  
  * 8 ITT8006A ....
  
  reply 8, options={all}, end
Example 4: Trace command to Stop Tracing:

```
trace ct,off,comp=sysbcpii
```

### Formatting a SYSBCPII trace
Format the trace with an IPCS CTRACE COMP(SYSBCPII) subcommand.

### Output from a SYSBCPII trace

**CTRACE COMP(SYSBCPII) SHORT subcommand output**
The following output is an example of SYSBCPII component trace records formatted with the CTRACE COMP(SYSBCPII) SHORT subcommand:

```
COMPONENT TRACE SHORT FORMAT
COMP(SYSBCPII)
**** 07/25/2008

<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>Message</td>
<td>10012130</td>
<td>13:50:09.359769</td>
<td>HWIPHCPI About to call HWIPHRES</td>
</tr>
<tr>
<td>SY1</td>
<td>Request</td>
<td>100321C0</td>
<td>13:50:09.359963</td>
<td>HWIPHRES HSDB created</td>
</tr>
<tr>
<td>SY1</td>
<td>State</td>
<td>10002007</td>
<td>13:50:09.361439</td>
<td>HWIPHARI Appl Extension located</td>
</tr>
<tr>
<td>SY1</td>
<td>Request</td>
<td>1000200E</td>
<td>13:50:09.368871</td>
<td>HWIPHARI Session Elem defined</td>
</tr>
<tr>
<td>SY1</td>
<td>Request</td>
<td>10002011</td>
<td>13:50:09.369177</td>
<td>HWIPHARI Request Elem created</td>
</tr>
<tr>
<td>SY1</td>
<td>Request</td>
<td>10002005</td>
<td>13:50:09.369328</td>
<td>HWIPHARI Request Elem queued</td>
</tr>
<tr>
<td>SY1</td>
<td>Request</td>
<td>10052220</td>
<td>13:50:09.374042</td>
<td>HWIPHSPI EDB Mds_MU created</td>
</tr>
<tr>
<td>SY1</td>
<td>State</td>
<td>10072351</td>
<td>13:50:09.427487</td>
<td>HWIPHMNX Appl Extension located</td>
</tr>
<tr>
<td>SY1</td>
<td>Request</td>
<td>10072352</td>
<td>13:50:09.427678</td>
<td>HWIPHMNX MDS_MU Req received</td>
</tr>
</tbody>
</table>
```

**CTRACE COMP(SYSBCPII) FULL subcommand output**
The following output is an example of SYSBCPII component trace records formatted with the CTRACE COMP(SYSBCPII) FULL subcommand:

```
COMPONENT TRACE FULL FORMAT
COMP(SYSBCPII)
**** 07/25/2008

<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>Message</td>
<td>10012130</td>
<td>13:50:09.359769</td>
<td>HWIPHCPI About to call HWIPHRES</td>
</tr>
</tbody>
</table>

ASIDHOME. 0018 ASIDPRI.. 0018
JOBNAME.. HWIPBCPII TCBCADDR.. 005DFA48
KEY...... 0004 LEN...... 0026 COUNT.... 0001
BCPii About to pass HSDB to HWIPHRES.

| SY1    | Request  | 100321C0 | 13:50:09.359963  | HWIPHRES HSDB created                           |

ASIDHOME. 0018 ASIDPRI.. 0018
JOBNAME.. HWIPBCPII TCBCADDR.. 005DFA48
KEY...... 0005 LEN...... 003C COUNT.... 0001
CBE2C4C2 080100B4 7ED57A54 00000001 | HSDB....=N:...... |
Component Trace

SY1 State 10002007 13:50:09.361439 HWIPHARI Appl Extension located

ASIDHOME. 0018 ASIDPRI.. 0018
JOBNAME.. HWIBCPII TCBADDR.. 005DFA48

KEY...... 0005 LEN...... 0060 COUNT.... 0001

C8E6C1E7 01100060 00F9000F 00000000 | HWAX...-.9.... |
00000000 00000000 00000000 00000000 | ................. |
00000000 00000000 00000000 00000000 C8E6C9E2 | ............HWIS |
C5D9E540 00000000 00000000 0000001C | ERV ............ |
7F548228 00000000 00000000 00000000 | \b............. |

SY1 Request 1000200E 13:50:09.368871 HWIPHARI Session Elem defined

ASIDHOME. 0018 ASIDPRI.. 0018
JOBNAME.. HWIBCPII TCBADDR.. 005DFA48

KEY...... 0005 LEN...... 0080 COUNT.... 0001

C8E2C540 01100080 C2BE9BC7 013E74E4 | HSE ....B..G...U |
00000000 00000000 7ED54FA0 00000018 | ........=N|..... |
00FB2A00 005DFA48 00000060 00000001 | .....).....-.... |
0000000D 005DFA48 E4E2C9C2 D4E2C340 | .....)..USIBMSC |
E2C3E9D7 F9F0F140 00000000 00000000 | SCZP901 ........ |
00000000 00000000 00000000 00000000 | ................ |
C8E6C9F0 F0F0F0F1 00000000 00C80000 | HWI00001.....H.. |

SYSCEA component trace

Before using this component trace
This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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</td>
</tr>
<tr>
<td></td>
<td>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 |
### Information

<table>
<thead>
<tr>
<th>Request of SVC dump</th>
<th>By DUMP or SLIP command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSCEA)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### 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>
</tbody>
</table>
**Component Trace**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on TRACE CT for Trace?</th>
</tr>
</thead>
<tbody>
<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**
The following shows an example of the formatted IPCS output produced from the CTRACE COMP(SYSCEA) FULL subcommand:

```
COMPONENT TRACE FULL FORMAT
COMP(SYSCEA)
**** 06/09/2008

SYNAME MNEMONIC ENTRY ID TIME STAMP DESCRIPTION
-------- -------- -------- --------------- -------------
SY1     ALL     05030001 11:37:11.181208 CEA CTRACE DEBUG INFO
FFFFB003E 7F47A000 00000000 00000000 | .0"............|
00000000 00000000 00000000 00200000 | ................|
00000000 00000000 7F74ACA0 01000000 | ........".......|
00000000 00000000 00000000 0000 | ..............|
SY1     CNTLFLOW 04010001 11:37:11.181208 CEAS SERVER
00160000 C3C5C140 40404040 0082E2E88 | ....CEA ...h |
```
The following summarizes information for requesting a SYSDLF component trace for the data lookaside facility (DLF).

**Information** | For SYSDLF:
---|---
Parmlib member | None
Default tracing | Yes; always on when DLF is running
Trace request OPTIONS parameter | None
Buffer | • Default: N/A
        • Range: N/A
        • Size set by: MVS system
        • Change size after IPL: No
        • Location: Data space. In the REPLY for the DUMP command, specify DSPNAME=(DLF.CCOFGSDO)
Trace records location | Address-space buffer, data-space buffer
Request of SVC dump | By DUMP or SLIP command
Trace formatting by IPCS | CTRACE COMP(SYSDLF)
Trace format OPTIONS parameter | None

**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.
Component Trace

Output from a SYSDLF trace

CTRACE COMP(SYSDLF) FULL subcommand output

The following 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
SYSDSOM component trace

Before using this component trace

This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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(SYDSOM) 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.
Component Trace

Output from a SYSDSOM trace

**CTRACE COMP(SYSDSOM) FULL subcommand output**

The following output 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.

```
```

<table>
<thead>
<tr>
<th>COMPONENT TRACE FULL FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>KESYS522 METRETRN 00000004 21:31:34.864277 Return from method</td>
</tr>
<tr>
<td>Entry to method: ImplRepository::somInit</td>
</tr>
</tbody>
</table>

The following 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.

```
```

<table>
<thead>
<tr>
<th>COMPONENT TRACE FULL FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSNAME(KESYS522) COMP(SYSDSOM)</td>
</tr>
<tr>
<td>**** 09/29/1995</td>
</tr>
<tr>
<td>SYSNAME MNEMONIC ENTRY ID TIME STAMP DESCRIPTION</td>
</tr>
<tr>
<td>-------- -------- -------- --------------- -------------</td>
</tr>
<tr>
<td>KESYS522 GETBUFF 00000001 21:31:30.198289 Get new trace buffer</td>
</tr>
<tr>
<td>Buffer address: 7F672508</td>
</tr>
<tr>
<td>KESYS522 METDEBUG 00000004 21:31:39.410681 Method debug</td>
</tr>
<tr>
<td>Entry to method: SOMOA::somInit</td>
</tr>
<tr>
<td>KESYS522 METRETRN 00000005 21:31:40.000019 Return from method</td>
</tr>
<tr>
<td>Exiting method: SOMOA::somInit, RC(hex)=00000000, RSN=00000000</td>
</tr>
</tbody>
</table>

The following output 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.

```
```

<table>
<thead>
<tr>
<th>COMPONENT TRACE FULL FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSNAME(KESYS522) COMP(SYSDSOM)</td>
</tr>
<tr>
<td>OPTIONS((SKIPID))</td>
</tr>
<tr>
<td>**** 09/29/1995</td>
</tr>
<tr>
<td>SYSNAME MNEMONIC ENTRY ID TIME STAMP DESCRIPTION</td>
</tr>
<tr>
<td>-------- -------- -------- --------------- -------------</td>
</tr>
<tr>
<td>KESYS522 GETBUFF 00000001 21:31:30.198289 Get new trace buffer</td>
</tr>
<tr>
<td>Buffer address: 7F672508</td>
</tr>
<tr>
<td>KESYS522 METDEBUG 00000004 21:31:39.410681 Method debug</td>
</tr>
<tr>
<td>Entry to method: SOMOA::somInit</td>
</tr>
<tr>
<td>KESYS522 METRETRN 00000005 21:31:40.000019 Return from method</td>
</tr>
<tr>
<td>Exiting method: SOMOA::somInit, RC(hex)=00000000, RSN=00000000</td>
</tr>
</tbody>
</table>

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.
**Component Trace**

**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.

---

**SYSGRS component trace**

---

**Before using this component trace**
This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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</td>
</tr>
<tr>
<td>Default member: CTIGRS00 specified in GRSCNF00 member</td>
<td></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>Range: 128KB - 2047MB (System rounds size up to nearest 64KB boundary.)</td>
<td></td>
</tr>
<tr>
<td>Size set by: CTnGRSxx member</td>
<td></td>
</tr>
<tr>
<td>Change size after IPL: Yes, when restarting a trace after stopping it</td>
<td></td>
</tr>
<tr>
<td>Location: In the GRS address space above the bar.</td>
<td></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(SYSGRS)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>FLOW, CONTROL, MONITOR, REQUEST, SIGNAL, and RSA. See &quot;OPTIONS parameter&quot; on page 387 for details on sub-options.</td>
</tr>
</tbody>
</table>
Component Trace

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>
<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 336 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>
Component Trace

<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-CONTROLF**

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.
Component Trace

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.
Component Trace

REQUEST2
Traces GQSCAN only.

REQUEST3
Traces IXLOCK 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.
TRACEOPTS
ON
OPTIONS('CONTROL','MONITOR','RSA')
BUFSIZE(32M)

Example 2: TRACE command

The example requests a trace of CONTROL, MONITOR, and REQUEST trace events.
trace ct,on,comp=sysgrs
* 17 ITT006A ...
reply 17,options=(control,monitor,request),end
Component Trace

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

CTRACE COMP(SYSGRS) SHORT subcommand output

The following is an example of SYSGRS component trace records formatted with the CTRACE COMP(SYSGRS) SHORT subcommand.

```plaintext
SYSGRS COMPONENT TRACE SHORT FORMAT

GRPXCTL 00000030 13:05:59.858746 GROUP EXIT IN CONTROL
DISRUP 0000000E 13:05:59.858780 RING DISRUPTION TRIGGERED
MAINRF1 0000000B 13:05:59.860196 MAIN RING FAILURE
CEXBCI1 0000000C 13:05:59.860324 CONTROL EXITED FROM ISGBCI
SETUS 00000035 13:06:00.031243 CALL TO XCF SETUS SERVICE
GRPXCTL 00000030 13:06:00.141669 GROUP EXIT IN CONTROL
STAXIN 00000033 13:06:00.160559 STATUS EXIT IN CONTROL
...
```

CTRACE COMP(SYSGRS) TALLY subcommand output

The following is an example of SYSGRS component trace records formatted with the CTRACE COMP(SYSGRS) TALLY subcommand.

```plaintext
COMPONENT TRACE TALLY REPORT
COMP(SYSGRS)
TRACE ENTRY COUNTS AND AVERAGE INTERVALS (IN MICROSECONDS)

FMTID   COUNT   INTERVAL     MNEMONIC     DESCRIBE
-------- -------- ----------- --------------------------
00000001 0        RSAIN1     rsa has no cmd area no qwb data
00000002 0        RSAIN2     rsa has qwb data but no cmd area
00000003 0        RSAIN3     rsa has cmd area but no qwb data
00000004 0        RSAIN4     rsa has cmd area and qwb data
00000005 0        RSAOUT1    rsa has no cmd area no qwb data
00000006 898      2,037,854  RSAOUT2    rsa has qwb data but no cmd area
00000007 0        RSAOUT3    rsa has cmd area but no qwb data
00000008 8        149,924,356 RSAOUT4    rsa has cmd area and qwb data
00000009 5        328,792,726 INVBBE1    ISGBBE - QMERGE
0000000A 0        INVBBE2    ISGBBE - not QMERGE
0000000B 4        490,847,959 MAINRF1    Main Ring Failure
0000000C 13       149,346,135 CEXBCI1    Control Exited from ISGBCI
0000000D 0        CLNQSCD    Cleanup after quiesced from ring
...
00000058 0        UEVENT8    Recovery during write
00000059 0        UEVENT9    Recovery during read
0000005A 0        UEVENTA    Remote discarded message

Total trace entries: 1,120
```
component trace

Before using this component trace

This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

The following summarizes information for requesting a SYSHZS component trace for IBM Health Checker for z/OS.

**Information** | For SYSHZS:
--- | ---
Parmlib member | CTIHZS00
Default tracing | Yes
Trace request OPTIONS parameter | In CTIHZS00 and REPLY for TRACE command
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 393
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>
</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>
<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 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.
Component Trace

**COMMANDS**
Traces information about the F hzsproc command, the HZSPRMxx 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:

```
TRACEOPTS
  ON
  OPTIONS('ALL')
  BUFSIZE(4M)
```

**Example 2: TRACE command**

The example requests a trace of ALL trace events.

```
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**

**CTRACE COMP(SYSHZS) FULL subcommand output**
The following is an example of SYSHZS component trace records formatted with the CTRACE COMP(SYSHZS) FULL subcommand.
Component Trace

B7VB0038 CHECKS 00000001 21:23:37.960765
ASID..0028 ModID..0201 TCB..004E3B58 Stack..7F11A000
Event..Candidat Function..N/A
Owner..IRMSRM
Name..RSM_MEMLIMIT
PQEAddr..7FFD4000 Result..00000000 Diag..00000000 00000000

B7VB0038 STORAGE 00000003 21:23:37.960793 GET/FREE
ASID..0028 ModID..0105 TCB..004E3B58 Stack..7F11A000
Oper..Get Type..PQE CModID..0201 Area@..7FFD5000
IPCS OUTPUT STREAM ----------------------------------- FOUND: LINE 5367 COL 12
Command ===> SCROLL ===> CSR

B7VB0038 STORAGE 00000003 21:24:09.757964 GET/FREE
ASID..0028 ModID..0105 TCB..004E3B58 Stack..7EEDA000
Oper..Get Type..CMDI CModID..0116 Area@..7FFE0000

B7VB0038 COMMANDS 00000002 21:24:09.757966
ASID..0028 ModID..0116 TCB..004E3B58 Stack..7EEDA000
Command..Display
Keywords..00000100 00000010 00000000 00000000
Owner..................
Name...................................
PolStmt..N/A

B7VB0038 STORAGE 00000003 21:24:09.762583 GET/FREE
ASID..0028 ModID..0105 TCB..004E3B58 Stack..7F13E000
Oper..Free Type..CMDI CModID..0703 Area@..7FFE0000

B7VB0038 STORAGE 00000003 21:28:25.209146 GET/FREE
ASID..0028 ModID..0105 TCB..004E3B58 Stack..7EEDA000
Oper..Get Type..CMDI CModID..0116 Area@..7FFE0000

B7VB0038 COMMANDS 00000002 21:28:25.209148
ASID..0028 ModID..0116 TCB..004E3B58 Stack..7EEDA000
Command..Display
Keywords..00000100 00000000 00000000 00000000
Owner..................
Name...................................
PolStmt..N/A

B7VB0038 MISC 00000004 21:28:41.204631
ASID..0028 ModID..0304 TCB..004E3B58 Stack..7F13E000
+0000 D9C5C3E5 C8E9E2E3 D2C4C9E2 840E0000 | RECVHZSTKDISd... |
+0010 00000028

SYSIEFAL component trace

Before using this component trace
This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355
The following summarizes information for requesting a SYSIEFAL component trace for Allocation.

### Information for SYSIEFAL:

- **Parmlib member**: CTIIEFxx
- **Default member**: CTIIEFAL
- **Default tracing**: Yes; FLOW0, FLOW1, FLOW6, DATA, CONTROL0, CONTROL1, CONTROL6, and SERIAL1 options
- **Trace request OPTIONS parameter**: In CTIIEFxx or REPLY for TRACE command
- **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, and DATA

### 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')
```
Component Trace

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 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 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 CTIIFFxx parmlib member and reply for a TRACE command are listed below. The sub-options 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 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 DATA, and all of its sub-options (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.
Component Trace

**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-CONTROLF**
Reserved for IBM use.

**CONTROLG**
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.
Component Trace

DATAA-DATAE
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–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: CTIEFxx member

The member requests FLOW and DATA options and requests a buffer size of 8 megabytes.

```
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. It is possible to use the OPTIONS subcommand for COMP (SYSIEFAL) with values of FLOW, DATA, and SERIAL for filtering.

Output from a SYSIEFAL trace

CTRACE COMP(SYSIEFAL) SHORT subcommand output

The following 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
SYSTYPE MMEMONIC ENTRY ID TIME STAMP DESCRIPTION
-------- -------- ---------- --------------- ---------------
N67      FLOW0  00000100 15:40:34.104633 Common Allocation Flow
N67      CONTROL0 00000200 15:40:34.104639 Common Allocation Control
N67      CONTROL0 00000200 15:40:34.104693 Common Allocation Control
N67      CONTROL0 00000200 15:40:34.104852 Common Allocation Control
N67      FLOW0  00000100 15:40:34.104859 Common Allocation Flow
N67      FLOW0  00000100 15:40:34.106631 Common Allocation Flow
N67      FLOW0  00000100 15:40:34.125582 Common Allocation Flow
```

CTRACE COMP(SYSIEFAL) FULL subcommand output

The following 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
```

<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>15:40:47.306228</td>
<td>Common Allocation Flow</td>
</tr>
<tr>
<td>ASID..007A</td>
<td>TCB..008E1980</td>
<td>MODNAME..IEFAB492</td>
<td>JOBNAME..T015067</td>
<td></td>
</tr>
<tr>
<td>EBCDIC Data...</td>
<td>ENTR</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Before using this component trace

This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

**SYSIOS component trace**

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 403.
- 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:
## Component Trace

<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>
| 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

**Note:** Additional areas are traced when OPTIONS are set for IOS component trace. See “OPTIONS parameter” on page 403.

### 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. In addition to this tracing, the user can request a SYSIOS trace using specific options by doing the following:
## Component Trace

- Using a CTnIOSxx SYS1.PARMLIB member during NIP processing by specifying the CTRACE(CTnIOSxx) 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.

#### 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 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>
Component Trace

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.

Notes:
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 340 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...
Component Trace

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.

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.

TRACEOPTS
  ON
  BUFSIZE(600K)
  OPTIONS(STORAGE)
  JOBNAME(JOB001)

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:

IPCS CTRACE COMP(SYSIOS) SUMMARY|FULL|SHORT|TALLY

Where:

SUMMARY Show 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.
## Component Trace

### CTRACE COMP(SYSIOS) SUMMARY

<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>S530</td>
<td>MIH</td>
<td>00080001</td>
<td>19:42:42.220726</td>
<td>MIH Recovery Halt/Clear Block</td>
</tr>
</tbody>
</table>

Trace Record Function: MIH
MIH condition detected: Start Pending

<table>
<thead>
<tr>
<th>Record ID: IOSDMHCB.MHCBSHIX</th>
<th>Length: 0034</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0000 00F168E8 28980180 F00000F0 0027FF00</td>
<td>.1.Y.........0...0</td>
</tr>
<tr>
<td>+0010 386888B8 FFFFFFFF 00000000 00804400</td>
<td>...Y............</td>
</tr>
<tr>
<td>+0020 3885DA88 00000000 00000000</td>
<td>.e.h............</td>
</tr>
<tr>
<td>+0030 00000000</td>
<td>....</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record ID: IOSDMHCB.MHCBUCB</th>
<th>Length: 0080</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0000 00000940 20200000 01E13480 00000000</td>
<td>... ............</td>
</tr>
<tr>
<td>+0010 00000000 00FCB8B4 00F16890 00000000</td>
<td>...........H.1....</td>
</tr>
<tr>
<td>+0020 00400400 00FC3800 00FC3100 0001001F</td>
<td>... ............</td>
</tr>
<tr>
<td>+0030 28980027 F0008OF0 38688888 FFFFFF</td>
<td>.q...0...0...Y....</td>
</tr>
<tr>
<td>+0040 01000040 00000000 00000000 00000000</td>
<td>00FC3800</td>
</tr>
<tr>
<td>+0050 008FF84 01800800 00F16968 00F1F0F0</td>
<td>.h.d.....1...180</td>
</tr>
<tr>
<td>+0060 00062024 00F168C0 00010100 F1F0F07</td>
<td>......1........180</td>
</tr>
<tr>
<td>+0070 C1D21000 00000000 00000000</td>
<td>AK.............</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record ID: IOSDMHCB.MHCBTMJB</th>
<th>Length: 0018</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0000 ACA29DF9 49B6E706 F0F0F0F0 00F1F0F0</td>
<td>.s..X.000001500</td>
</tr>
<tr>
<td>+0010 5CD4C1E2 E3C5095C</td>
<td>MASTER</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record ID: IOSDMHCB.MHCBADDL</th>
<th>Length: 0008</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0000 BCBC2010 0100040</td>
<td>.........</td>
</tr>
</tbody>
</table>

S530 U/R 00000001 19:42:52.885939 Unconditional Reserve Sense

Device: 0180 Channel Path: 38
U/R Sense issued by: Missing Interrupt Handler
U/R Sense completion code: 52
Component Trace

SYSJES component trace

Before using this component trace
This topic assumes you have read:
* “Planning for component tracing” on page 333
* “Obtaining a component trace” on page 341
* “Viewing the component trace data” on page 355

The following summarizes information for requesting a SYSJES component trace for the JES common coupling services component, also known as JES XCF.
Component Trace

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSJES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTTnJESxx</td>
</tr>
<tr>
<td></td>
<td>Default members: CTIJES01, CTIJES02, CTIJES03,</td>
</tr>
<tr>
<td>Default tracing</td>
<td>CTIJES04</td>
</tr>
<tr>
<td>Trace request OPTIONS</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>Trace records location</td>
<td>Address-space buffer, trace data set</td>
</tr>
<tr>
<td>Request of SVC dump</td>
<td>By the component</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>[TRACE COMP(SYSJES)]</td>
</tr>
<tr>
<td>Trace format OPTIONS</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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 IXZIXSM 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.

- **XCFEVT, system event (SYSEVENT) tracing:** XCFEVT records SYSEVENT data processed by the JES common coupling services component. By default, XCFEVT 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.
Component Trace

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.

Example: Cataloged procedure for SYSJES

The following example shows an external writer procedure, IXZCTW, that sends SYSJES trace output to trace data sets.

```
//CTWDASD PROC
//IEFPROC 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
```

- 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>
</tbody>
</table>
Component Trace

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnJESxx?</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>SUB</td>
<td>Yes</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>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**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:

```
TRACEOPTS
OFF
```

The default contents of parmlib members CTIJES03 is:

```
TRACEOPTS
ON
```

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.
Example: Turning on tracing in a CTIJESxx member

The following 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.

```
TRACEOPTS
  WTRSTART(IXZCTW)
  ON
  WTR(IXZCTW)
```

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.

Example: Return to default in a CTIJESxx member

The following example shows the CTIJES01, CTIJES02, and CTIJES04 parmlib members after having been returned to their original contents, with tracing set off.

```
TRACEOPTS
  OFF
```

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.”
- Specify SYSJES options on the OPTIONS parameter. See “OPTIONS parameter for formatting a SYSJES trace” on page 412.
- Merge the output from the different sublevels requested. See “Merging SYSJES information from sublevels” on page 412.

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:
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
CTRACE COMP(SYSJES) SUB((XCFEVT)) FULL
CTRACE COMP(SYSJES) SUB((FLOW)) FULL
MERGEEND

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 for information on writing a CLIST.

Output from a SYSJES trace
The following is an example of merged output from the four SYSJES sublevel traces with the FULL parameter specified:
Component Trace

********** MERGED TRACES **********
01. CTRACE comp(sysjes) sub((flow)) full
02. CTRACE comp(sysjes) sub((usrxit)) full
03. CTRACE comp(sysjes) sub((msgtrc)) full
04. CTRACE comp(sysjes) sub((xcfevt)) full

**COMPONENT TRACE FULL FORMAT**
SYSNAME(SY1)
COMP(SYSJES) SUBNAME((FLOW))

**COMPONENT TRACE FULL FORMAT**
SYSNAME(SY1)
COMP(SYSJES) SUBNAME((USRXIT))

**COMPONENT TRACE FULL FORMAT**
SYSNAME(SY1)
COMP(SYSJES) SUBNAME((MSGTRC))

**COMPONENT TRACE FULL FORMAT**
SYSNAME(SY1)
COMP(SYSJES) SUBNAME((XCFEVT))

**** 10/25/93

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>04. XCFEVT</td>
<td>00000030</td>
<td>16:53:54.876999</td>
<td>XCF event message buffer</td>
</tr>
</tbody>
</table>

HOMEASID 0013  JOBNAME. JESXCF  HOMETCB@ 007EA6F8
CPUID... FF170945 30900000  CTCR0... 03062460 MEMBER.. SY1
SYSNAME. SY1
MSGBUF0. 20000014 ALET.... 010101B REQTOKEN 00000001 20000014
MSGTOKEN 00000001 20000014

+0000 EBC9E7C5 D5400100 00000001 00000001 | YIXEN .......... |
+0010 E2EBE2E9 D1C5E2F3 E2EBE2C5 E5C5D5E3 | SYSEVENT |
+0020 40404040 40404040 E2EBE2E9 D1C5E2F3 | SYSEVENT |
+0030 40404040 40404040 E2EBE2E9 D1C5E2F3 | SYSEVENT |
+0040 E2EBE2C5 E5C5D5E3 40404040 40404040 | SYSEVENT |
+0050 E2EBE2C5 E5C5D5E3 40404040 40404040 | SYSEVENT |
+0060 10001000 B0000108 01140000 00000000 | SYSEVENT |
+0070 00000000 A849C5A7 AE08EC01 00000000 | SYSEVENT |
+0080 00000000 00000000 00000000 00000000 | SYSEVENT |
## Component Trace

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<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>02. PREXIT3</td>
<td>00000007</td>
<td>16:53:55.303610</td>
<td>SPELL prior to Exit 3 processing</td>
</tr>
<tr>
<td>HOMEASID</td>
<td>0017</td>
<td>JOBNAME. JES3</td>
<td>HOMETCB0</td>
</tr>
<tr>
<td>CPUID...</td>
<td>FF170945</td>
<td>3090000000</td>
<td>CTCR@...</td>
</tr>
<tr>
<td>MEMBER..</td>
<td>SY1</td>
<td>SYSNAME. SY1</td>
<td>XPLBUF@.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 10/25/93

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>02. POSTXIT3</td>
<td>00000008</td>
<td>16:53:55.306462</td>
<td>SPELL after Exit 3 processing</td>
</tr>
<tr>
<td>HOMEASID</td>
<td>0017</td>
<td>JOBNAME. JES3</td>
<td>HOMETCB0</td>
</tr>
<tr>
<td>CPUID...</td>
<td>FF170945</td>
<td>3090000000</td>
<td>CTCR@...</td>
</tr>
<tr>
<td>MEMBER..</td>
<td>SY1</td>
<td>SYSNAME. SY1</td>
<td>XPLBUF@.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 10/25/93

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>03. INDATA</td>
<td>0000011</td>
<td>16:55:17.318441</td>
<td>input message data</td>
</tr>
<tr>
<td>HOMEASID</td>
<td>0017</td>
<td>JOBNAME. JES3</td>
<td>HOMETCB0</td>
</tr>
<tr>
<td>CPUID...</td>
<td>FF170945</td>
<td>3090000000</td>
<td>CTCR@...</td>
</tr>
<tr>
<td>MEMBER..</td>
<td>SY1</td>
<td>SYSNAME. SY1</td>
<td>MSGBUF0.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Component Trace

---

z/OS V1R13.0 MVS Diagnosis: Tools and Service Aids
## Component Trace

### 02. EXIT1ERR 00000003 16:55:17.474658 SPELL error Exit 1 processing
HOMEASID 0017 JOBNAME. JES3 HOMETCB0 007FD28B
CPUID... FF170945 30900000 CTCR0... 03062460 MEMBER.. SY1
SYSNAME. SY1

- XPLBUF0. 1FFFF814
- MSGBUF0. 1FFFF814 ALET.. 0102001B REQTOKEN 00000001 1FFFF814
- MSGTOKEN 00000001 1FFFF814

```plaintext
+0000  E950E707 D34000100 C9E7E9E7 C9E3F0F1 Z$XPL ..IXZXIT01
+0010  40404040 40404040 40000000 20000000 ..............
+0020  00000000 00000000 00000000 00000000 ..............
+0030  00000000 00000000 E2E8E2E9 D1C5E2F3 ........SYSZJES3
+0040  E2E8F240 40404040 40404040 40404040 SY2
+0050  E2E8E2D1 C5E24040 C3D6505E2 C5D9E540 SY5JES CONSERV
+0060  E2E8E2E9 D1C5E2F3 E2E8F140 40404040 SY5JES3SY1
+0070  40404040 40404040 E2E8E2D1 C5E24040 SYSJES
+0080  C3D6505E2 C5D9E540 00000010 1FFFF84B CONSERV ......4.
+0090  00000000 00000000 00000000 00000000 ..............
+00A0  E3C9E2E4 40C9E240 C1D540C1 E2E8E2D3 THIS IS AN ASYNC
+00B0  CBC1C3D2 40D4C5E2 E2C1C7C5 40404040 HACK MESSAGE
+00C0  40404040 40404040 40404040 40404040
+00D0  40404040 40404040 40404040 40404040
+00E0  40404040 40404040 40404040 40404040
+00F0  40404040 40404040 40404040 40404040
+0100  40404040 40404040 40404040 40404040
+0110  40404040 40404040 40404040 40404040
+0120  40404040 40404040 40404040 40404040
+0130  40404040 40404040 40404040 40404040
+0140  40404040 40404040 40404040 40404040
+0150  40404040 40404040 40404040 40404040
+0160  40404040 40404040 40404040 40404040
+0170  40404040 40404040 40404040 40404040
+0180  40404040 40404040 40404040 40404040
+0190  40404040 40404040 40404040 40404040
```

### 03. SEND 00000010 16:55:17.568558 message queued to be sent
HOMEASID 0013 JOBNAME. JESXCF HOMETCB0 007EA6F8
CPUID... FF170945 30900000 CTCR0... 03062460 MEMBER.. SY1
SYSNAME. SY1

- MSGBUF0. 1FFFF814 ALET.. 0102001B REQTOKEN 00000001 1FFFF814
- MSGTOKEN 00000001 1FFFF814

```plaintext
+0000  E8C9E7C5 D54000100 00000001 00000001 YIXEN .........
+0010  E2E8E2E9 D1C5E2F3 E2E8F240 40404040 40404040 SY5JES3SY2
+0020  40404040 40404040 E2E8E2D1 C5E24040 SYSJES
+0030  C3D6505E2 C5D9E540 E2E8E2E9 D1C5E2F3 CONSERV SY5JES3
+0040  E2E8F140 40404040 40404040 40404040 SY1
+0050  E2E8E2D1 C5E24040 C3D6505E2 C5D9E540 SYSJES CONSERV

```

The following 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

**COMPONENT TRACE TALLY REPORT**  
**SYSNAME(SY1)**  
**COMP(SYSJES) SUBNAME((FLOW))**

<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>6,902,004</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))**

<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 queuing 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>RECEBUF</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>RECEQERR</td>
<td>Receiveq queuing error</td>
</tr>
</tbody>
</table>

Total trace entries: 79

**COMPONENT TRACE TALLY REPORT**  
**SYSNAME(SY1)**  
**COMP(SYSJES) SUBNAME((XCFEVT))**

<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))**

<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>0</td>
<td>PREXIT1</td>
<td>SPELL prior to Exit 1 processing</td>
</tr>
<tr>
<td>00000002</td>
<td>0</td>
<td>0</td>
<td>POSTXIT1</td>
<td>SPELL after Exit 1 processing</td>
</tr>
<tr>
<td>00000003</td>
<td>1</td>
<td>0</td>
<td>EXIT1ERR</td>
<td>SPELL error Exit 1 processing</td>
</tr>
<tr>
<td>00000004</td>
<td>1</td>
<td>0</td>
<td>PREXIT2</td>
<td>SPELL prior to Exit 2 processing</td>
</tr>
<tr>
<td>00000005</td>
<td>0</td>
<td>0</td>
<td>POSTXIT2</td>
<td>SPELL after Exit 2 processing</td>
</tr>
<tr>
<td>00000006</td>
<td>1</td>
<td>0</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>0</td>
<td>EXIT3ERR</td>
<td>SPELL error Exit 3 processing</td>
</tr>
</tbody>
</table>

Total trace entries: 32
SYSjes2 component trace

Before using this component trace

This topic assumes you have read:

- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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.

### Information

<table>
<thead>
<tr>
<th>Parmlib member</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<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>

<table>
<thead>
<tr>
<th>Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default: N/A</td>
</tr>
<tr>
<td>Range: N/A</td>
</tr>
<tr>
<td>Size set by: JES2</td>
</tr>
<tr>
<td>Change size after IPL: No</td>
</tr>
<tr>
<td>Location: In the component address space</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trace records location</th>
<th>Address-space buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request of SVC dump</td>
<td>By the component, or DUMP or SLIP</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSjes2)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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, $QIX, $GETJLOK, $QRBDCHK, $QBUSY, $GETLOKW, $FREJLOK, and $FRELOKW).

- **JOE service tracing**: JOE records all job output element service calls (to include: $#ADD, $#PUT, $#REM, $#MOD, $#RBDChek, $#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.

The following is an example of merged output from both SYSjes2 sublevel traces with the FULL parameter specified:

```
********** MERGED TRACES **********
01. CTRACE comp(sysjes2) sub((jqe)) full
02. CTRACE comp(sysjes2) sub((joe)) full
```

The following is an example of merged output from both SYSjes2 sublevel traces with the SHORT parameter specified:

```
**************************************** short format screen ******************************
COMPONENT TRACE SHORT FORMAT
COMP(Sysjes2) SUBNAME((JQE))
**** 07/11/94

SYSTYPE       MNEMONIC ENTRY ID     TIME STAMP  DESCRIPTION
-------------- --------- ----------- ----------- ------------
MVS1           JQE    00000200 14:33:35.162400 $QADD
MVS1           JQE    00000204 14:33:35.162404 $QJIX (ALLOC new number)
MVS1           JQE    00000200 14:33:36.174242 $QADD
```

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.
The following is an example of merged output from both SYSjes2 sublevel traces with the TALLY parameter specified:

**full format screen**

```
COMPONENT TRACE FULL FORMAT
COMP(SYSjes2) SUBNAME((JQE))
*** 07/11/94

<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>MVS1</td>
<td>JQE</td>
<td>00000200</td>
<td>14:33:35.162400</td>
<td>$QADD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>03B06C20</td>
<td>00000000 00000064 FF200100</td>
<td>..%.............</td>
</tr>
</tbody>
</table>
|         |          | 00000000 0000 | ...   | ...
| MVS1    | JQE      | 00000204 | 14:33:35.162404 | $QJIX (ALLOC new number) |
|         |          | 03B06C20 | 00000001 00000064 20200010 | ..%............. |
|         |          | 04000000 0000 | ...   | ...
| MVS1    | JQE      | 00000200 | 14:33:36.174242 | $QADD |
```

**tally format screen**

```
COMPONENT TRACE TALLY REPORT
COMP(SYSjes2) SUBNAME((JQE))

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>00000200</td>
<td>12</td>
<td>96,278,898</td>
<td>JQE</td>
<td>$QADD</td>
</tr>
<tr>
<td>00000201</td>
<td>0</td>
<td>JQE</td>
<td>$QPUT</td>
<td></td>
</tr>
<tr>
<td>00000202</td>
<td>0</td>
<td>JQE</td>
<td>$QREM</td>
<td></td>
</tr>
<tr>
<td>00000203</td>
<td>30</td>
<td>36,473,953</td>
<td>JQE</td>
<td>$QMOD</td>
</tr>
<tr>
<td>00000204</td>
<td>12</td>
<td>96,278,898</td>
<td>JQE</td>
<td>$QJIX (ALLOC new number)</td>
</tr>
<tr>
<td>00000205</td>
<td>0</td>
<td>JQE</td>
<td>$QJIX (SWAP job numbers)</td>
<td></td>
</tr>
<tr>
<td>00000206</td>
<td>5</td>
<td>273,117,249</td>
<td>JQE</td>
<td>$GETJLOK</td>
</tr>
<tr>
<td>00000207</td>
<td>5</td>
<td>274,068,170</td>
<td>JQE</td>
<td>$FREJLOK</td>
</tr>
</tbody>
</table>

Total trace entries: 89
```

The following summarizes information for requesting a SYSLLA component trace for library lookaside (LLA) of contents supervision.
Component Trace

<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
This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

The following table summarizes information for requesting a SYSLOGR component trace for the system logger component.

Table 24. Summary of SYSLOGR component trace request

<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, DATA SET, 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>
</tbody>
</table>
Table 24. Summary of SYSLOGR component trace request (continued)

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSLOGR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer</td>
<td>• Parmlib default: 16MB&lt;br&gt;• Default: 2MB&lt;br&gt;• Range: 2MB - 2047MB&lt;br&gt;• Size set by: CTnLOGxx parmlib member or REPLY&lt;br&gt;for TRACE CT command.&lt;br&gt;• Change size after IPL: Yes&lt;br&gt;• 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>

SYSLOGR tracing is started during initialization.

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 'SYSI.SAMPLIB(IEMDCLx)'. Refer to the IEMDCLx members for more information, or see Table 7 on page 21.

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)<br>**rr IEE994D SPECIFY OPERAND(S) FOR DUMP COMMAND<br>rr JOBNAME=('IXGLOGR'),CONT<br>ss DSPNAME=('IXGLOGR',SYSLOGR),CONT<br>tt SDATA=(COUPLE,ALLNUC,LPA,LSQA,PSA,GRG,SGA,SUM,<br>TRT,CSA,GRGQ,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, XEDATA), CONT
uu, STRLIST=(STRNAME=structure_name, LOCKENTRIES, ACC=NOLIM, (LISTNUM=ALL, ADJUNCT=DIRCTIO, 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, XEDATA), CONT
uu, STRLIST=(STRNAME=structure_name, LOCKENTRIES, ACC=NOLIM, (LISTNUM=ALL, ADJUNCT=DIRCTIO, 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 24 on page 420.

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 (IXLOGCRS). (S IXLOGCRS

)

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.

Notes:

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

Component Trace
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:

```
SLIP SET,COMP=1C5,REASON=804,
STRLIST=(STRNAME=strname1,LOCKE,ACC=NOLIM,
(LNUM=ALL,EDATA=SER,ADJ=CAP)),
JL=(XCFAS,IXGLOGR),DN=("XCFAS".*,"IXGLOGR".*),
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:

- IXGCNFXxx SYS1.PARMLIB member (see IXGCNFXXX 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 421) 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,DATA SET,SERIAL,MISC,LOCBUFF,RECOVERY')
```

These parameters turn on the minimal 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.

**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)')
```
**Component Trace**

**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, nnnM, 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 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>DATA SET</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.
Component Trace

ASID
Traces events for only the specified address space identifiers (ASID).

COMPERR
Traces internal system logger errors.

CONNECT
Traces list structure connections, disconnections, rebuild and event exit processing.

DATA SET
Traces log stream data set allocation and management.

INVENTORY
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, INVENTORY, and DATA SET 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.

strmname
Component Trace

DATA SET
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

CTRACE COMP(SYSLOGR) subcommand output
The following 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 C9C7F0F3 40404040 40404040 | IXCS1G03
E2D3C3E3 C5E2E3F1 0100 | SLCTEST1...

RECOVERY 07040001 13:03:58.055519 System Logger Services
C9E7C7C3 F4D9C6C3 840C1000 00000001 | IXGC4RFCd........
031700A0 0000 | ......|

RECOVERY 07040001 13:09:55.907719 System Logger Services
C9E7C7C3 F4D9C6C3 840C1000 00000001 | IXGC4RFCd........
031700A0 0000 | ......|

COMPERR 01070007 13:30:58.322696 System Logger Services
E2E8E2F0 F0F0F0F1 C9E7C7D3 D6C7D94B | SYS00001IXGLOGR.
E2C3D6E3 E3F34BC1 F0F0F0F0 F0F0F140 | SCOTT3.A0000001
40404040 40404040 40404040 40404040 |
40404040 0000 | ..

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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</td>
</tr>
<tr>
<td></td>
<td>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>
<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>
</tbody>
</table>
Parameters Allowed on CTnBPXxx?

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Allowed on CTnBPXxx?</th>
</tr>
</thead>
<tbody>
<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 userid(s) specified in the JOBNAME list. This filtering is based on the userid 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:

```plaintext
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>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 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.
Component Trace

LOCK
   Formats locking services events.

PIPE
   Formats pipe events.

PROCESS
   Formats process events.

PTRACE
   Formats PTRACE events.

SCOUNTS
   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" 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:
**Component Trace**

---------- CTRACE DISPLAY PARAMETERS ---------- Enter option
COMMAND ===>

System ===>
Component ===> SYSOMVS (Component name (required))
Subnames ===>

GMT/LOCAL ===> G (G or L, GMT is default)
Start/time ===> (mm/dd/yy,hh:mm:ss:ddddd or
Stop time ===> mm/dd/yy,hh:mm:ss:ddddd)
Limit ===> 0 Exception ===>
Report type ===> SHORT (SShort, 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.

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.

**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 SCOUNTS option ---
The example requests the SCOUNTS option to count the number of syscalls from within the trace.

CTRACE COMP(SYSOMVS) FULL OPTIONS((SCCOUNTS))

**Output from a SYSOMVS trace**

**CTRACE COMP(SYSOMVS) FULL subcommand output**
The following is an example of SYSOMVS component trace records formatted with the CTRACE COMP(SYSOMVS) FULL subcommand.
### Component Trace

**COMPONENT TRACE FULL FORMAT**

**COMP(SYSOMVS)**

<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>SY1</td>
<td>XCF</td>
<td>0D890407</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>ASID..0025 USERID....WELLIE1 STACK0....2566DF18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TCB...009E04A0 EUID.........00000008 SYSCALL...00000036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 E2C5DC54 80180101 02000001 000A0002 SEND ..........</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 B2D8CB52 28F5AC7 78A70500 403E3000 ..H.-!G#x...</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 01FF0006 00081878 C6000000 ........a.F...</td>
</tr>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>0D890401</td>
<td>18:14:14.551325</td>
<td>NXMSO--&gt;XCF MESSAGE OUT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..0025 USERID....WELLIE1 STACK0....2566DF18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TCB...009E04A0 EUID.........00000008 SYSCALL...00000036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 E2EBD5C3 80A001D3 0A010014 0170BD4 SYNC...L......M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 00130000 02000001 000A0002 0004C4B ..{(.........&lt;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 78A70500 000080E0 00000000 00000000 #x......\</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 006F0000 00300256 009E04A0 00000008 ?...............</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 2538E980 01000000 ........Z......</td>
</tr>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>0D890402</td>
<td>18:14:14.554457</td>
<td>NXMSG--&gt;XCF MESSAGE SRB EXIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..000E USERID....OMVS STACK0....2538F28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TCB...00000000 EUID.........00000000 SYSCALL...00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 D9C5E2D7 B4600101 0906C68 00000000 RESP.-....%.....</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 00030000 0A010014 01170BD4 0013402C ............M.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 02000001 000A0002 00000110 01FF0006 ............</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 03000998 24C02910 00080800 00000000 ...Q...............</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 00000000 00000000 ..........</td>
</tr>
</tbody>
</table>

**SY1**

| ASID..0025 USERID....WELLIE1 STACK0....2566DF18 |
| TCB...009E04A0 EUID.........00000008 SYSCALL...00000036 |
| +0000 C6D9C5C5 10000100 00000000 00000000 FREE............. |
| +0010 00000000 00000000 00000000 00000000 ................... |
| +0020 00000000 00000000 00000000 00000000 ................... |
| +0030 006F0000 00000000 00000000 00000000 ?............... |
| +0040 00000000 2538E980 00000000 ...........Z..... |

---

**Figure 33. SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) FULL**

*Part 1 of 2*
SY1 trace flow: Figure 34 on page 436 and Figure 35 on page 436 contain the SY1 trace information found in Figure 33 on page 434.

Figure 34 on page 436 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.
Figure 35 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.

Component Trace

<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>SY1</td>
<td>XCF</td>
<td>0D890407</td>
<td>18:14:14.551107</td>
<td>NXFST--WRITE XCF BUFFER</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#ASID..0025 USERID....WELLE1 STACK0....2566DF18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#TCB...009E04A0 EUID........00000008 SYSCALL...00000036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 E2C5D5C4 80180101 02000001 000A0002</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 B20BC852 285F5AC7 078A70500 403E3000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 01FF0006 00000178 C6000000</td>
</tr>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>0D6F0401</td>
<td>18:14:14.551325</td>
<td>NXMSO--&gt;XCF MESSAGE OUT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#ASID..0025 USERID....WELLE1 STACK0....2566DF18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#TCB...009E04A0 EUID........00000008 SYSCALL...00000036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 E2E0D5C3 80A001D3 10A010014 +01170BD4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 0013C000 02000001 00A00002 00040C48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 078A70500 000080E0 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 06DF0000 0030025 09E04A0 00000008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 2538E980 01000000</td>
</tr>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>0D690402</td>
<td>18:14:14.554457</td>
<td>NXMSG--&gt;XCF MESSAGE SRB EXIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..000E USERID....OMVS STACK0....25385F28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TCB...00000000 EUID........00000000 SYSCALL...00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 D9C5E2D7 84600101 009D6C68 00000080</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 00300000 10A010014 +01170BD4 0013C002</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 02000001 00A00002 00000118 01FF0006</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 0300098 24C02910 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 00000000 00000000</td>
</tr>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>0D6F0401</td>
<td>18:14:14.554513</td>
<td>NXMSO--&gt;XCF MESSAGE OUT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#ASID..0025 USERID....WELLE1 STACK0....2566DF18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#TCB...009E04A0 EUID........00000008 SYSCALL...00000036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 C6D9C5C5 10000100 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 06DF0000 00000000 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 2538E980 01000000</td>
</tr>
</tbody>
</table>

# - ASID / TCB of requester
$ - Buffer address containing request
! - Block #, Index into NXRQ
* - Unique Request-ID = System number w/ 3byte seq#

Figure 34. SY1 Trace Flow: Part 1

Figure 35 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.

<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>SY1</td>
<td>XCF</td>
<td>0D690402</td>
<td>18:14:14.554457</td>
<td>NXMSG--&gt;XCF MESSAGE SRB EXIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASID..000E USERID....OMVS STACK0....25385F28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TCB...00000000 EUID........00000000 SYSCALL...00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 D9C5E2D7 84600101 009D6C68 00000080</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 00300000 10A010014 +01170BD4 0013C002</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 02000001 00A00002 00000118 01FF0006</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 0300098 24C02910 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 00000000 00000000</td>
</tr>
<tr>
<td>SY1</td>
<td>XCF</td>
<td>0D6F0401</td>
<td>18:14:14.554513</td>
<td>NXMSO--&gt;XCF MESSAGE OUT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#ASID..0025 USERID....WELLE1 STACK0....2566DF18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>#TCB...009E04A0 EUID........00000008 SYSCALL...00000036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0000 C6D9C5C5 10000100 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0010 00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0020 00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0030 06DF0000 00000000 00000000 00000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+0040 00000000 2538E980 01000000</td>
</tr>
</tbody>
</table>

# - ASID / TCB of requester
$ - Buffer address containing request
! - Block #, Index into NXRQ
* - Unique Request-ID = System number w/ 3byte seq#

Figure 35. SY1 Trace Flow: Part 2

SY2 trace flow: Figure 36 on page 437 and Figure 37 on page 438 contain the SY2 trace information found in Figure 33 on page 434
Figure 36 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.

Component Trace

Figure 36 on page 438 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.
Component Trace

<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>00890407</td>
<td>18:14:14.55581</td>
<td>XCF BUFFER I/O TRACE</td>
</tr>
</tbody>
</table>

#ASID..0025 USERID....OMVS STACK0....25CF0000
#TCB...009E04A0 EUID........00000008
FCODE.0003 %SYSNAME...SY1
+0000 E2C5D5C4 81800101 01000001 000A0001 | SEND............ |
+0010 B20BCB52 29111412 @7F636AD8 40180000 | ..H........Q ... |
+0020 01FF0066 00000118 C6000000 | ........F... |

SY2 XCF 06DF0401 18:14:14.554039 NXMSO-->XCF MESSAGE OUT

#ASID..0025 USERID....OMVS STACK0....25CF0000
#TCB...009E04A0 EUID........00000008
FCODE.0003 %SYSNAME...SY1
+0000 D9C5DE07 20200203 I0A0102014 +01178D04 | RESP....L.......M |
+0010 50013402C 01000001 000A0001 00002BBC | .. ................ |
+0020 07F636AD8 00000080 00000000 00000000 | *.Q............ |
+0030 06DF0000 00000000 00000000 00000000 | ?........%.... |
+0040 253A4088 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 37. SY2 Trace Flow: Part 2

Control block trace: The following 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 38. Control block trace output

CTRACE COMP(SYSOMVS) SHORT subcommand output

The following is an example of SYSOMVS component trace records formatted with the CTRACE COMP(SYSOMVS) SHORT subcommand.
Component Trace

COMPONENT TRACE SHORT FORMAT
COMP(SYSOMVS)
**** 06/17/92

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSCALL</td>
<td>0F000002</td>
<td>22:02:42.314264</td>
<td>STANDARD SYSCALL EXIT TRACE</td>
</tr>
<tr>
<td>SYSCALL</td>
<td>0F000001</td>
<td>22:02:42.821156</td>
<td>STANDARD SYSCALL ENTRY TRACE</td>
</tr>
<tr>
<td>PROCESS</td>
<td>0B000007</td>
<td>22:02:42.821219</td>
<td>PROCESS LATCH OBTAIN</td>
</tr>
<tr>
<td>PROCESS</td>
<td>0B00000A</td>
<td>22:02:42.821256</td>
<td>PROCESS LATCH-ON THE WAY OUT</td>
</tr>
<tr>
<td>FILE</td>
<td>05700103</td>
<td>22:02:42.821324</td>
<td>TRACE CALL TO VN_RDWR</td>
</tr>
<tr>
<td>CHARS</td>
<td>05A90503</td>
<td>22:02:42.821398</td>
<td>TRACE CHARSPEC CALL TO DEVICE DR</td>
</tr>
<tr>
<td>PROCESS</td>
<td>0B00000B</td>
<td>22:02:42.821452</td>
<td>PROCESS LATCH RELEASE REQUEST</td>
</tr>
<tr>
<td>PROCESS</td>
<td>0B00000A</td>
<td>22:02:42.821472</td>
<td>PROCESS LATCH-ON THE WAY OUT</td>
</tr>
<tr>
<td>DEVPTY</td>
<td>0223E005</td>
<td>22:02:42.821530</td>
<td>MASTER READ BEGIN</td>
</tr>
<tr>
<td>DEVPTY</td>
<td>0223E008</td>
<td>22:02:42.821566</td>
<td>MASTER READ END</td>
</tr>
<tr>
<td>PROCESS</td>
<td>0B000007</td>
<td>22:02:42.822182</td>
<td>PROCESS LATCH OBTAIN</td>
</tr>
<tr>
<td>PROCESS</td>
<td>0B00000A</td>
<td>22:02:42.822206</td>
<td>PROCESS LATCH-ON THE WAY OUT</td>
</tr>
<tr>
<td>CHARS</td>
<td>05A90603</td>
<td>22:02:42.822253</td>
<td>TRACE DEVICE DRIVER READ RETURN</td>
</tr>
<tr>
<td>FILE</td>
<td>05700203</td>
<td>22:02:42.822506</td>
<td>TRACE RETURN FROM VN_RDWR</td>
</tr>
</tbody>
</table>

Figure 39. SYSOMVS component trace formatted with CTRACE COMP(SYSOMVS) SHORT

Output from a SYSOMVS trace using the SCCOUNTS option

The output from a SYSOMVS trace using the SCCOUNTS option has 2 formats, shown in Figure 40 and Figure 41.

<table>
<thead>
<tr>
<th>SYSCALL#</th>
<th>SYSCALL NAME</th>
<th>COUNT</th>
<th>FREQUENCY/SEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>BPX1CHO</td>
<td>5000</td>
<td>nnn</td>
</tr>
<tr>
<td>2F</td>
<td>BPX1STA</td>
<td>150</td>
<td>nnn</td>
</tr>
</tbody>
</table>

Figure 40. SCCOUNT Function Displaying SYSCALL Frequency

Figure 40 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.

<table>
<thead>
<tr>
<th>FuncCode</th>
<th>FuncCode Name</th>
<th>Count</th>
<th>Functions/Sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>00001001</td>
<td>MntCatchup</td>
<td>76</td>
<td>0.0593</td>
</tr>
<tr>
<td>00001010</td>
<td>GetPathName</td>
<td>60</td>
<td>0.0468</td>
</tr>
<tr>
<td>00000012</td>
<td>UnQuiesce</td>
<td>38</td>
<td>0.0296</td>
</tr>
</tbody>
</table>

Figure 41. SCCOUNT Function Displaying Function Code Frequency

Figure 41 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.

Output from a SYSOMVS trace using the KERNINFO option

The output from a SYSOMVS trace using the KERNINFO option is shown in Figure 42 on page 440. The syscall function name (FCN) and the process ID (PID) are shown on the first line of the trace entry.
## Component Trace

The following summarizes information for requesting a SYSOPS component trace for the operations services component (OPS).

### Information

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSOPS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTTnOPxx</td>
</tr>
<tr>
<td></td>
<td>Default member: CTTOPS0 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 CTTnOPxx or REPLY for TRACE command</td>
</tr>
<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: CTTnOPxx 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>

---

**Before using this component trace**

This topic assumes you have read:

- “Planning for component tracing” on page 333
- "Obtaining a component trace" on page 341
- "Viewing the component trace data" on page 355

---

*Figure 42. CTRACE COMP(SYSOMVS) FULL OPTIONS((KERNINFO))

---

**SYSOPS component trace**

```plaintext
FCN...open SYSCALL...BPX1OPN PID...00010006 MODULE...BPXJCPC
SY1 SYSCALL 0F080001 17:34:03.106875 STANDARD SYSCALL ENTRY TRACE

ASID....0020 USERID....MEGA STACK@....26E09068
TCB...000C1470 EUID......00000000 PID........00010006
+0000 00000000 00000000 8C000000 00010006           |       
+0010 00020000 00000000 863CE16 00290200           |       
+0020 00000000 00000000 25836828                    |       
+0030 00000000 00000000 61A39497 6148A2B8           |       
+0040 000889A2 A39699A8 00000000 00000488           |       
+0050 00000180 FFFFFFFF 00000000 584C0002           |       
+0060 00000000 00000000 00000000 00000000           |       
+0070 00000000 00000000 00000000 00000000           |       
+0080 00000000 00000000 00000000 00000000           |       

FCN...open SYSCALL...BPX1OPN PID...00010006 MODULE...BPXJCPC
SY1 SYSCALL 0F080002 17:34:03.106876 STANDARD SYSCALL EXIT TRACE

ASID....0020 USERID....MEGA STACK@....26E09068
TCB...000C1470 EUID......00000000 PID........00010006
+0000 00000000 00000000 8C000000 00010006           |       
+0010 00020000 00000000 863CE16 00290200           |       
+0020 00000000 00000000 25836828                    |       
+0030 00000000 00000000 61A39497 6148A2B8           |       
+0040 000889A2 A39699A8 00000000 00000488           |       
+0050 00000180 FFFFFFFF 00000000 584C0002           |       
+0060 00000000 00000000 00000000 00000000           |       
+0070 00000000 00000000 00000000 00000000           |       
+0080 00000000 00000000 00000000 00000000           |       
```
Note: To get a complete dump for OPS, request also the NUC, CSA, and SQA.

**Requesting 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.

| Parameters                      | Allowed on TRACE CT for Trace?
<table>
<thead>
<tr>
<th></th>
<th></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>
### Component Trace

<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.

**MCACHE**

Traces events related to the message cache.

**MESSAGES**

This option includes the WTO and MSGDLVRY options.

**MSG=msgid**

Traces processing of a specific message. It REQUIRES either one of the following OPTIONS: MESSAGES, WTO or MSGDLVRY. *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, syplex serialization services, syplex 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, or MSGDLVRY 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
trace ct,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.
- **MCACHE**: Traces events related to the message cache.
Component Trace

MESSAGES
This option includes the WTO and MSGDLVRY options.

MSG=msgid
Traces processing of a specific message. It REQUIRES either one of the following OPTIONS: MESSAGES, WTO or MSGDLVRY. 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

CTRACE COMP(SYSOPS) SHORT subcommand output
The following is an example of OPS component trace records formatted with the CTRACE COMP(SYSOPS) SHORT subcommand:

CTRACE COMP SYSOPS SHORT FORMAT
COMP(SYSOPS)
**** 05/20/93

<table>
<thead>
<tr>
<th>MNEMONIC</th>
<th>ENTRY ID</th>
<th>TIME STAMP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INITMSG</td>
<td>00000001</td>
<td>14:41:06.918883</td>
<td>Message prior to MPF processing</td>
</tr>
<tr>
<td>POSTMPF</td>
<td>00000002</td>
<td>14:41:06.919198</td>
<td>Message after MPF processing</td>
</tr>
<tr>
<td>POSTEXIT</td>
<td>00000003</td>
<td>14:41:06.919595</td>
<td>Post Message Exit</td>
</tr>
<tr>
<td>POSTSSI</td>
<td>00000004</td>
<td>14:41:06.920118</td>
<td>Post Subsystem Interface</td>
</tr>
<tr>
<td>INITMSG</td>
<td>00000001</td>
<td>14:41:06.930088</td>
<td>Message prior to MPF processing</td>
</tr>
<tr>
<td>POSTMPF</td>
<td>00000002</td>
<td>14:41:06.930405</td>
<td>Message after MPF processing</td>
</tr>
<tr>
<td>POSTEXIT</td>
<td>00000003</td>
<td>14:41:06.930803</td>
<td>Post Message Exit</td>
</tr>
<tr>
<td>POSTSSI</td>
<td>00000004</td>
<td>14:41:06.931267</td>
<td>Post Subsystem Interface</td>
</tr>
<tr>
<td>INITMSG</td>
<td>00000001</td>
<td>14:41:06.931637</td>
<td>Message prior to MPF processing</td>
</tr>
<tr>
<td>POSTMPF</td>
<td>00000002</td>
<td>14:41:06.931934</td>
<td>Message after MPF processing</td>
</tr>
</tbody>
</table>

CTRACE COMP(SYSOPS) FULL subcommand output
The following is an example of OPS component trace records formatted with the CTRACE COMP(SYSOPS) FULL subcommand:
SYSRRS component trace

Before using this component trace

This topic assumes you have read:

- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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</td>
</tr>
<tr>
<td></td>
<td>No default member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>Yes; minimal; unexpected events; general UR services</td>
</tr>
</tbody>
</table>
Component Trace

Information | For SYSRRS:
--- | ---
Trace request OPTIONS parameter | In CTnRRSxx and REPLY for TRACE command
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.
Trace records location | Data space buffer, trace data set, trace buffers in the RRS address space
Request of SVC dump | By DUMP or SLIP command
Trace formatting by IPCS | CTRACE COMP(SYSRRS)
Trace format OPTIONS parameter | Yes

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.
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.

```plaintext
OPTIONS=((EVENTS(event[,event]...)
     [USERID(userid[,userid]...))
     [RMNAME(rmname[,rmname]...))
     [LUWID((luwid)[,(luwid)]...)))
     [EID((eid)[,(eid)]...))
```

Note: In the REPLY to the TRACE CT command, separate the options by one or more blanks.

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.
Component Trace

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,...)
  Specifies 1 to 16 user IDs as filters for specified events. The system traces only events relating to the user IDs.

RMNAME(rmnname,...)
  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),...)
  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:
  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:
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)

**Examples of requesting SYSRRS traces**

**Example 1: CTnRRSxx member**  
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)
```

**Example 2: TRACE command**  
The example requests the same trace as Example 1.

```
trace ct,off,comp=sysrrs
trace ct,1024K,comp=sysrrs
  * 17 ITT006A ...
reply 17,options=('events(context) userid(jones)'),end
```

**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)
- EID(eid)
- RMNAME(rmname)
- URID(urid)
- USERID(userid)

**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.

---

**Example of 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**

The following is an example of SYSRRS component trace records formatted with the CTRACE COMP(SYSRRS) SHORT subcommand.
## Component Trace

**COMPONENT TRACE SHORT FORMAT**
**COMP(SYRSSRS)**
### 01/20/1997

<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>SY1</td>
<td>COMPERR</td>
<td>00000000</td>
<td>07:53:43.615114</td>
<td>Resource Recovery Services</td>
</tr>
<tr>
<td>SY1</td>
<td>FLOW</td>
<td>0801FFFE</td>
<td>07:53:43.615114</td>
<td>ATRB1PCT EXIT</td>
</tr>
<tr>
<td>SY1</td>
<td>FLOW</td>
<td>0801FFFF</td>
<td>07:53:43.619823</td>
<td>ATRB1PCT ENTRY</td>
</tr>
<tr>
<td>SY1</td>
<td>FLOW</td>
<td>0201FFFF</td>
<td>07:53:43.619867</td>
<td>ATRU1EIN ENTRY</td>
</tr>
<tr>
<td>SY1</td>
<td>CONTEXT</td>
<td>02010002</td>
<td>07:53:43.620027</td>
<td>CTXMEINT call</td>
</tr>
<tr>
<td>SY1</td>
<td>URSERVS</td>
<td>02010001</td>
<td>07:53:43.620699</td>
<td>ATREINT invoked</td>
</tr>
<tr>
<td>SY1</td>
<td>FLOW</td>
<td>0201FFFE</td>
<td>07:53:43.620887</td>
<td>ATRU1EIN EXIT</td>
</tr>
</tbody>
</table>

...
## Component Trace

### CTRACE COMP(SYSRRS) SUMMARY or FULL output

Component Trace FULL FORMAT
COMP(SYSRRS)
**** 01/20/1997

<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>SY1</td>
<td>COMPERR</td>
<td>00000000</td>
<td>07:53:43.615114</td>
<td>Resource Recovery Services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FFF0003E 7EF6000 0001FE6 00000000</td>
<td>.0...6}....&gt;....</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>000A0000 00000000 0020000</td>
<td>............</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0101001F 00000000 7F04D000 01000000</td>
<td>........*.}....</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>00000000 00000000 0000</td>
<td>..............</td>
</tr>
</tbody>
</table>

** SY1 FLOW 0001FFE 07:53:43.615114 ATRB1PCT EXIT **

| HASID.... | 00AA | HJOBNAME. APPL1A5 |
| SASID.... | 00A3 | SJOBNAME. RMAS1 |
| USERID.... | * | RMNAME... |
| URID..... | AE1AB4E 7ED2CF90 | 0000012B 01010000 |
| TID....... | 000000000000 | GTID..... 00000000 |
| LUWID.... | 00000000 00000000 00000000 | 00000000 |
| NETNAME.. | ******** | LUNAME... ******** |
| INSTNUM.. | ****** | SEQUUM... ** |

** SY1 FLOW 0001FFFE 07:53:43.619823 ATRB1PCT ENTRY **

| HASID.... | 00AA | HJOBNAME. APPL1A5 |
| SASID.... | 00A3 | SJOBNAME. RMAS1 |
| USERID.... | * | RMNAME... |
| URID..... | AE1AB4E 7ED2CF90 | 0000012B 01010000 |
| TID....... | 000000000000 | GTID..... 00000000 |
| LUWID.... | 00000000 00000000 00000000 | 00000000 |
| NETNAME.. | ******** | LUNAME... ******** |
| INSTNUM.. | ****** | SEQUUM... ** |

** SY1 FLOW 0201FFFF 07:53:43.619867 ATRUE1N ENTRY **

| HASID.... | 00AA | HJOBNAME. APPL1A5 |
| SASID.... | 00A3 | SJOBNAME. RMAS1 |
| USERID.... | * | RMNAME... |
| URID..... | AE1AB4E 7ED2CF90 | 0000012B 01010000 |
| TID....... | 000000000000 | GTID..... 00000000 |
| LUWID.... | 00000000 00000000 00000000 | 00000000 |
| NETNAME.. | ******** | LUNAME... ******** |
| INSTNUM.. | ****** | SEQUUM... ** |
### SYSRSM component trace

**Before using this component trace**

This topic assumes you have read:

- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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</td>
</tr>
<tr>
<td></td>
<td>No default member</td>
</tr>
<tr>
<td>Default tracing</td>
<td>No</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>In CTnRSMxx or REPLY for TRACE command</td>
</tr>
<tr>
<td>Buffer</td>
<td>• Default: 3 buffers of 32 pages</td>
</tr>
<tr>
<td></td>
<td>• 2-7 page-fixed primary buffers, 4 - 262,144 pages per buffer</td>
</tr>
<tr>
<td></td>
<td>• 1 - 2047 MB for secondary buffers</td>
</tr>
<tr>
<td></td>
<td>• Size set by: CTnRSMxx member or REPLY for TRACE CT command</td>
</tr>
<tr>
<td></td>
<td>• Change size after IPL: Yes, when starting a trace</td>
</tr>
<tr>
<td></td>
<td>• Common service area (LIKECSA) and, if specified in CTnRSMxx, high virtual private storage of the RASP address space.</td>
</tr>
<tr>
<td>Trace records location</td>
<td>In the trace data set, trace buffers in high common memory, and the RASP address space.</td>
</tr>
</tbody>
</table>
Information For SYSRSM:

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSRSM:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Request of SVC dump</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 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 tracing is turned off</td>
</tr>
<tr>
<td>Trace formatting by IPCS</td>
<td>CTRACE COMP(SYSRSM)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>

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.
Example: CTWRSM05 parmlib member

For RSM, use BUFF in the CTnRSMxx OPTIONS parameter to specify the number of page-fixed buffers and their page sizes. 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)')
```

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...
Component Trace

This trace collects an enormous amount of data and degrades system performance. Use the SYRSRM 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)**

Specifies the number and size of the SYRSRM 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 SYRSRM 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=SYRSRM 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.
Component Trace

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.

DSPDRF0F
Traces events in DSPSERV define DREF off.

DSPDRF0N
Traces events in DSPSERV define DREF on.

DSPEXTen
Traces events in the DSPSERV EXTEND service.

DSPLOAD
Traces events in the DSPSERV LOAD service.

DSPIOOF
Traces events in the DSPSERV IOOFF service.

DSPIOON
Traces events in the DSPSERV IOON service.

DSPOUT
Traces events in the DSPSERV OUT service.

DSPREL
Traces events in the DSPSERV RELEASE service.

DSPSRTR
Traces events in the DSPSERV router service.

DSPSRTRD
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:

HSPCACHE
Traces events in the HSPSERV cache services.

HSPSCROL
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:

FLTASp
Traces all events in the address space faults group. The group options, which can be specified separately, are:
Component Trace

FLTADPAG
Traces disabled address space page faults.

FLTAEPAG
Traces enabled address space page faults.

FLTAESEG
Traces enabled address space segment faults.

FLTAEHPAG
Traces address space page faults for address above the 2 gigabytes bar.

FLTAEHSEG
Traces address space segment faults for address above the 2 gigabytes bar.

FLTAREGN
Traces address space region faults.

FLTATYPE
Traces address space type faults.

FLTADSP
Traces all events on the data space faults group. The group options, which can be specified separately, are:

FLTDEN
Traces enabled data space faults.

FLTDDIS
Traces disabled data space faults.

FLTEPRT
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.

GENIOCOMP
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.

VSMOUTR
Traces IARVSERV service router.

VSSHARE
Traces IARVSERV SHARE requests.
Component Trace

VSSHSEG
  Traces IARVSEVR SHARESEG requests.

VSUNSHAR
  Traces IARVSEVR 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 DISCARDATA 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.

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.
Component Trace

**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:

**FUNCREQ**
Traces the function request event.
Component Trace

**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.
Component Trace

**HVPGDEQ**
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.

- **RSDGDFER**
  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:

- **RSEDEFFER**
  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 the SQA frame queue.

- **RSEVRW**
  Traces when a frame is enqueued onto the V=R waiting frame queue.
Component Trace

**RSFREE**
Traces all events in the free frame group. The group options, which can be specified separately, are:

**LSFREE**
Traces when a single large 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:

**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.

**SCMBLKMG**
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.

**SCMICNHG**
Traces SCM Block Manager Increment Change.

**SCMOTT**
Traces the SCM Block Manager Obtain Block.
Component Trace

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

SCMENDDSP
  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.
Component Trace

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

<table>
<thead>
<tr>
<th>Example 1: CTnRSMxx member</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td>TRACEOPTS ON</td>
</tr>
<tr>
<td>ASID(11,41)</td>
</tr>
<tr>
<td>JOBNAME(PGM1)</td>
</tr>
<tr>
<td>OPTIONS('FAULTS','PGANY','VIO')</td>
</tr>
</tbody>
</table>
Component Trace

Example 2: TRACE command

The example specifies that options are to be obtained from the parmlib member CTWRSM17.

```
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

CTRACE COMP(SYSRSM) FULL subcommand output

The following is an example of RSM component trace records formatted with the CTRACE COMP(SYSRSM) FULL subcommand:

```
XEPENTRY 00000001 18:18:06.441411 External Entry Point Entry
  FUNC1... PGFIX Page Fix
  JOB1... ASN8  ASID1... 0000  PLOCKS.. 80000001 CPU..... 0000
  JOB2... ASN8  ASID2... 0000  RLOCKS.. 80000000
  KEY.... 0036  ADDR.... 015FF008 ALET.... 00000000
  7D00
  KEY.... 002C  ADDR.... 005EFFFF ALET.... 00000000
  00000000 005EF000 005EFFFF 00F00200 00FF8DD8 00FF8BD0 00FF8BC9
  005EFFC3 005EF02C 00F8BD50 005EF02C 00F8BE00 00F8BC00 005EF78
  00FF910A 81082798

FIX 00000003 18:18:06.441921 Page Being Fixed
  FUNC1... PGFIX Page Fix
  JOB1... ASN8  ASID1... 0000  PLOCKS.. 80004001 CPU..... 0000
  JOB2... ASN8  ASID2... 0000  RLOCKS.. 80004000
  KEY.... 0036  ADDR.... 015FF008 ALET.... 00000000
  7D000350
  KEY.... 005D  ADDR.... 005EF000 ALET.... 00000000
  KEY.... 0001  ADDR.... 011F8220 ALET.... 00000000
  0151182C 01202E60 81C00000 03000001 00000000 005EF000 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.
Before using this component trace

This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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>None</td>
</tr>
<tr>
<td>Default tracing</td>
<td>No</td>
</tr>
<tr>
<td>Trace request OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>
| Buffer                             | - Default: 64KB  
- Range: N/A  
- Size set by: MVS system  
- Change size after IPL: No  
- Location: In the component area |
| Trace records location             | Address-space buffer |
| Request of SVC dump                | By the component |
| Trace formatting by IPCS           | CTRACE COMP(SYSSPI) |
| Trace format OPTIONS parameter     | None        |

**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:
   ```
   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.

**Formatting a SYSSPI trace**

1. 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 12, “Transaction trace,” on page 489.
SYSVLF component trace

Before using this component trace

This topic assumes you have read:

- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

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>Range: N/A</td>
<td></td>
</tr>
<tr>
<td>Size set by: MVS system</td>
<td></td>
</tr>
<tr>
<td>Change size after IPL: No</td>
<td></td>
</tr>
<tr>
<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>
<td></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>
Component Trace

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 CTIITT00 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**

**CTRACE COMP(SYSVLF) FULL subcommand output**
The following 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.

```
VLF COMPONENT TRACE FULL FORMAT
**** 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
```

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.

**COFRCVRY**
- The name or identifier of the trace record.
- The identifier in hexadecimal
Component Trace

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

RSNCODE. 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
Component Trace

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

SYSWLM component trace

Before using this component trace
This topic assumes you have read:
- “Planning for component tracing” on page 333
- “Obtaining a component trace” on page 341
- “Viewing the component trace data” on page 355

The following summarizes information for requesting a SYSWLM component trace for the workload manager (WLM).

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSWLM:</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: 64KB</td>
</tr>
<tr>
<td></td>
<td>Range: 64KB - 16M</td>
</tr>
<tr>
<td></td>
<td>Size set by: MVS system</td>
</tr>
<tr>
<td></td>
<td>Change size after IPL: Yes, when starting a trace</td>
</tr>
<tr>
<td></td>
<td>Location: Extended common service area (ECSA)</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(SYSWLM)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>None</td>
</tr>
</tbody>
</table>
Component Trace

Requesting a SYSWLM trace

Request a SYSWLM 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>

<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>No</td>
</tr>
<tr>
<td>WTR</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples of requesting SYSWLM traces

The following is an example of requesting a SYSWLM component trace.

```
trace ct,on,comp=syswlm
  * 17 ITT006A ...
reply 17,end
```

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

CTRACE COMP(SYSWLM) SHORT subcommand output

The following is an example of SYSWLM component trace records formatted with the CTRACE COMP(SYSWLM) SHORT subcommand.
Component Trace

<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>14:07:46.335563</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>14:07:46.336540</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>14:07:46.337909</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td>SMSYNMEM</td>
<td>00000921</td>
<td>14:07:46.512018</td>
<td>SM Synch XCF Member</td>
</tr>
<tr>
<td>WLMEPEXT</td>
<td>00005003</td>
<td>14:07:46.512360</td>
<td>Entry Point Exited</td>
</tr>
<tr>
<td>WLMEPENT</td>
<td>00005003</td>
<td>14:07:46.512374</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td>SMSYNMEM</td>
<td>00000921</td>
<td>14:07:46.594486</td>
<td>SM Synch XCF Member</td>
</tr>
</tbody>
</table>

**CTRACE COMP(SYSWLM) FULL subcommand output**

The following is an example of SYSWLM component trace records formatted with the CTRACE COMP(SYSWLM) 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>WLMEPENT</td>
<td>00005003</td>
<td>14:52:23.449339</td>
<td>Entry Point Entered</td>
</tr>
<tr>
<td></td>
<td>FUNCID</td>
<td>0409</td>
<td>CPU</td>
<td>0001</td>
</tr>
<tr>
<td></td>
<td>HOMEASID</td>
<td>0008</td>
<td>HJOBNAME</td>
<td>WLM</td>
</tr>
<tr>
<td></td>
<td>REQASID</td>
<td>0000</td>
<td>RJOBNAME</td>
<td>UNKNOWN</td>
</tr>
<tr>
<td></td>
<td>KEY</td>
<td>5018</td>
<td>RUCA_EPID</td>
<td>IWMDMPRP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>04090000</td>
<td>PARM1</td>
<td>00000084</td>
</tr>
<tr>
<td></td>
<td></td>
<td>501F</td>
<td>PARM2</td>
<td>00000040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5020</td>
<td>PARM3</td>
<td>00000000</td>
</tr>
</tbody>
</table>

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

This topic assumes you have read:

- "Planning for component tracing" on page 333
- "Obtaining a component trace" on page 341
- "Viewing the component trace data" on page 355

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</td>
</tr>
<tr>
<td>Default member</td>
<td>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>
| Buffer                        | • Default: 4MB  
                                 | • Range: 16KB - 16MB (System rounds size up to a multiple of 72 bytes.)  
                                 | • Size set by: CTnXCFxx member  
                                 | • Change size after IPL: No  
                                 | • Location: Extended local system queue area (ELSQLA) of XCFAS |
| 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.
Component Trace

<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.
Component Trace

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.

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.*')
Component Trace

Examples of requesting SYSXCF traces

Example 1: CTnXCFxx member

The 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')
```

Example 2: TRACE commands

This example requests the same trace as Example 1.

```
trace ct,wrtstart=wtdasd1
trace ct,on,comp=sysxcf
  * 62 ITT006A ...
  r 62,wtr=wtdasd1,options=(storage,signal),end
```

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.

- **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.
Component Trace

**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 ttttttt notation (for example, x'01001768' or 01001768) with or without the leading x and surrounding quotes (').

Output from a SYSXCF trace

**CTRACE COMP(SYSXCF) FULL subcommand output**
The following is an example of SYSXCF component trace records formatted with the CTRACE COMP(SYSXCF) FULL subcommand.

```
**** 01/15/90
STORAGE 0F030001 21:01:30.893078 CROSS SYSTEM COUPLING FACILITY
  0000000 00000004 00000000 | ........... |
  0000000 00000000 | ............ |
  0000000 00000000 | ........... |
  0000000 0000 | ....... |
SIGNAL 08560000 21:01:30.941115 CROSS SYSTEM COUPLING FACILITY
  0100000 08018000 826445C0 C9D5C9E3 | .......b..{INIT |
  4040404 00000000 00000000 | ............ |
  0000000 7F68A810 00000000 | ....".y...... |...
  0000000 0000 | ...... |
```

SYSXES component trace

The following summarizes information for requesting a SYSXES component trace for cross-system extended services (XES).

<table>
<thead>
<tr>
<th><strong>Information</strong></th>
<th>For SYSXES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parmlib member</td>
<td>CTTnXESxx</td>
</tr>
<tr>
<td></td>
<td>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 CTTnXESxx or REPLY for TRACE command</td>
</tr>
</tbody>
</table>
### Component Trace

<table>
<thead>
<tr>
<th>Information</th>
<th>For SYSXES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer</td>
<td>• Default:</td>
</tr>
<tr>
<td></td>
<td>– 336KB for connector-related SUB trace buffers.</td>
</tr>
<tr>
<td></td>
<td>There are multiple instances of these trace buffers in use on the system</td>
</tr>
<tr>
<td></td>
<td>– 16M 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: Data space. In the REPLY for the DUMP command, specify SDATA=XESDATA and_DSPNAME=(asid.IXLCTCAD) where asid is the ASID for address space XCFAS</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(SYSXES)</td>
</tr>
<tr>
<td>Trace format OPTIONS parameter</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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 43 on page 483 is 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. Furthermore, the trace buffers are allocated from a
single common area data space (CADS). If the entire CADS is used up,
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 specified size per connector.
- The SYSXES trace buffers are in disabled reference (DREF) data space 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 16MB. 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.
Component Trace

<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>

<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>

**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.
Examples of requesting SYSXES traces

Example 1: CTnXESxx member
The 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)
```

Example 2: TRACE command
The example 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
```

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:
Component Trace

- **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

**CTRACE COMP(SYSXES) SHORT subcommand output**

The following is an example of SYSXES component trace records formatted with the following subcommand:

```
CTRACE COMP(SYSXES) SUB((GLOBAL)) SHORT OPTIONS((CONNECT,HWLAYER))
```

```
component trace short format
comp(sysxes) subname((global))
**** 10/20/93

 mnemonic entry id time stamp description
-------- -------- --------------- -----------
 HWLAYER 090C0002 20:47:22.096016 EXIT FROM IXLMLTAM
 HWLAYER 07140001 20:47:22.096296 ENTRY TO IXLERTRR
 HWLAYER 07140002 20:47:22.096429 EXIT FROM IXLERTRR
 CONNECT 08190001 20:47:30.171676 CONNECTOR DIE ROUTINE
 HWLAYER 090C0001 20:47:30.171718 ENTRY TO IXLMLTAM
 HWLAYER 09030001 20:47:30.171758 ENTRY TO IXLMLXRB
 HWLAYER 09080001 20:47:30.171779 ENTRY TO IXLM2SR START IMMED RE
 HWLAYER 09080003 20:47:30.171804 ISSUING A SMSG COMMAND
 CONNECT 08110001 20:47:30.172316 MAINLINE TIMER EXIT ENTERED
 CONNECT 08110004 20:47:30.172476 MAINLINE TIMER EXITED
 HWLAYER 09080004 20:47:30.180754 COMPLETION OF A SMSG COMMAND
```
Chapter 12. 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.

The following topics explain transaction trace in detail:

- “How transaction trace works”
- “Transaction trace commands” on page 490
- “Using IPCS to view transaction trace output” on page 492

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:

- TRACE TT
- DISPLAY TRACE,TT

For information about using the TRACE or DISPLAY TRACE commands with transaction trace, see [z/OS MVS System Commands](#).

**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 userid 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 above 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 userid 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 userid 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:

```
trace tt,off=2
ITZ016I TRANSACTION TRACE FILTER SET TURNED OFF
```

indicates that the transaction trace filter set 02 has been turned off.
**Stopping transaction trace**
Use the OFF=ALL keyword to stop transaction trace. For example:
```plaintext
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:
```plaintext
DUMP COMM=(TTrace for TRAN=ATM1)
R x,DSPPNAME='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:
```plaintext
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:
```plaintext
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 allow a change in the transaction trace data space size. The data space is from 16K to 999K or 1M to 32M. For example:
```plaintext
trace tt,bufsiz=2m
ITZ002I 'BUFSIZ' IS SET TO 0002M
```

**Specifying a level indicator**
The transaction trace TTRACE TT command allow 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. For example:
```plaintext
trace tt,bufsiz=2m,user=testerp1,tran=tran1,lvl=01
ITZ002I 'BUFSIZ' IS SET TO 0002M
```
```plaintext
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.

An example follows:
Transaction trace

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.

The following is an example of a DISPLAY TRACE,TT command response:

IEE843I 14.47.19 TRACE DISPLAY
SYSTEM STATUS INFORMATION
ST=(ON,0064K,00064K) AS=ON BR=OFF EX=ON
MT=(ON,024K)
--------------------------------------------------------------
TRANSACTION TRACE STATUS: ON
BUFSIZ= 0002M WRITER= *NONE* LATENT= YES
01: TRAN= TRAN1 USER= TESTERP1
     LVL = 001
02: USER=DONNA* LVL = 002
SYSTEMS PARTICIPATING IN TT: SYS1 SYS2 SYS3

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.

IPCS CTRACE COMP(SYSTTRC) examples

Following is an example of a short IPCS CTRACE COMP(SYSTTRC) SHORT command response:

ctrace comp(systtrc) short
COMPONENT TRACE SHORT FORMAT
COMP(SYSTTRC)
***** 09/23/1999

<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>TTCMD</td>
<td>00000002</td>
<td>14:17:20.833847</td>
<td>TRACE TT Command</td>
</tr>
<tr>
<td>SY1</td>
<td>TTCMD</td>
<td>00000002</td>
<td>14:18:11.611755</td>
<td>TRACE TT Command</td>
</tr>
<tr>
<td>SY1</td>
<td>EVENT</td>
<td>00000003</td>
<td>14:31:55.813125</td>
<td>TRACE EVENT</td>
</tr>
<tr>
<td>SY1</td>
<td>EVENT</td>
<td>00000003</td>
<td>14:31:55.899216</td>
<td>TRACE EVENT</td>
</tr>
<tr>
<td>SY1</td>
<td>EVENTU</td>
<td>00000005</td>
<td>14:31:56.378480</td>
<td>TRACE EVENT with User Data</td>
</tr>
<tr>
<td>SY1</td>
<td>EVENTG</td>
<td>00000004</td>
<td>14:31:56.818367</td>
<td>TRACE EVENT with GTF Data</td>
</tr>
</tbody>
</table>

Following is an example of a IPCS CTRACE COMP(SYSTTRC) LONG command response:

ctrace comp(systtrc) full
COMPONENT TRACE FULL FORMAT
COMP(SYSTTRC)
### Transaction trace

<table>
<thead>
<tr>
<th>SY1</th>
<th>TTCDM</th>
<th>00000002</th>
<th>14:17:20.833847</th>
<th>TRACE TT Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDID</td>
<td>0501</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMAND</td>
<td>TRACETT,BUFSIZE=2M,USER=TESTERP1,TRAN=TRAN1,_LVL=01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SY1</td>
<td>TTCDM</td>
<td>00000002</td>
<td>14:18:11.611755</td>
<td>TRACE TT Command</td>
</tr>
<tr>
<td>CMDID</td>
<td>0402</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMMAND</td>
<td>TRACETT,USER=DONNA*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SY1</th>
<th>EVENT</th>
<th>00000003</th>
<th>14:31:55.813125</th>
<th>TRACE EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
<td>COMP</td>
<td>EVENTDESC..TTVAPIEA008</td>
<td>CMDID.....0501</td>
<td>FUNCTION...TEST_ITZEVENT_WITH_FUNCTIONNAME. TCB...007ED9CB</td>
</tr>
<tr>
<td>ASID</td>
<td>.0022</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRACETOKEN..SY1</td>
<td>B2E447A3 F32E4048 05010100 00000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SY1</th>
<th>EVENT</th>
<th>00000003</th>
<th>14:31:55.899216</th>
<th>TRACE EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
<td>COMP</td>
<td>EVENTDESC..TTVAPIEA009</td>
<td>CMDID.....0000</td>
<td>FUNCTION...TEST_ITZEVENT_WITH_FUNCTIONNAME. TCB...007ED7AB</td>
</tr>
<tr>
<td>ASID</td>
<td>.0022</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRACETOKEN..</td>
<td>40404040 40404040 40404040 40404040</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LATENT workunit traced.

<table>
<thead>
<tr>
<th>SY1</th>
<th>EVENTU</th>
<th>00000005</th>
<th>14:31:56.378480</th>
<th>TRACE EVENT with User Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
<td>COMP</td>
<td>EVENTDESC..TTVAPIEA003</td>
<td>CMDID.....0501</td>
<td>FUNCTION...TEST_ITZEVENT_WITH_FUNCTIONNAME. TCB...007ED148</td>
</tr>
<tr>
<td>ASID</td>
<td>.0022</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRACETOKEN..SY1</td>
<td>B2E447A3 F5D056C1 0105FF00 00000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+0000 E3C8C9E2 40C9E240 E3E340C4 C1E3C140 THIS IS TT DATA
+0010 C60D9040 C140E309 C1DE21C1  C3E3C906 FOR A TRANSACTION
+0020 D540E309 C1C3540 D9C5C306 D944B83 E N TRACE RECORD.
+0030 CBC9E240 C9E240E3 E3C4C1 E1C140C6 HIS IS TT DATA FOR A TRANSACTION
+0040 D6940C1 40E3D9C1 D5E2C1C3 E3C90D65 OR A TRANSACTION
+0050 40E3D9C1 C3C54099 C5C3D609 C448 TRACE RECORD.

<table>
<thead>
<tr>
<th>SY1</th>
<th>EVENTG</th>
<th>00000004</th>
<th>14:31:56.818367</th>
<th>TRACE EVENT with GTF Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPONENT</td>
<td>COMP</td>
<td>EVENTDESC..TTVAPIEA004</td>
<td>CMDID.....0402</td>
<td>FUNCTION...TEST_ITZEVENT_WITH_FUNCTIONNAME. TCB...007ED368</td>
</tr>
<tr>
<td>ASID</td>
<td>.0022</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRACETOKEN..SY1</td>
<td>B2E447A3 F566F584 03030300 00000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HEXFORMAT AID FF FID 00 EID 0000
+0000 E3C8C9E2 40C9E240 C7E3C640 C4C1E3C1 THIS IS GTF DATA
+0010 40C6D6D9 40C140E3 D9C1D5E2 C1E3C906 FOR A TRANSACTION
+0020 D60540E3 D9C1C354 D9C5C306 D9C4C4B ON TRACE RECORD.
+0030 E3C8C9E2 40C9E240 C7E3C640 C4C1E3C1 THIS IS GTF DATA
+0040 40C6D6D9 40C140E3 D9C1D5E2 C1E3C906 FOR A TRANSACTION
+0050 D60540E3 D9C1C354 D9C5C306 D9C4C4B ON TRACE RECORD.
Transaction trace
Chapter 13. 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”
- “Receiving GFS trace data” on page 496
- “Formatted GFS trace output” on page 498
- “Unformatted GFS trace output” on page 499

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, 7, 8 and 9:

VSM TRACE GETFREE (ON)
ASID (3, 5-9)
LENGTH (24)
DATA (ALL)

You'll need another DIAGxx parmlib member defined to stop GFS tracing. See 5 on page 496

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=EX,DEBUG=NO,TIME=YES,BLOK=40K,SD=0K,SA=40K'
//IEFREDER DD DSN=D31POOL.PJREDGTF.TRACE,
//  DISP=SHR,UNIT=3380,VOL=SER=CTDS1
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

01 AHL101A SPECIFY TRACE EVENT KEYWORDS--USR=
REPLY 01, USR=(F65)

02 AHL102A CONTINUE TRACE DEFINITION OR REPLY END
REPLY 02 END

AHL103I TRACE OPTIONS SELECTED--USR=(F65)

03 AHL125A RESPECIFY TRACE OPTIONS OR REPLY U
REPLY 03, U
```

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)
```

Reference

- See `z/OS MVS Initialization and Tuning Reference` for the syntax of the DIAGxx parmlib member.
- See `z/OS MVS System Commands` for the syntax of the SET and START commands.
- See `Chapter 10, “The Generalized Trace Facility (GTF),” on page 225` 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 XF65. 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.

Reference
GETMAIN, FREEMAIN, STORAGE trace

See "z/OS MVS IPCS Commands" for the GTFTRACE subcommand.
Formatted GFS trace output

Example: Formatted GFS trace output

```plaintext
READY
IPCS NOPARM
IPCS
   DROPD DA('D10JHM1.VSMNEW.GTF')
BLS18206I All records for 1 dump dropped
IPCS
   SETD NOCONFIRM
IPCS
   GFTRACE DA('D10JHM1.VSMNEW.GTF') USR(F65)
IKJ56650I TIME-03:42:20 PM. CPU-00:00:01 SERVICE-52291 SESSION-00:00:20 JANUARY 22,1998
BLS18221 Initialization in progress for DSNAME('D10JHM1.VSMNEW.GTF')
IKJ56650I TIME-03:42:21 PM. CPU-00:00:01 SERVICE-54062 SESSION-00:00:20 JANUARY 22,1998
   **** GTFTRACE DISPLAY OPTIONS IN EFFECT ****
   USR=SEL
   **** GTF DATA COLLECTION OPTIONS IN EFFECT: ****
   USRP option
   **** GTF TRACING ENVIRONMENT ****
   Release: SP6.0.6  FMID: HBB6606  System name: CMN
   CPU Model: 9672  Version: FF  Serial no. 270067

USRDA F65 ASCB 00FA0800  JOBN GTFJM2
Getmain SVC(120)  Cond=Yes
Loc=(Below,Below)  Bndry=Dblwd
Return address=849CA000  Asid=001A  Jobname=GTFJM2
Subpool=229  Key=0  Asid=001A  Jobname=GTFJM2  TCB=008DCA70  Retcode=0
Storage address=008D6768  Length=10392  X'2898'
GPR Values
   0-3  00002898  00000000  7FFC918  0B601E88
   4-7  01FE3240  008FF830  849CA000  00FA0800
   8-11  00000000  00000E88  049CBFFE  849CA000
  12-15  049CAFFF  0B601A9C  00FE9500  0000E510

   .
   .

USRDA F65 ASCB 00FA0800  JOBN GTFJM2
Freemain SVC(120)  Cond=No
Return address=BB2D608A  Asid=001A  Jobname=GTFJM2
Subpool=230  Key=0  Asid=001A  Jobname=GTFJM2  TCB=008DCA70  Retcode=0
Storage address=7F73DFF8  Length=8  X'B'
GPR Values
   0-3  00000000  7F73DFF8  008D02D8  008D7BC0
   4-7  00000958  008D6800  008D65C8  08335000
   8-11  00000000  00000000  7F73DFF8  008D062C
  12-15  BB2D6044  008D69C9  049D242A  0000E603


IPCS
   SETD CONFIRM
IPCS
   END
IPCS
   END
```
GETMAIN, FREEMAIN, STORAGE trace

The GETMAIN / FREEMAIN / STORAGE trace produces a second type of record with a slightly different format. Following is an example of this record type:

```
USRDA F65 ASCB 00F4C280 JOBN IYCSCTS6
   Releasing Subpool=230 Key=1 Asid=003E TCB=008B11E0
   Storage address=7F653E00 Length=512 X'200'
```

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

This topic 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.

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>8</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>

Figure 44. Layout of the GFS trace output (Part 1 of 2)
**GETMAIN, FREEMAIN, STORAGE trace**

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 VSWKSVC</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>Copy of VSWKRFLG</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 VSWKRFLG2</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>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 '40'</td>
<td>Caller's registers 0-15</td>
</tr>
</tbody>
</table>

Figure 44. Layout of the GFS trace output (Part 2 of 2)

**Note:** The IGVVSMWK macro contains field names beginning with VSWK. For more information, see z/OS MVS Data Areas in z/OS Internet Library at [http://www.ibm.com/systems/z/os/zos/bkserv/](http://www.ibm.com/systems/z/os/zos/bkserv/)
Chapter 14. 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 45 shows the error processing for a logrec data set, named SYS1.LOGREC, which is the default name for the logrec data set.

Major Topics

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 502
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

References

- See “Initializing and reinitializing the logrec data set” if you want to initialize a logrec data set for your system.
- See “Defining a logrec log stream” on page 504 if you want to define a logrec log stream for your installation.

Initializing and reinitializing the logrec data set

You must initialize the logrec data set before IPLing 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.

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 after IPL using a program, such as a defragmentation program, your system will experience difficulty both reading from and writing to the data set.
Initializing the logrec data set

If the logrec data set does not exist, you must first allocate it and then initialize it. (Whenever you allocate or reallocate the logrec data set, the newly allocated data set will not be used until you initialize it and IPL the system on which it is to be used.)

Following 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.)

Note: If you run the preceding JCL and an error occurs after the logrec data set has been scratched but before it has been reallocated, you will be unable to IPL your system using this logrec data set.

To solve this problem, do one of the following:
- Use the DFDSS stand-alone restore program to restore your old logrec data set.
- Run the reallocate job on the data set while running under another system.

Reference
- See "z/OS DFSMSdfp Storage Administration" for information about the DFDSS 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.
Recording logrec error records

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.

Following is an example of using the IFCDIP00 service aid to reinitialize the logrec data set:

**Example: Reinitializing the logrec data set**

Use the following JCL statements:

```
//INERLOG JOB
//STEP1 EXEC PGM=IFCDIP00
//SERERDS DD DSNAME=SYS1.LOGREC,UNIT=3380,
// VOL=SER=111111,DISP=(OLD,KEEP)
```

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.

Defining a logrec log stream

Before defining a logrec log stream, note that IBM recommends that you IPL with a logrec data set initialized by IFCDIP00. If you do not IPL with a data set, you cannot change the logrec recording medium from LOGSTREAM to DATASET using the SETLOGRC command.

To use the 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 logrec log stream per sysplex. This means that if you make your logrec log stream DASD-only, only one system will be able to access it. See the system logger chapter of z/OS MVS Setting Up a Sysplex for information on DASD-only log streams.
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 named SYSPLEX.LOGREC.ALLRECS using the system logger log stream definition utility, IXCMIAPU.

```
Example: Sample JCL of using IXCMIAPU

IFBLSJCL is available in SYS1.SAMPLIB as an example of using the administrative data utility, IXCMIAPU, to define the coupling facility logrec log stream to a sysplex.

//IFBLSJCL JOB
//** Member Name: IFBLSJCL
//** Descriptive Name: *
//** Sample JCL to provide an example of using the System Logger utility to define the Logrec log stream to a sysplex.
//** Function: *
//** This JCL sample provides an example of running the System Logger utility (IXCMIAPU) to define the Logrec log stream in the logger inventory.
//** Note that the MAXBUFSIZE parameter must have at least 4068 specified, or Logrec will not be able to write to the Log stream.
//** The Logrec log stream name must be specified as SYSPLEX.LOGREC.ALLRECS.
//** Suggested Modifications:
//** Provide the specifications that are relevant for your installation on the SYSIN DATA TYPE(LOGR) definition.
//** For example, the following parameters define the log stream data set attributes:
//** LS_DATACLAS(data class) - Name of data class
//** LS_MGMTCLAS(management class) - Name of management class
//** LS_STORCLAS(storage class) - Name of storage class
//** Distribution Library: ASAMPLIB*
//**
//** DEFINE EXEC PGM=IXCMIAPU
//** SYSPRINT DD SYSOUT=A
//** SYSSIN DD *
//** DATA TYPE (LOGR)
//** DEFINE STRUCTURE NAME(LOGRECSTRUCTURE)
//** LOGSNUM(1)
//** AVGBUFSIZE(4068)
//** MAXBUFSIZE(4068)
//** DEFINE LOGSTREAM NAME(SYSPLEX.LOGREC.ALLRECS)
//** STRUCTNAME(LOGRECSTRUCTURE)
/*

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-options 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, after IPLing with LOGREC=dsname, 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 logstream with a logrec data set in a single EREP job. If you IPL the system with LOGREC=LOGSTREAM, you cannot use the SETLOGRC command to change the logrec recording medium to a logrec data set.

3. Change the EREP job stream as follows:
   - Change the SERLOG DD DSN=SYS1.LOGREC statement associated with a logrec data set to an ACCIN DD DSN=SYSPLEX.LOGREC.ALLRECS statement, 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 512.
   - 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.

References
   - 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.

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
Recording logrec error records

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.

Reference

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”
- “Logrec data set time stamp record” on page 508

This section describes what is in the logrec data set or the logrec log stream:

- “Types of logrec error records” on page 508

Reference

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.
Recording logrec error records

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 records (ANR):**
  - 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:
  - 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
Recording logrec error records

- **Miscellaneous data (MDR) records** for:
  - Buffer overflow and device failures on buffered log devices
  - Demounts on DASD with buffered logs
  - Demounts by the DFDSS 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
Recording logrec error records

- 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)

Example: Printing a detail edit report

The following example shows how to generate detail edits and summaries of all software and operational records:

```plaintext
//STEP7 EXEC PGM=IFCEREP1,PARM='CARD'
//ACCIN DD DSN=EHISTORY,DISP=SHR
//DIRECTWK DD UNIT=SYSDA,
// SPACE=(CYL,5,,CONTIG)
//EREPPT DD SYSOUT=A,DCB=BLKSIZE=133
//TOURIST DD SYSOUT=A,DCB=BLKSIZE=133
//SYSIN DD *
PRINT=PS
TYPE=SIE
HIST
ACC=N
ENDPARAM
```

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 principal 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

---

### Example: Printing an event history report

The following JCL 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.

```plaintext
/EREPA 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
//EREPPRT DD SYSOUT=A,DCB=BLKSIZE=133
//SYSIN DD DUMMY

/EREPA EXEC PGM=IFCEREP1,PARM='TYPE=SIE,PRINT=PS,ACC=N',
// REGION=256K
//SERLOG DD DSN=SYS1.LOGREC,DISP=SHR
//TOURIST DD SYSOUT=A
//EREPPRT DD SYSOUT=A,DCB=BLKSIZE=133
//SYSIN DD DUMMY
```

---

**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
Example: Printing a detail summary report

The following example shows how to generate detail summaries of all I/O errors:

```z/os
//STEP6 EXEC PGM=IFCEREP1,PARM='CARD'
//ACCIN DD DSN=EHISTORY,DISP=(OLD,PASS)
//DIRECTWK DD UNIT=SYSDA,
//   SPACE=(CYL,5,,CONTIG)
//EREPPT DD SYSOUT=A,DCB=BLKSIZE=133
//TOURIST DD SYSOUT=A,DCB=BLKSIZE=133
//SYSIN DD DSN=EREP.PARMS(STEP6),
//   DISP=(OLD,PASS)
//   DD DSN=EREP.CONTROLS,
//   DISP=(OLD,PASS)
PRINT=SU
TYPE=DOTH
DEV=(N34XX,N3704,N3705,N3720,N3725,N3745)
HIST
ACC=N
ENDPARM
```

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."
- Using EREP: see "Using EREP to obtain records from the logrec log stream."

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 MVS Data Areas in z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/.

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.
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 IXGDELET 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.

Along with the above 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.
Recording logrec error records

DELETEx is mutually exclusive with the FROM and DURATION keywords in \textit{SUBSYS-options1} and the LASTRUN and SYSTEM keywords from \textit{SUBSYS-options2}.

\textbf{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.

\textbf{SYSTEM} = \textit{system name}

Indicates that only records originating from the specified \textit{system name} are to be returned to the application reading the logrec log stream.

The \textit{system name} value should match the name specified in the SYSNAME parameter of the IEASYSxx parmlib member.

\textit{SYSTEM} is mutually exclusive with the DELETE keyword from \textit{SUBSYS-options2}.

\textbf{Time of Day Considerations}

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.

\begin{example}

\textbf{Example: Using SUBSYS parameters}

To select logrec log stream records that were produced between 05:00 on June 1st, 1997, and the end of that day, code the following:

```
//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')
```

\end{example}

- 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.

\begin{example}

\textbf{Example: Using EREP parameters}

To select logrec records that were produced between 05:00 on June 1st, 1997, and the end of that day, code the following:

```
DATE=(97152-97152),TIME=(0500-2400)
```

Note that coding the following would be an error:

```
DATE=(97152-97153),TIME=(0500-0000)
```

\end{example}
Example: Creating a history data set

Use the following JCL 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)
//ACCDEV DD DSN=EREP.HISTORY,
//   DISP=(NEW,CATLG),
//   DCB=(RECFM=VB,BLKSIZE=4000),
//   UNIT=SYSDA,SPACE=(CYL,(25,5))
//SERLOG DD DUMMY
//DIRECTWK DD UNIT=SYSDA,SPACE=(CYL,15,,CONTIG)
//TOURIST DD SYSDA,DCB=BLKSIZE=133
//EREPPT DD SYSDA,DCB=BLKSIZE=133
//SYSABEND DD SYSDA
//SYSIN DD DUMMY
/*
```

Example: Producing an event history

Use the following JCL 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.

```
//EREPNOW 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,DCB=NEW,CATLG,
//   DCB=BLKSIZE=133,
//   UNIT=SYSDA,SPACE=(CYL,(25,5))
//TOURIST DD SYSDA,DCB=BLKSIZE=133
//SYSABEND DD SYSDOUT=A
//SYSIN DD DUMMY
/*
```

Chapter 14. Recording logrec error records 517
Recording logrec error records

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.

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’ (RBCBWRCB) points to the WTO buffer.
- RBCB+X’1C’ (RBCBWLEN) 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.
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 520 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 526 for more information.

Using report 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.

References

- 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.

Report Output

The example output is from one record with SDWARC4 and 64-bit information. This record also has information in the VRA, which is formatted.
Recording logrec error records

<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></td>
<td></td>
</tr>
</tbody>
</table>

- **FORMATTED BY:** IEAVTFDE HBB7703
- **REPORT DATE:** 343.04
- **ERROR DATE:** 336.04
- **MODEL:** 2084
- **HH:MM:SS.TH:**
- **SERIAL:** 11778D
- **TIME:** 17:43:44.72

- **JOBNAME:** PIDA1028
- **SYSTEM NAME:** J50
- **ERRORID:** SEQ=00757 CPU=0056 ASID=0097 TIME=17:43:44.7

**SEARCH ARGUMENT ABSTRACT**

- **PIDS/5752SCLDR RIDS/IEWLDR00#L RIDS/IEWLUNF0 AB/S0378 PRCS/00000014**
- **RIDS/IEWLRECV#R**

**SYMPTOM DESCRIPTION**

<table>
<thead>
<tr>
<th>PROGRAM ID</th>
<th>LOAD MODULE NAME</th>
<th>CSECT NAME</th>
<th>SYSTEM ABEND CODE</th>
<th>ABEND REASON CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5752SCLDR</td>
<td>IEWLDR00</td>
<td>IEWLUNF0</td>
<td>0378</td>
<td>00000014</td>
</tr>
</tbody>
</table>

**OTHER SERVICEABILITY INFORMATION**

- **SUBFUNCTION:** LSLOADER

**SERVICEABILITY INFORMATION NOT PROVIDED BY THE RECOVERY ROUTINE**

**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
```

**RTM WAS ENTERED BECAUSE AN SVC WAS ISSUED IN AN IMPROPER MODE.**

**THE ERROR OCCURRED WHILE:** A TYPE 1 SVC WAS IN CONTROL

**A LOCKED OR DISABLED ROUTINE WAS IN CONTROL**

**LOCKS HELD:** LOCAL/CML

**NO SUPER BITS WERE SET.**
**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:

<table>
<thead>
<tr>
<th>Registers 0-7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GR</strong>: 008FD000 00000000 7FFC100 00000000 008FD098 7FFF0150 7FFF0150 00F52C00</td>
</tr>
<tr>
<td><strong>AR</strong>: 00000000 00000000 00000000 00000000 00000000 00000000 01FF000C 01FF000C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Registers 8-15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GR</strong>: 7F33F4A8 06520100 00FD5750 00000001 8651F240 7F33F0E8 7F33F638 00000000</td>
</tr>
<tr>
<td><strong>AR</strong>: 00000000 00000000 00000000 01FF000C 00000000 00000000 00000000 00000000</td>
</tr>
</tbody>
</table>

**HEXADECIMAL DUMP**

<table>
<thead>
<tr>
<th>Address</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>+000</td>
<td>4031820 00000000 0004336F 17434472</td>
</tr>
<tr>
<td>+010</td>
<td>0011778D 20848000</td>
</tr>
<tr>
<td>+020</td>
<td>D7C9C4C1 F1F0F0F8</td>
</tr>
<tr>
<td>+030</td>
<td>00000000 00000000 84000000 84378000</td>
</tr>
<tr>
<td>+040</td>
<td>00000000 00000000 00001748 00000000</td>
</tr>
<tr>
<td>+050</td>
<td>2C417000 7F36EC88 8651F240 7F33F0E8</td>
</tr>
<tr>
<td>+060</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+070</td>
<td>0008F000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+080</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+090</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+0A0</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+0B0</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+0C0</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+0D0</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+0E0</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+0F0</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+100</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+110</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+120</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+130</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+140</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+150</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+160</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
</tbody>
</table>

**VARIABLE RECORDING AREA (SDWAVRA)**

<table>
<thead>
<tr>
<th>Address</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>+000</td>
<td>KEY: 37 LENGTH: 06</td>
</tr>
<tr>
<td>+002</td>
<td>C4C405C1 0445</td>
</tr>
<tr>
<td>+008</td>
<td>KEY: 39 LENGTH: 08</td>
</tr>
<tr>
<td>+00A</td>
<td>6060C8C6 E2606060</td>
</tr>
<tr>
<td>+00C</td>
<td>00000000 00000000 00000000 00000000</td>
</tr>
<tr>
<td>+00E</td>
<td>KEY: FF LENGTH: 00</td>
</tr>
</tbody>
</table>
### Recording logrec error records

<table>
<thead>
<tr>
<th>SDWA FIRST RECORDABLE EXTENSION (SDWARC1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+000  E2C3D3C4  D903E2D3  D6C1C4C5  D9404040  SCLDRLSLOADER</td>
<td></td>
</tr>
<tr>
<td>+010  40404040  40404040  40404040  00000000</td>
<td></td>
</tr>
<tr>
<td>+020  00000000  00000000  00000000  00000014</td>
<td></td>
</tr>
<tr>
<td>+030  00000000  00000000  F5F7F5F2  01000001</td>
<td></td>
</tr>
<tr>
<td>+1B0  00000000  00000000  00000000  00000000</td>
<td></td>
</tr>
<tr>
<td>+1C0  D1F5F040  40404040</td>
<td>J50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SDWA SECOND RECORDABLE EXTENSION (SDWARC2)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+000  00000000  00000000  00000000  00000000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SDWA THIRD RECORDABLE EXTENSION (SDWARC3)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+000  00000000  00000000  00000000  00000000</td>
<td></td>
</tr>
<tr>
<td>+010  00000000  00000000  00000000  00000000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SDWA FOURTH RECORDABLE EXTENSION (SDWARC4)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+000  00000000  84000000  00000000  B4378000</td>
<td></td>
</tr>
<tr>
<td>+010  00000000  00000200  00000000  000FC03</td>
<td></td>
</tr>
<tr>
<td>+020  00000001  08FD0908  00000000  00FD5750</td>
<td></td>
</tr>
<tr>
<td>+030  00000000  00000003  00000001  00FD5200</td>
<td></td>
</tr>
<tr>
<td>+150  00000000  00000000  07041000  80000000</td>
<td></td>
</tr>
<tr>
<td>+160  00000000  012F902E</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ERRORID</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+000  02F50056  00970009  BD27</td>
<td>.5...P....</td>
</tr>
</tbody>
</table>

**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](#) 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'.
Recording logrec error records

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 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.

Reference
For the format of the SDWA, including a description of the keys, see z/OS MVS Data Areas in z/OS Internet Library at http://www.ibm.com/systems/z/os/zos/bkserv/

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).
Recording logrec error records

- **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.

**References**

- See [z/OS MVS Programming: Assembler Services Reference IAR-XCT](http://www.ibm.com/) for information about the SYMREC macro.

**Report output:** The following two-part example 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.
### Recording logrec error records

**TYPE: SYMPTOM RECORD**

<table>
<thead>
<tr>
<th>REPORT DATE: 176.92</th>
<th>DAY.YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERROR DATE: 175.92</td>
<td></td>
</tr>
</tbody>
</table>

**SCP:** VS 2 REL 3

**MODEL:** 9021

**SERIAL:** 031347

**SEARCH ARGUMENT ABSTRACT:**

```markdown
PIDS/5752SC1CM AB/S080A PRCS/00000010 RIDS/IEAVTRSR
RIDS/IGC0101C#L FLDS/SR#ORIGIN VALU/CIEAVTRSR PCSS/FAILING
```

**SYSTEM ENVIRONMENT:**

- CPU MODEL: 9021
- CPU SERIAL: 031347
- 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:**

```markdown
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
```

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>SYMPTOM DATA</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIDS/5752SC1CM</td>
<td>5752SC1CM</td>
<td>COMPONENT IDENTIFIER</td>
</tr>
<tr>
<td>AB/S080A</td>
<td>080A</td>
<td>ABEND CODE - SYSTEM</td>
</tr>
<tr>
<td>PRCS/00000010</td>
<td>00000010</td>
<td>RETURN CODE</td>
</tr>
<tr>
<td>RIDS/IEAVTRSR</td>
<td>IEAVTRSR</td>
<td>ROUTINE IDENTIFIER</td>
</tr>
<tr>
<td>RIDS/IGC0101C#L</td>
<td>IGC0101C#L</td>
<td>ROUTINE IDENTIFIER</td>
</tr>
<tr>
<td>FLDS/SR#ORIGIN</td>
<td>SR#ORIGIN</td>
<td>DATA FIELD NAME</td>
</tr>
<tr>
<td>VALU/CIEAVTRSR</td>
<td>IEAVTRSR</td>
<td>ERROR RELATED CHARACTER VALUE</td>
</tr>
<tr>
<td>PCSS/FAILING</td>
<td>FAILING</td>
<td>SOFTWARE STATEMENT</td>
</tr>
<tr>
<td>PCSS/CSECT</td>
<td>CSECT</td>
<td>SOFTWARE STATEMENT</td>
</tr>
<tr>
<td>PCSS/UNKNOWN</td>
<td>UNKNOWN</td>
<td>SOFTWARE STATEMENT</td>
</tr>
<tr>
<td>FLDS/RTM2SCTC</td>
<td>RTM2SCTC</td>
<td>DATA FIELD NAME</td>
</tr>
<tr>
<td>FLDS/FROM#PRWA</td>
<td>FROM#PRWA</td>
<td>DATA FIELD NAME</td>
</tr>
<tr>
<td>VALU/H00040000</td>
<td>00040000</td>
<td>ERROR RELATED HEXADECIMAL VALUE</td>
</tr>
</tbody>
</table>
Recording logrec error records

SECONDARY SYMPTOM STRING:
FLDS/RTM2SCTR VALU/H00040000 FLDS/RTM2SCTX VALU/H00040000

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>SYMPTOM DATA</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLDS/RTM2SCTR</td>
<td>RTM2SCTR DATA FIELD NAME</td>
<td>FLDS/RTM2SCTX VALU/H00040000</td>
</tr>
<tr>
<td>VALU/H00040000</td>
<td>00040000 ERROR RELATED HEXADECIMAL VALUE</td>
<td></td>
</tr>
</tbody>
</table>

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|
+020 C5D9D9D6 D940C4C5 E3C5C3E3 C5C440C2

HEX DUMP OF RECORD:
HEADER
+000 4C831800 00000000 0092175F 10411437 |<C.......K. ....|
+010 A6031347 90210000 |W....... |

SYMPTOM RECORD
+000 E2D9F9F0 F2F1F0F3 F1F3F4F7 00000000 |SR9021031347....|
+010 A5E2A254 A5ED4104 40404040 40404040 |V55.V... |
+020 4040C3D7 E4D94040 4040F5F7 F5F2D1C2 | COPR 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.

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

Reference
See z/OS MVS Installation Exit for information about ASREXIT.
Chapter 15. AMBLIST

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.

Major Topics

The following topics describe AMBLIST:
- "Obtaining AMBLIST output" on page 530
- "Reading AMBLIST output" on page 543

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).

Notes:
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 582 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”
- “Controlling AMBLIST processing”
- “Examples of running AMBLIST” on page 535
- “Examples for z/OS UNIX System Services file support” on page 542

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 data set. This statement may define a z/OS UNIX System Services file. If so, the complete path name, including the file name, must be specified. For an object module in a z/OS UNIX System Services file, PATHOPTS=(ORDONLY) must be specified. This statement cannot define a concatenated data set.

**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
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. If you omit the MEMBER= parameter, AMBLIST will print all modules in the data set.

Notes:

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.

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, 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.

OUTPUT=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.
IMPEXP=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,member2...}]
```
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={member1[,member2...]...}
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.

Notes:
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, 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). AMBLIST also supports the LISTIDR control statement for program objects in z/OS UNIX System Services files.

LISTIDR

OUTPUT={IDENT|ALL]
[TITLE=('title',position)]
[DDN=ddname]
[MEMBER={member1[,member2...]...}]
[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.
AMBLIST

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. If you omit
the MEMBER parameter, AMBLIST will print all modules in the data set. Do
not specify MEMBER if you specify the MODLIB parameter.

Note: 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.

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 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 549.
Example: Listing an object module

In this example, AMBLIST is used to format and list an object module included in the input stream.

```plaintext
//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)
/*

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.
Example: Listing several object modules

In this example, 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)
```

**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 558, "Alphabetical cross-reference" on page 580, and "LISTLOAD OUTPUT=XREF output (comparison of load module and program object version 1)" on page 582.
Example: Listing several load modules or program objects

In this example, 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.

```bash
//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)
```

**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.
Example: Listing several load modules or program objects

This example 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.

```
//LSTDOBJ JOB MSGLEVEL=(1,1)
// EXEC PGM=AMBLIST,REGION=64K
//SYSPRINT DD SYSOUT=A
//OBJMOD DD DSN=MYM0D,DISP=SHR
//LOADMOD1 DD DSN=YOURM0D,DISP=SHR
//LOADMOD2 DD DSN=HISM0D,DISP=SHR
//SYSIN DD *
LISTOBJ DDN=OBJMOD,
   TITLE=('OBJECT LISTING FOR MYM0D',20)
LISTLOAD DDN=LOADMOD1,OUTPUT=BOTH,
   TITLE=('LISTING FOR YOURM0D',25)
LISTIDR DDN=LOADMOD1,OUTPUT=ALL,
   TITLE=('IDRS FOR YOURM0D',25)
LISTLOAD DDN=LOADMOD2,OUTPUT=BOTH,
   TITLE=('LISTING FOR HISM0D',25)
LISTIDR DDN=LOADMOD2,OUTPUT=ALL,
   TITLE=('IDRS FOR HISM0D',25)
```

**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 588.
Example: Listing IDR information for several load modules

In this example, 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
   TITLE=('LISTING OF MODIFICATIONS TO TESTMOD',20)
   LISTIDR OUTPUT=ALL,DDN=LOADLIB,MEMBER=(MOD1,MOD2,MOD3),
   TITLE=('IDR LISTINGS OF MOD1 MOD2 MOD3',20)
   LISTIDR DDN=LOADLIB,MODLIB
/*

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.

SYSIN 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 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 591.

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.

Example: Listing a system nucleus and the link pack area

This example 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 the z/OS MVS IPCS User’s Guide and the z/OS MVS IPCS Commands.

```
//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
```

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.
z/OS UNIX System Services program object example

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 following JCL example as a guide:

```
//LIST EXEC PGM=AMBLIST
//HFS1 DD PATH='/u/USER1/outmod'
//      PATHDISP=(KEEP,KEEP)
//SYSPRINT DD SYSOUT=*  
//SYsin DD *
LISTLOAD DDN=HFS1,OUTPUT=MODLIST
```

z/OS UNIX System Services object module example

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 following JCL example 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
```

z/OS UNIX System Services control statement example

AMBLIST will support the LISTIDR control statement for program objects in z/OS UNIX System Services files. Use the following JCL example as a guide:

```
//LIST EXEC PGM=AMBLIST
//HFS1 DD PATH='/u/USER1/outmod'
//      PATHDISP=(KEEP,KEEP)
//SYSPRINT DD SYSOUT=*  
//SYsin DD *
LISTIDR DDN=HFS1
```

Differences in output

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 the following example, library name is truncated while member name is not:

- MEMBER NAME: 01234567890123456789012345678901234567890123456789abc
- MAIN ENTRY POINT: 00000000
- LIBRARY: .. 34567890123456789012345678901234567890123456789abc/
- AMODE OF MAIN ENTRY POINT: 31

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 46 and Figure 47 on page 545 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

LISTLOAD DDN=DD1,MEMBER=TESTPR

| MEMBER NAME: TESTPR | MAIN ENTRY POINT: 00000000 |
| LIBRARY: DD1 | AMODE OF MAIN ENTRY POINT: ANY |

------------------------------------------------------------------------------------------------------------------------

| /SF580000B/SF590000 | **** LINKAGE EDITOR ATTRIBUTES OF MODULE * |
| ** BIT STATUS | ** BIT STATUS | ** BIT STATUS | ** BIT STATUS |
| 0 NOT-REN  | 1 NOT-REUS | 2 NOT-OVLY | 3 NOT-TEST |
| 4 NOT-CL  | 5 BLOCK | 6 EXEC | 7 MULTI-RCD |
| 8 NOT-DC | 9 ZERO-ORG | 10 EP-ZERO | 11 RLD |
| 12 EDIT | 13 NO-SYM | 14 F-LEVEL | 15 NOT-REFR |

------------------------------------------------------------------------------------------------------------------------

| /SF580000C/SF590000 | MODULE SSI: NONE |
| APF CODE: 00000000 |
| RMODE: 24 |

***** LOAD MODULE PROCESSED BY VS LINKAGE EDITOR

Figure 46. Sample module summary for a load module processed by the linkage editor
The following describes Figure 46 on page 544 and Figure 47.

**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 46 on page 544 and Figure 47, bit 0 is interpreted as NOT-RENT. This means the module is not reentrant. For a description of all the STATUS values, see Table 25 on page 546.

**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 25. Program object and load module attributes. 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>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>
</tbody>
</table>
Table 25. Program object and load module attributes (continued). 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>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>I-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>REFR</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>Meaning</th>
<th>ON Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>&lt;16M  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 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 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 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 This is a load module.</td>
<td>PGM OBJ</td>
<td>This is a program object. Always on for program object.</td>
</tr>
</tbody>
</table>
Table 25. Program object and load module attributes (continued). 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>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>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>FETCHOPT PRIME option.</td>
<td>NO-PRIME</td>
<td>FETCHOPT NOPRIME option.</td>
</tr>
<tr>
<td>34</td>
<td>PACK</td>
<td>FETCHOPT PACK option.</td>
<td>NO-PACK</td>
<td>FETCHOPT 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

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.

Reference
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 48. Sample output for LISTOBJ with an object module

Figure 49. Sample output for LISTOBJ with XSD Record
### 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 Figure 51 on page 552. Note that some of the flags and lengths in the GOFF format are of a structural nature and do not represent the data content of the module. To save space, those elements have been omitted from the listing. For the same reason, unsupported data elements are not shown. A list of omitted elements is provided for each record type and the reason for omission is coded in parens following the field name. Code values are S (structural or syntactic data) and U (unsupported element). PTV for all record types is not formatted.
AMBLIST

Figure 51. LISTOBJ Format for GOFF (Part 1 of 3)
Figure 51. LISTOBJ Format for GOFF (Part 2 of 3)
Figure 51. LISTOBJ Format for GOFF (Part 3 of 3)

Display elements in the above figure are described as follows. The numbers
closed in braces following the field heading are the location (byte.bit) in
the GOFF record where the data element can be found.

1 Page Header
   - The page header is printed at the top of each page.
   - The second line contains an optional user title.

2 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, REF1)
  - 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)
The AMBLIST on page 556 of the z/OS V1R13.0 MVS Diagnosis: Tools and Service Aids manual contains information on the following topics:

- 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.
  - **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)**

**5 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.

**6 RLD Record**

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.

Data elements formatted:

- R-PTR. The ESDID of the target element, the value which will be used in relocating the address constant.
- P-PTR. The ESDID of the element containing the adcon or data area to be modified.
- OFFSET. The offset within the element described by the P-PTR at which the adcon or data area is located.
- TYPE. This describes the type of adcon and implies the operation to be performed on it. Bytes 1 and 2 must be printed in hexadecimal.
- LEN. Length of the adcon or data area. Range: 2-255.
- ATTRIB:
  - H - the high order bit of the target field should be set from the target AMODE.
  - S - RLD is part of a conditional sequential RLD chain and the following RLD is also part of the chain.

Data elements not formatted:

- Total data length (S)
- Flag bytes 0 (except for 0.7) and 5 (S)
- Extended Attributes ESDID and offset (U)

**END Record**

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.

Data elements formatted:

- Line 1
  - RECORD COUNT. Count of the logical records in the module, including the HDR and END records.
  - AMODE. Amode to be used for the entry point specified on this END record.
  - ENTRY POINT ESDID. The identifier of the element containing the entry point.
  - ENTRY POINT OFFSET. The offset of the entry point within the element identified by ESDID.
- Lines 2 contain the symbol name, if specified. The display format is identical to that on the ESD record type.
LISTLOAD OUTPUT=MODLIST output

LISTLOAD MEMBER=ADATA3,OUTPUT=MODLIST,ADATA=YES

***** MODULE SUMMARY *****
MEMBER NAME: ADATA3 MAIN ENTRY POINT: 00000368
LIBRARY: SYSLIB AMODE OF MAIN ENTRY POINT: ANY
NO ALIASES **

**** ATTRIBUTES OF MODULE ****

** BIT STATUS **
0 NOT-RENT 1 NOT-REGS 2 NOT-OL 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 NO-PF 18 NOT-SI 19 NO-SSI
20 APF 21 PM OBJ 22 NOT-SIGN 23 RESERVED
24 NOT-ALT 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 SSI: NONE
APFCODE: 00000000
RMODE: 24
PO FORMAT: 3
XPLINK: NO

*****PROGRAM OBJECT PROCESSED BY BINDER

THE FOLLOWING ARE THE UNFORMATTED PSE DIRECTORY ENTRY SECTIONS (PMAR AND PMARL)

PMAR 001E0309 02C00C03 00000000 05A40000 03680000 03680000 00000000 0000
PMARL 00628000 00000000 000A0000 10180000 10000000 27AC0000 74980000 00E00000
01400000 00240000 011C0000 000A0000 02200002 00000000 05300000 00180000
20002011 017F0131 240FC1C4 C1E3C1F3 40403000 00010000 005C0000 30000000

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

**** ESDs ****
C_WSA(ED)
CLASS: C_WSA LENGTH: 5C (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE RMODE: ANY
TEXT DATA DEFER FILL: 0 (HEX)

C_@@DLLI(ED)
CLASS: C_@@DLLI LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE RMODE: ANY
TEXT DATA LOAD FILL: 0 (HEX)

C_@@PPA2(ED)
CLASS: C_@@PPA2 LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE RMODE: ANY
TEXT DATA LOAD READ-ONLY 0 (HEX)

B_PRV(ED)
CLASS: B_PRV LENGTH: 4 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 2 ALIGNMENT: DOUBLE WORD BIND METHOD: MERGE RMODE: 24
TEXT NOLOAD FILL: UNSPEC

$PRIV000001(PO)
CLASS: C_@@DLLI LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: BYTE PRIORITY: 0 (HEX) SCOPE: LIBRARY
ATTRIBUTES: GENERATED,STRONG

$PRIV0000011(PO)
CLASS: C_@@PPA2 LENGTH: 8 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: BYTE PRIORITY: 0 (HEX) SCOPE: LIBRARY
ATTRIBUTES: GENERATED,STRONG

$PRIV000002(PO)
CLASS: C_WSA LENGTH: 10 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD PRIORITY: 0 (HEX) SCOPE: SECTION
ATTRIBUTES: GENERATED,STRONG

__ls__7os-amFPCc(PO)
CLASS: C_WSA LENGTH: 20 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD PRIORITY: 0 (HEX) SCOPE: MODULE
ATTRIBUTES: GENERATED,STRONG,INDIRECT,MANGLED

endl__FR7-stream(PO)
CLASS: C_WSA LENGTH: 20 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD PRIORITY: 0 (HEX) SCOPE: MODULE
ATTRIBUTES: GENERATED,STRONG,INDIRECT,MANGLED

HELLOW1#S(PO)
CLASS: C_WSA LENGTH: C (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 3 ALIGNMENT: DOUBLE WORD PRIORITY: 0 (HEX) SCOPE: LIBRARY
ATTRIBUTES: GENERATED,STRONG

Q1(PO)
CLASS: B_PRV LENGTH: 4 (HEX) CLASS OFFSET: 0 (HEX) FORMAT: F(0001)
NAME SPACE: 2 ALIGNMENT: FULL WORD PRIORITY: 0 (HEX) SCOPE: MODULE
ATTRIBUTES: WEAK

Figure 52. Sample output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object (Part 1 of 6)
Figure 52. Sample output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object (Part 2 of 6)
Figure 52. Sample output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object (Part 3 of 6)
Figure 52. Sample output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object (Part 4 of 6)
Figure 52. Sample output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object (Part 5 of 6)
** LONG NAME TABLE LISTING OF PROGRAM OBJECT ADATA3 ** ** PAGE 16

ABBREVIATION LONG NAME
__ls__7os-amFPCc := __ls__7ostreamFPCc
endl__FR7-stream := endl__FR7ostream

** END OF LONG NAME TABLE LISTING OF PROGRAM OBJECT ADATA3 **

** END OF PROGRAM OBJECT LISTING

Figure 52. Sample output for LISTLOAD OUTPUT=MODLIST,ADATA=YES for a program object (Part 6 of 6)
## Listing of Load Module PL1LOAD

<table>
<thead>
<tr>
<th>RECORD#</th>
<th>TYPE</th>
<th>CESD</th>
<th>ESD ID</th>
<th>ESID</th>
<th>ESD SIZE</th>
<th>CESD#</th>
<th>SYMBOL</th>
<th>TYPE</th>
<th>ADDRESS</th>
<th>SEGNUM</th>
<th>ID/LENGTH(DEC)</th>
<th>HEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>CESD</td>
<td>1</td>
<td></td>
<td>240</td>
<td>1</td>
<td>PLITCOZ</td>
<td>00(SD)</td>
<td>000000</td>
<td>1</td>
<td>1206 486</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>PLITCOZA</td>
<td>00(SD)</td>
<td>000488</td>
<td>1</td>
<td>608 260</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IHEQINV</td>
<td>06(PR)</td>
<td>000000</td>
<td>3</td>
<td>4 4</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 53. Sample Output for LISTLOAD OUTPUT=MODLIST for an overlay structured load module (Part 1 of 4)**
<table>
<thead>
<tr>
<th>RECORD#</th>
<th>TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>000000</td>
<td>A01</td>
</tr>
<tr>
<td>000020</td>
<td>B04</td>
</tr>
<tr>
<td>000040</td>
<td>C06</td>
</tr>
<tr>
<td>000060</td>
<td>D08</td>
</tr>
<tr>
<td>000090</td>
<td>E10</td>
</tr>
<tr>
<td>000110</td>
<td>F12</td>
</tr>
<tr>
<td>000140</td>
<td>G14</td>
</tr>
<tr>
<td>000160</td>
<td>H16</td>
</tr>
<tr>
<td>000180</td>
<td>I18</td>
</tr>
<tr>
<td>000200</td>
<td>J20</td>
</tr>
<tr>
<td>000220</td>
<td>K22</td>
</tr>
<tr>
<td>000240</td>
<td>L24</td>
</tr>
<tr>
<td>000260</td>
<td>M26</td>
</tr>
<tr>
<td>000280</td>
<td>N28</td>
</tr>
<tr>
<td>000300</td>
<td>O30</td>
</tr>
<tr>
<td>000320</td>
<td>P32</td>
</tr>
<tr>
<td>000340</td>
<td>Q34</td>
</tr>
<tr>
<td>000360</td>
<td>R36</td>
</tr>
<tr>
<td>000380</td>
<td>S38</td>
</tr>
<tr>
<td>000400</td>
<td>T40</td>
</tr>
<tr>
<td>000420</td>
<td>U42</td>
</tr>
<tr>
<td>000440</td>
<td>V44</td>
</tr>
<tr>
<td>000460</td>
<td>W46</td>
</tr>
<tr>
<td>000480</td>
<td>X48</td>
</tr>
<tr>
<td>000500</td>
<td>Y50</td>
</tr>
<tr>
<td>000520</td>
<td>Z52</td>
</tr>
</tbody>
</table>

---

Figure 53. Sample Output for LISTLOAD OUTPUT=MODLIST for an overlay structured load module (Part 2 of 4)
<table>
<thead>
<tr>
<th>RECORD # 6</th>
<th>TYPE 02 - RLD</th>
<th>RLD SIZE 236</th>
</tr>
</thead>
<tbody>
<tr>
<td>R- PTR</td>
<td>P- PTR</td>
<td>FL ADDR</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>0C 000010</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>24 00002E</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>24 00029A</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0D 000284</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>25 000448</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>24 000478</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>24 000482</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>24 000490</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>25 0004A2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0D 0004BC</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>0C 0004D8</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>0C 0004D9</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>0D 0004E0</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0C 0004F0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>0D 0004F8</td>
</tr>
<tr>
<td>16</td>
<td>2</td>
<td>0C 000508</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
<td>0C 00050C</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>0C 000510</td>
</tr>
<tr>
<td>19</td>
<td>2</td>
<td>0C 000514</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>0C 0004E8</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>0C 00051B</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>0C 00051C</td>
</tr>
<tr>
<td>23</td>
<td>2</td>
<td>0C 000520</td>
</tr>
</tbody>
</table>

Figure 53. Sample Output for LISTLOAD OUTPUT=MODLIST for an overlay structured load module (Part 3 of 4)
LISTING OF LOAD MODULE PL1LOAD  
RECORD# 7  TYPE 0E - RLD  
R-PTR  P-PTR  FL ADDR  FL ADDR  FL ADDR  FL ADDR  FL ADDR  FL ADDR  FL ADDR  FL ADDR
24  2  0C  000524
25  2  0C  000528
26  2  0C  00052C
2  2  09  00053D  09  000559  09  00058D  09  0005CD  0D  0005F8  0C  0005FC
25  2  0C  000600
2  2  0B  000605
26  2  0C  000608
1  2  0C  00060C
2  2  0B  000611
26  2  0C  000614
1  2  0C  000618
2  2  0B  00061D
26  2  0C  000620
1  2  0C  000624
2  2  0B  000629
26  2  0C  00062C
1  2  0C  000630
2  2  0B  000635
1  8  0C  000718
10  9  0C  000728
27  26  24  000748
******END OF LOAD MODULE LISTING

Figure 53. Sample Output for LISTLOAD OUTPUT=MODLIST for an overlay structured load module (Part 4 of 4)

LOAD MODULE PROCESSED EITHER BY VS LINKAGE EDITOR OR BINDER

LISTING OF LOAD MODULE MYMOD
RECORD# 1  TYPE 20 - CESD  
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

Figure 54. Sample Output for LISTLOAD OUTPUT=MODLIST for a normal (non-overlay) structured load module
LISTING OF PROGRAM OBJECT TESTPR

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

TRANSLATOR VER MOD DATE TIME
566896201 02 01 09/16/92

ESDs

ALPHA(PR)
ALIGNMENT: FULL WORD LENGTH: 00000004

RLDs

SEC.OFF MOD.OFF TYPE BDY STATUS REFERENCED SYMBOL
00000004 00000004 CPR NONE RES $CUMULATIVE PSEUDO REGISTER LENGTH
00000008 00000008 PR NONE RES (+)ALPHA

TEXT

PSEUDO REGISTER
VECTOR LOC LENGTH NAME
0 4 ALPHA
0 10 BETA

LENGTH OF PSEUDO REGISTERS 14

** END OF PROGRAM OBJECT LISTING

Figure 55. Sample output for LISTLOAD OUTPUT=MODLIST for a PDSE (program object Version 1)

MODULE SECTION: $MODULE
USABILITY: UNSPECIFIED OVERLAY SEGMENT: 0 OVERLAY REGION: 0

DATE USER DATA
09/28/2007 *** z/OS V1.9 ***

ESDs

TESTASM(ER)

TARGET SECTION: TESTASM
NAME SPACE: 1 SCOPE: LIBRARY ELEMENT OFFSET: 0 (HEX)
RESOLVED AUTOCALL

ATTRIBUTES: STRONG

MAP

CLASS: B_MAP

MAP

CLASS: B_MAP

Figure 56. Sample output for LISTLOAD OUTPUT=MODLIST,SECTION1=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 Figure 52 on page 558):

**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. ADA - Adassa 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:
AMBLIST

- $PRIVxxxx, 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 589, 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 - 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 autocalc, 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:
3. The third line displays binder attributes. Possible attributes are: XPL, STRONG or WEAK, MAPPED, INDIRECT, GENERATED, or MANGLED.

- NAME SPACE - in hexadecimal.
- ALIGNMENT - in either BYTE, HALF WORD, FULL WORD, DOUBLE WORD, or PAGE.
- PRIORITY - Controls the order of the part within the element.
- SCOPE - Scope of part (SECTION, MODULE, LIBRARY, or IMP/EXP).

- 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.
  - ADCON 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
  - 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 Figure 53 on page 564 and Figure 54 on page 567).

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.
AMBLIST

- 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:
Figure 58 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 60 on page 582 and Figure 61 on page 583 allow you to compare the output for a load module with the output for a program object version 1.

“The sample segment map table for LISTLOAD OUTPUT=XREF of mutiple-text class module” on page 581 shows a sample segment map table for a multiple-text class module.

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. This new format for program objects is shown in Figures 15-13 and 15-16. No changes were made to LISTLOAD output for load modules, thus figure 15-15 is unchanged from previous releases.

In the following listing, 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 Figure 58 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.
** SEGMENT MAP TABLE **

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SEGMENT</th>
<th>OFFSET</th>
<th>LENGTH</th>
<th>LOAD</th>
<th>TYPE</th>
<th>ALIGNMENT</th>
<th>RMODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_TEXT</td>
<td>1</td>
<td>0</td>
<td>2030</td>
<td>INITIAL</td>
<td>CAT</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

** NUMERICAL MAP OF PROGRAM OBJECT LOADMOD1 **

<table>
<thead>
<tr>
<th>CLASS LOC</th>
<th>ELEM LOC</th>
<th>LENGTH</th>
<th>TYPE</th>
<th>ALIGNMENT</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 430</td>
<td>ED PAGE</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>430 238</td>
<td>ED DOUBLE WORD</td>
<td>SD2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>668 8</td>
<td>ED DOUBLE WORD</td>
<td>SDX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>668 0</td>
<td>ED PAGE</td>
<td>LO1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>666 4</td>
<td>ED PAGE</td>
<td>L02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 30</td>
<td>ED PAGE</td>
<td>$BLANKCOM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000 30</td>
<td>ED PAGE</td>
<td>CM1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** 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>FROM SYMBOL</th>
<th>CLASS LOC</th>
<th>ELEM LOC</th>
<th>IN CLASS</th>
<th>IN SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 48</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>SD1</td>
<td>A</td>
<td>0 0</td>
<td>B_TEXT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C6 C6</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>SD1</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12E 12E</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>B</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>196 196</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>C</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1FE 1FE</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>D</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>266 266</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>E</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2CE 2CE</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>F</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>336 336</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>G</td>
<td>$CLASS_OFFSET</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30C 30C</td>
<td>B_TEXT</td>
<td>SD1</td>
<td>$CLASS_LEN</td>
<td>$CLASS_LEN</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>478 48</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>SD2</td>
<td>430</td>
<td>0 B_TEXT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4F4 C4</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>L02</td>
<td>66C</td>
<td>4 B_TEXT</td>
<td>SDX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>554 124</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>CM1</td>
<td>2000</td>
<td>0 B_TEXT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>604 104</td>
<td>B_TEXT</td>
<td>SD2</td>
<td>CM1</td>
<td>2000</td>
<td>0 B_TEXT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT LOADMOD1 **

** RESIDENT CLASS: B_PRV **

**** NO RLD DATA ****

** CLASS LENGTH: 18 **

** LENGTH OF PROGRAM OBJECT: 2030 **

Figure 58. Sample output for LISTLOAD OUTPUT=XREF for a program object with class names: B_PRV and B_TEXT (Part 1 of 2)
** ALPHABETICAL MAP OF PROGRAM OBJECT LOADMOD1 **

<table>
<thead>
<tr>
<th>ENTRY NAME</th>
<th>CLAS</th>
<th>LOC</th>
<th>ELEM</th>
<th>LEN/LOC</th>
<th>CLASS NAME</th>
<th>SECTION NAME</th>
<th>OR ENTRY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$PRIV000003</td>
<td>0</td>
<td>18</td>
<td>B_PRV</td>
<td>(ED)</td>
<td>$BLANKCOM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$BLANKCOM</td>
<td>0</td>
<td>0</td>
<td>B_PRV</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>1000</td>
<td>30</td>
<td>B_TEXT</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>1</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>1</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM1</td>
<td>2000</td>
<td>30</td>
<td>B_TEXT</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM1</td>
<td>0</td>
<td>0</td>
<td>B_PRV</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>4</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>10</td>
<td>8</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>1</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM1</td>
<td>2000</td>
<td>30</td>
<td>B_TEXT</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM1</td>
<td>0</td>
<td>0</td>
<td>B_PRV</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>4</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>10</td>
<td>8</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>1</td>
<td>B_PRV</td>
<td>(PD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD1</td>
<td>668</td>
<td>0</td>
<td>B_TEXT</td>
<td>SDX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD2</td>
<td>66C</td>
<td>4</td>
<td>B_TEXT</td>
<td>SDX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDX</td>
<td>668</td>
<td>8</td>
<td>B_TEXT</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDX</td>
<td>0</td>
<td>0</td>
<td>B_PRV</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD1</td>
<td>0</td>
<td>430</td>
<td>B_TEXT</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD1</td>
<td>0</td>
<td>0</td>
<td>B_PRV</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD2</td>
<td>430</td>
<td>238</td>
<td>B_TEXT</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD2</td>
<td>0</td>
<td>0</td>
<td>B_PRV</td>
<td>(ED)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT LOADMOD1 **

<table>
<thead>
<tr>
<th>SYMBOL REFERRED</th>
<th>CLAS</th>
<th>LOC</th>
<th>ELEM</th>
<th>LOC IN CLASS</th>
<th>IN SECTION</th>
<th>CLAS</th>
<th>LOC</th>
<th>ELEM</th>
<th>LOC FROM CLASS</th>
<th>FROM SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$CLASS_LEN</td>
<td>B_PRV</td>
<td>39C</td>
<td>39C</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>06</td>
<td>C6</td>
<td>C6 B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>12E</td>
<td>12E</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>196</td>
<td>196</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM1</td>
<td>2000</td>
<td>0</td>
<td>B_TEXT</td>
<td>554</td>
<td>124 B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CM1</td>
<td>2000</td>
<td>0</td>
<td>B_TEXT</td>
<td>604</td>
<td>104 B_TEXT</td>
<td>SD2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>1FE</td>
<td>1FE</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>266</td>
<td>266</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>2CE</td>
<td>2CE</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>$CLASS_OFFSET B_PRV</td>
<td>336</td>
<td>336</td>
<td>B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD2</td>
<td>66C</td>
<td>4</td>
<td>B_TEXT</td>
<td>SDX</td>
<td>4F4</td>
<td>4F4 B_TEXT</td>
<td>SD2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD1</td>
<td>0</td>
<td>0</td>
<td>B_TEXT</td>
<td>48</td>
<td>48 B_TEXT</td>
<td>SD1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD2</td>
<td>430</td>
<td>0</td>
<td>B_TEXT</td>
<td>478</td>
<td>48 B_TEXT</td>
<td>SD2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LENGTH OF PROGRAM OBJECT 2030

---

Figure 58. Sample output for LISTLOAD OUTPUT=XREF for a program object with class names: B_PRV and B_TEXT (Part 2 of 2)

**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 multiple-text class module” on page 581.

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, PAGE, and QUAD WORD**.

**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 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:

$PRIVxxxxx - where xxxxx is numeric.
$BLANKCOM
$SEGTAB
$ENTAB

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-, and Q-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.
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, $PRIVxxxxx), 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

Below is an example of a Segment map for a multiple-text class module.

```
** SEGMENT MAP TABLE **
CLASS SEGMENT OFFSET LENGTH LOAD TYPE ALIGNMENT RMODE
C_CODE 1 0 160 INITIAL CAT DOUBLE WORD 31
B_TEXT 1 160 99A INITIAL CAT DOUBLE WORD 31
C_EXTNATTR 1 B00 28 INITIAL CAT DOUBLE WORD 31
C_DATA 1 B28 18 INITIAL CAT DOUBLE WORD 31
C_@@PPA2 1 B40 8 INITIAL MERGE DOUBLE WORD 31
B_LIT 1 B48 140 INITIAL CAT DOUBLE WORD 31
B_IMPEXP 1 C88 98 INITIAL CAT DOUBLE WORD 31
C_WSA 2 0 24 DEFER MERGE DOUBLE WORD 31
```

Figure 59. Sample 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)

LISTLOAD OUTPUT=XREF,DDN=DD1, MEMBER=MAINRTN

***** MODULE SUMMARY *****
MEMBER NAME: MAINRTN MAIN ENTRY POINT: 00000000
LIBRARY: DD1 AMODE OF MAIN ENTRY POINT: 31
NO ALIASES **

**** LINKAGE EDITOR ATTRIBUTES OF MODULE ****

** BIT STATUS **
0 NOT-RENT 1 NOT-REUS 2 NOT-ONLY 3 NOT-TEST
4 NOT-OL 5 BLOCK 6 NOT-EXEC 7 MULTI-RCED
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

*****LOAD MODULE PROCESSED BY VS LINKAGE EDITOR
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
16B $PRIVATE BC PC
22B $PRIVATE BC PC
2EB SUBRTN 102 SD
3F0 AAAAAAAA 54 CM
44B $BLANKCOM 54 CM

LMOD LOC CSECT LOC IN CSECT REFERENCES TO SYMBOL AT LMOD LOC CSECT LOC IN CSECT
AC AC MAINRTN AAAAAAAA 3F0 00 AAAAAAAA
80 80 MAINRTN NONAME1M 104 6C $PRIVATE
84 84 MAINRTN NONAME2M 294 6C $PRIVATE
160 160 MAINRTN SUBRTN 2EB 00 SUBRTN
394 394 AC SUBRTN $BLANKCOM 44B 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 NAME
$BLANKCOM 44B 54 CM
$PRIVATE 16B BC PC
$PRIVATE 22B BC PC
AAAAAAA 3F0 54 CM
MAINRTN 00 166 SD
NONAME1M 104 6C $PRIVATE
NONAME2M 294 6C $PRIVATE
SUBRTN 2EB 102 SD

ALPHABETICAL CROSS-REFERENCE LIST OF LOAD MODULE MAINRTN PAGE 0003

SYMBOL AT LMOD LOC CSECT LOC IN CSECT IS REFERRED TO BY LMOD LOC CSECT LOC IN CSECT
$BLANKCOM 394 AC SUBRTN
AAAAAAA 3F0 00 AAAAAAAA AC AC MAINRTN
NONAME1M 104 6C $PRIVATE 80 80 MAINRTN
NONAME2M 294 6C $PRIVATE 84 84 MAINRTN
SUBRTN 2EB 00 SUBRTN 160 160 MAINRTN

** END OF MAP AND CROSS-REFERENCE LISTING

Figure 60. Sample output for LISTLOAD OUTPUT=XREF for a load module
** Segment Map Table **

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SEGMENT</th>
<th>OFFSET</th>
<th>LENGTH</th>
<th>LOAD</th>
<th>TYPE</th>
<th>ALIGNMENT</th>
<th>RMODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_TEXT</td>
<td>166</td>
<td>ED</td>
<td>DOUBLE WORD</td>
<td>MAINRTN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>BC</td>
<td>ED</td>
<td>DOUBLE WORD</td>
<td>$PRIV000010</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>228</td>
<td>BC</td>
<td>ED</td>
<td>DOUBLE WORD</td>
<td>$PRIV000011</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>294</td>
<td>102</td>
<td>ED</td>
<td>DOUBLE WORD</td>
<td>SUBRTN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3F0</td>
<td>54</td>
<td>ED</td>
<td>DOUBLE WORD</td>
<td>$BLANKCOM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>448</td>
<td>54</td>
<td>ED</td>
<td>DOUBLE WORD</td>
<td>$BLANKCOM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Numerical Map of Program Object MAINRTN **

<table>
<thead>
<tr>
<th>CLASS</th>
<th>LENGTH</th>
<th>4A0</th>
</tr>
</thead>
</table>

** Numerical Cross-reference List of Program Object MAINRTN **

<table>
<thead>
<tr>
<th>CLAS LOC</th>
<th>ELEM LOC FROM CLASS</th>
<th>FROM SECTION</th>
<th>REFERS TO SYMBOL</th>
<th>CLAS LOC</th>
<th>ELEM LOC IN CLASS</th>
<th>IN SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>AC B_TEXT</td>
<td>MAINRTN</td>
<td>$BLANKCOM</td>
<td>448</td>
<td>0 B_TEXT</td>
<td></td>
</tr>
</tbody>
</table>

Figure 61. Sample output for LISTLOAD OUTPUT=XREF for a program object (Part 1 of 2)
### ALPHABETICAL MAP OF PROGRAM OBJECT MAINRTN

**XREF LISTINGS OF A LONG ALIAS NAME**

<table>
<thead>
<tr>
<th>ENTRY NAME</th>
<th>CLAS</th>
<th>LOC</th>
<th>ELEM</th>
<th>LEN/LOC</th>
<th>CLASS</th>
<th>SECTION NAME</th>
<th>OR ENTRY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$PRIV000010</td>
<td>168</td>
<td>BC</td>
<td>0 B_TEXT (ED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$PRIV000011</td>
<td>228</td>
<td>BC</td>
<td>0 B_TEXT (ED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$BLANKCOM</td>
<td>448</td>
<td>54</td>
<td>0 B_TEXT (ED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAAAAAAAA</td>
<td>3F0</td>
<td>54</td>
<td>0 B_TEXT (ED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAINRTN</td>
<td>0</td>
<td>166</td>
<td>0 B_TEXT (ED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME1M</td>
<td>1D4</td>
<td>6C</td>
<td>0 B_TEXT $PRIV000010</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME2M</td>
<td>294</td>
<td>6C</td>
<td>0 B_TEXT $PRIV000011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBRTN</td>
<td>2E8</td>
<td>102</td>
<td>0 B_TEXT (ED)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT MAINRTN

**XREF LISTINGS OF A LONG ALIAS NAME**

<table>
<thead>
<tr>
<th>SYMBOL REFERRED</th>
<th>CLAS</th>
<th>LOC</th>
<th>ELEM</th>
<th>LOC IN CLASS</th>
<th>IN SECTION</th>
<th>CLAS</th>
<th>LOC</th>
<th>ELEM</th>
<th>LOC FROM CLASS</th>
<th>FROM SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$BLANKCOM</td>
<td>448</td>
<td>0 B_TEXT</td>
<td>394</td>
<td>AC B_TEXT</td>
<td>SUBRTN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAAAAAAAA</td>
<td>3F0</td>
<td>0 B_TEXT</td>
<td>394</td>
<td>AC B_TEXT</td>
<td>MAINRTN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME1M</td>
<td>1D4</td>
<td>6C B_TEXT</td>
<td>394</td>
<td>0 B_TEXT $PRIV000010</td>
<td>80</td>
<td>80 B_TEXT</td>
<td>MAINRTN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONAME2M</td>
<td>294</td>
<td>6C B_TEXT</td>
<td>394</td>
<td>0 B_TEXT $PRIV000011</td>
<td>84</td>
<td>84 B_TEXT</td>
<td>MAINRTN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBRTN</td>
<td>2E8</td>
<td>0 B_TEXT</td>
<td>394</td>
<td>160 B_TEXT</td>
<td>MAINRTN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LENGTH OF PROGRAM OBJECT: 1640 bytes

### LONG NAME TABLE LISTING OF PROGRAM OBJECT MAINRTN

**ABBREVIATION**

<table>
<thead>
<tr>
<th>LONG NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>THISISALONGALIASNAMEYOUMAYCHANGERENAMEIFYOULIKEANYNAMEWILLDOO000</td>
</tr>
</tbody>
</table>

**END OF LONG NAME TABLE LISTING OF PROGRAM OBJECT MAINRTN**

**END OF MAP AND CROSS-REFERENCE LISTING**

Figure 61. Sample output for LISTLOAD OUTPUT=XREF for a program object (Part 2 of 2)
LISTLOAD OUTPUT=BOTH Output

1 LISTLOAD MEMBER=TESTLS,OUTPUT=BOTH,SECTION1=NO
0 MEMBER NAME: TESTLS MAIN ENTRY POINT: 00000028
0 LIBRARY: SYSLIB AMODE OF MAIN ENTRY POINT: 24
0 NO ALIASES **

-------------------------------------------------------------------------------------------------------------------------
**** ATTRIBUTES OF MODULE ****
** BIT STATUS BIT STATUS BIT STATUS BIT STATUS **
0 0 NOT-RENT 1 NOT-REUS 2 NOT-OVLY 3 NOT-TEST
4 NOT-UL 5 BLOCK 6 EXEC 7 MULTI-RCD
8 NOT-OC 9 ZERO-ORG 10 RESERVED 11 HLQ
12 EDIT 13 NO-SYMS 14 RESERVED 15 NOT-REFR
16 RESERVED 17 <6M 18 NOT-PL 19 NO-SI
20 NOT-APF 21 PGM OBJ 22 NOT-SIGN 23 RESERVED
24 NOT-ALT 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
------------------------------------------------------------------------------------------------------------------------
- MODULE SSI: NONE
APPCODE: 00000000
RMODE: 24
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
00002005 013F0193 505FC3D6 D7E84040 4040

0 LISTING OF PROGRAM OBJECT TESTLS PAGE 1

Figure 62. Sample output for LISTLOAD OUTPUT=BOTH for a PDSE (Part 1 of 3)
Figure 62. Sample output for LISTLOAD OUTPUT=BOTH for a PDSE (Part 2 of 3)
** AMBLIST **

** NUMERICAL MAP OF PROGRAM OBJECT TESTLR5 **

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SEGMENT OFFSET</th>
<th>LENGTH</th>
<th>LOAD</th>
<th>TYPE</th>
<th>ALIGNMENT</th>
<th>RMODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_TEXT</td>
<td>1</td>
<td>0</td>
<td>38</td>
<td>INITIAL</td>
<td>CAT</td>
<td>DOUBLE WORD</td>
</tr>
</tbody>
</table>

** NUMERICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT TESTLR5 **

<table>
<thead>
<tr>
<th>SYMBOL REFERRED</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>FROM CLASS</th>
<th>FROM SECTION</th>
<th>TO SYMBOL</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>IN CLASS</th>
<th>IN SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTA</td>
<td>14</td>
<td>14</td>
<td>B_TEXT</td>
<td>A</td>
<td></td>
<td>6</td>
<td>6</td>
<td>B_TEXT</td>
<td>A</td>
</tr>
<tr>
<td>ENTB</td>
<td>28</td>
<td>10</td>
<td>B_TEXT</td>
<td>B</td>
<td>$CLASS_OFFSET</td>
<td>28</td>
<td>10</td>
<td>B_TEXT</td>
<td>B</td>
</tr>
<tr>
<td>Q1</td>
<td>0</td>
<td>4</td>
<td>B_PRV</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>B_TEXT</td>
<td></td>
</tr>
<tr>
<td>UNRES</td>
<td>30</td>
<td>7</td>
<td>B_TEXT</td>
<td></td>
<td></td>
<td>24</td>
<td>0</td>
<td>B_TEXT</td>
<td>B</td>
</tr>
</tbody>
</table>

** ALPHABETICAL MAP OF PROGRAM OBJECT TESTLR5 **

<table>
<thead>
<tr>
<th>ENTRY NAME</th>
<th>CLAS LOC</th>
<th>ELEM LOC</th>
<th>CLASS NAME</th>
<th>SECTION NAME OR ENTRY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$PRIV000003</td>
<td>0 0</td>
<td>B_PRV (ED)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B_PRV</td>
<td>0 0</td>
<td>B_PRV (ED)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>0 18</td>
<td>B_TEXT (ED)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>18 14</td>
<td>B_TEXT (ED)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>14 14</td>
<td>B_TEXT</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>28 10</td>
<td>B_TEXT</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Q1</td>
<td>0 4</td>
<td>B_PRV (PD)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>B_TEXT</td>
<td>30 7</td>
<td>B_TEXT</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

** ALPHABETICAL CROSS-REFERENCE LIST OF PROGRAM OBJECT TESTLR5 **

Figure 62. Sample output for LISTLOAD OUTPUT=BOTH for a PDSE (Part 3 of 3)
LISTIDR output

LISTIDR DDN=DD1,MEMBER=TLIST

***** MODULE SUMMARY *****
MEMBER NAME: TLIST
LIBRARY: DD1
MAIN ENTRY POINT: 0000000E
AMODE OF MAIN ENTRY POINT: 24
NO ALIASES **

------------------------------------------------------------------------------------------------------------------------

**** 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 EXEC 7 MULTI-RCD
8 NOT-DE 9 ZERO-ORG 10 EP > ZERO 11 RLD
12 EDIT 13 NO-SYMS 14 F-LEVEL 15 NOT-REFR

------------------------------------------------------------------------------------------------------------------------

MODULE SSI: NONE
APPCODE: 00000000
RMODE: 24

*****LOAD MODULE PROCESSED EITHER BY VS LINKAGE EDITOR OR BINDER
LISTIDR FOR LOAD MODULE TLIST PAGE 0001

[C]

CSECT YR/DAY SPZAP DATA
A 1972/271 92240
B 1972/271 NO IDENT

------------------------------------------------------------------------------------------------------------------------

This load module was produced by linkage editor 5695DF108 at level 21.01 on day 271 of year 1992.

[D]

CSECT TRANSLATOR VR.MD YR/DY
A 566896201 02.01 1972/271
B 566896201 02.01 1972/271
D1 566896201 02.01 1972/271
UNRES 566896201 02.01 1992/034

------------------------------------------------------------------------------------------------------------------------

E

CSECT YR/DAY USER
A 1972/271 ANOTHERONE
B 1972/271 myprogram

------------------------------------------------------------------------------------------------------------------------

Figure 63. Sample LISTIDR output for a load module processed by linkage editor or binder
Description of LISTIDR output

As shown in Figure 63 on page 588 and Figure 64, the IDR listing has four sections, separated by dashed lines. The four sections contain the following:

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.

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 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
### AMBLIST

**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>IGC0006I</td>
<td>--------</td>
<td>------</td>
<td>08B419C0</td>
<td>IGC0006I</td>
<td>IGC0006I</td>
<td>--------</td>
<td>------</td>
<td>08B414D8</td>
<td></td>
</tr>
<tr>
<td>IGC0006I</td>
<td>--------</td>
<td>------</td>
<td>08B419C0</td>
<td></td>
<td>IGC0006E</td>
<td>--------</td>
<td>------</td>
<td>08B414D8</td>
<td></td>
</tr>
</tbody>
</table>

**MODIFIED LINK PACK AREA MAP - NUMERICALLY BY ENTRY POINT**

<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>IGC0006E</td>
<td>--------</td>
<td>------</td>
<td>08B37FA0</td>
<td></td>
<td>IGC0006E</td>
<td>--------</td>
<td>------</td>
<td>08B414D8</td>
<td></td>
</tr>
<tr>
<td>IGC0006E</td>
<td>--------</td>
<td>------</td>
<td>08B37FA0</td>
<td></td>
<td>IGC0006E</td>
<td>--------</td>
<td>------</td>
<td>08B414D8</td>
<td></td>
</tr>
</tbody>
</table>

**PAGEABLE LINK PACK AREA MAP - ALPHABETICALLY BY NAME**

<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>AHLTFCV</td>
<td>01971468</td>
<td>000008B98</td>
<td>00C26318</td>
<td></td>
<td>AHLTFCV</td>
<td>01971468</td>
<td>000008B98</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLTSR</td>
<td>019717D2</td>
<td>000008B98</td>
<td>00C26318</td>
<td></td>
<td>AHTLTSR</td>
<td>019717D2</td>
<td>000008B98</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLTPD</td>
<td>01971468</td>
<td>000008B98</td>
<td>00C26318</td>
<td></td>
<td>AHTLTPD</td>
<td>01971468</td>
<td>000008B98</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLSRB</td>
<td>01956920</td>
<td>000006D0</td>
<td>00C26318</td>
<td></td>
<td>AHTLSRB</td>
<td>01956920</td>
<td>000006D0</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLTSF</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
<td>AHTLTSF</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTATSE</td>
<td>01956920</td>
<td>000006D0</td>
<td>00C26318</td>
<td></td>
<td>AHTATSE</td>
<td>01956920</td>
<td>000006D0</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLTSY</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
<td>AHTLTSY</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLTXV</td>
<td>01956920</td>
<td>000006D0</td>
<td>00C26318</td>
<td></td>
<td>AHTLTXV</td>
<td>01956920</td>
<td>000006D0</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLVTS</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
<td>AHTLVTS</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
</tr>
<tr>
<td>AHTLTVT</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
<td>AHTLTVT</td>
<td>0193A908</td>
<td>000006F8</td>
<td>00C26318</td>
<td></td>
</tr>
</tbody>
</table>

Figure 65. Sample LISTLPA output
Chapter 16. SPZAP

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.

Restriction:

AMASPZAP does not support load modules assembled with GOFF.

Major topics

The following topics describe SPZAP:

• “Planning for SPZAP” on page 594
• “Inspecting and modifying data” on page 594
• “Updating the System Status Index (SSI)” on page 606
• “Running SPZAP” on page 608
• “Reading SPZAP output” on page 625

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 using RACF should employ a combination of GDASDVOL and DASDVOL resource profiles to establish this protection. See \textit{z/OS Security Server RACF Security Administrator's Guide} for more information regarding these profiles.

IBM recognizes the particular sensitivity of the VTOC. For a VTOC, the console operator must respond to message AMA117D before SPZAP will process an update request. This authorization must be supplied in addition to authorization through use of the installation's security protection scheme.

**Inspecting and modifying data**

**Inspecting 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.

\textbf{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.

**Modifying data** 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, which is created by the linkage editor and is stored in a PDS.
- A program object, which is created by the program management binder and is stored in a PDSE or a z/OS UNIX file.

\textbf{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.
- A partitioned data set extended (PDSE) program library (see note above).

There are several types of data sets that are not supported by SPZAP:

- An extended sequential data set.
- A VSAM data set in an extended address volume.
A partitioned data set extended (PDSE) data library (see note above).

See the following topics:

- "Inspecting and modifying a load module or program object"
- "Inspecting and modifying a data record" on page 603

**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 612 for an explanation of the IDRDATA statement.
Example: Inspecting and modifying a single CSECT load module

This example shows how to inspect and modify a load module containing a single CSECT.

```plaintext
//ZAPCSECT JOB MSGLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.LINKLIB,DISP=OLD
//SYSIN DD *
  NAME IEEVLNKT
  VERIFY 0018 C9C8,D2D9,D1C2,C7D5
  REP 0018 E5C6,D3D6,E6F0,4040
  SETSSI 01211234
  IDRDATA 71144
  DUMP IEEVLNKT
/*

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.
```
Example: Modifying a CSECT in a load module

This example shows how to apply an IBM-supplied PTF in the form of an SPZAP fix, rather than a module replacement PTF.

```plaintext
//PTF40228 JOB MSGLLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.NUCLEUS,DISP=OLD
//SYSIN DD *
NAME IENUC01 IEWFETCH
IDRDATA LOCFIX01
VERIFY 01F0 47F0C018
VERIFY 0210 5830C8F4
REP 01F0 4780C072
REP 0210 4130C8F4
SETSSI 02114228
DUMPT IENUC01 IEWFETCH
/*

SYSLIB DD Statement: Defines the library (SYS1.NUCLEUS) that contains input module IENUC01.

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 IENUC01.

IDRDATA Control Statement: Causes SPZAP to update the IDR in module IENUC01 for CSECT IEWFETCH with the date 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 IENUC01 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 IENUC01.
```
Example: Inspecting and modifying two CSECTs (Part 1)

Use this JCL 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
/*
```

**SYSLIB DD Statement:** Defines the system library SYS1.LINKLIB containing the load module IEFX5000 that is to be changed by SPZAP.

---

Example: Explanation of First control statements (Part 2)

**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.
**Example: Explanation of Second control statements (Part 3)**

<table>
<thead>
<tr>
<th>Control Statement #2</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NAME</strong> Control Statement #2</td>
<td>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.</td>
</tr>
<tr>
<td><strong>VERIFY</strong> Control Statement #2</td>
<td>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.</td>
</tr>
<tr>
<td><strong>REP</strong> Control Statement #2</td>
<td>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.</td>
</tr>
<tr>
<td><strong>IDRDATA</strong> Control Statement #2</td>
<td>Causes SPZAP to update the IDR in module IEFX5000 for CSECT IEFQMRAW with the data PTF01483, if the second REP operation is successful.</td>
</tr>
<tr>
<td><strong>SETSSI</strong> Control Statement #2</td>
<td>Causes SPZAP to perform the same function as the previous SETSSI, but only if the second VERIFY is not rejected.</td>
</tr>
<tr>
<td><strong>DUMPT</strong> Control Statement #2</td>
<td>Causes SPZAP to perform the DUMPT function on control section IEFQMRAW.</td>
</tr>
</tbody>
</table>
Example: Inspecting and Modifying a CSECT in z/OS UNIX

Use this JCL to inspect and modify control section PRINTF in z/OS UNIX.

```//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 58F0C210 REP 0000 68F0D210 DUMP LOADMOD1 PRINTF /*
```

**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.
Example: Using SPZAP to modify a CSECT (Part 1)

Use this JCL to inspect and modify a CSECT within a program object:

```
//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 50E0,9434,9118,9058,47E0,C0A8,45E0,C476,948F,9058,#
  181D,58D0,D004,1FFF,43F0,A046,1F00,BF07,A047
REP 00009A 1861,1870,1F55,0E64,98EC,D00C,07FE
```

**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.
Example: Using SPZAP to Modify a CSECT (Part 2)

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 612.

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 66 on page 603 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.
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.

Record not in a PDSE

Note: The following information does NOT apply to a PDS. SPZAP only supports a PDS that contains load modules.

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

Figure 66. Sample Assembly Listing Showing Multiple Control Sections
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 membernam
ABSDUMP(T) 1 99999999
```

The results show a display of all records in the member, record length, relative record number, and other pertinent information.
Example: Inspecting and modifying a data record

In this example, 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)
//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: Cause 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.
//ABSDUMPT 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.
```
Example: Using SPZAP to modify a data record

This example shows how to inspect and modify a record within a PDSE data library.

```
//UPDDATA JOB MSGLEVEL=(1,1)
//ZAPSTEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSN=IBMUSER.LMD.PDSE,DISP=OLD
//SYSIN DD *

NAME USERDATA
RECORD 0003
VER 000010 04B3,9017
REP 000014 10C7,C5E3,C4E2
ABSDUMP 3 3
```

**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 73 on page 629.

**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 612.
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 67 shows the position of the SSI in load module directory entries.

<table>
<thead>
<tr>
<th>Member Name</th>
<th>TTR</th>
<th>C</th>
<th>User Data Field</th>
<th>SSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
<td>15 to 70 max</td>
<td>variable</td>
</tr>
</tbody>
</table>

Figure 67. SSI bytes in a load module directory entry

Figure 68 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.

<table>
<thead>
<tr>
<th>Change Level</th>
<th>Flag Byte</th>
<th>Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 byte</td>
<td>1 byte</td>
<td>2 bytes</td>
</tr>
</tbody>
</table>

Bits:

1 2 3 4 5 6 7

(Reserved) Force Flag Local Fix Flag Program Temporary Fix Flag Dependency Flag Critical Flag IBM Flag

Figure 68. Flag bytes in the System Status Index field
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 609
- "Invoking SPZAP dynamically" on page 611

### Operational considerations

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.

**Reference** See [z/OS DFSMS Using Data Sets](https://www.ibm.com) for more information about PDSEs and their data structure.

- Unexpired data sets such as system libraries cannot be modified unless the operator replies r xx,’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 612, 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.

Normally, 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 only valid parameter that you may specify is PARM=IGNIDRFULL, which enables SPZAP to override the standard restrictions placed upon CSECT updates (through NAME and REP) when IDR space for the module is found to be full.

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.

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 DSNAMES 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 DSNAMES=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 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 may result in future errors if an action is not taken to correct the warning now.</td>
</tr>
<tr>
<td>08</td>
<td>A 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>
</tbody>
</table>
A requested JCL statement is absent or specifies a data set that was not successfully opened. SPZAP ends immediately.

A permanent I/O error has 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 permitted. However, the program management binder might require as much as 4M or 6M if the program object is very large.

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.

**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 general form of these macros when used to invoke SPZAP is shown below.

```plaintext
(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 609.

**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:

<table>
<thead>
<tr>
<th>Entry</th>
<th>Standard name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7</td>
<td>not applicable</td>
</tr>
<tr>
<td>8-15</td>
<td>not applicable</td>
</tr>
</tbody>
</table>
SPZAP

16-23  not applicable
24-31  SYSLIB
32-39  SYSIN
40-47  SYSPRINT

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 69 is an example of two functionally equivalent dynamic invocations of SPZAP:

```assembly
EXSPZAP  CSECT
USING  *,15        ASSUME REG15 IS BASE
MODID  MODULE ID AND DATE IN PROLOG
SAVE  (14,12)      SAVE REGISTERS
BALR  12,0          ESTABLISH BASE REGISTER
USING  *,12
ST   13,SAVEAREA+4  CHAIN NEW SAVEAREA TO PREVIOUS
LR   2,13           TEMPORARILY SAVE ADDRESS OF OLD SAVEAREA
LA   13,SAVEAREA    INIT REG13 WITH ADDRESS OF NEW SAVEAREA
ST   13,8(0,2)      CHAIN PREVIOUS SAVEAREA TO NEW

*************************************************************************
** This example shows two functionally equivalent dynamic **
** invocations of SPZAP. **
** No options are passed. **
** The DDNAME for the SYSLIB file is changed to TESTLIBR. **
** The DDNAME for the SYSIN file is not changed. **
** The DDNAME for the SYSPRINT file is changed to PRINTOUT. **

*************************************************************************

LINKZAP1  LINK  EP=AMASPZAP,PARAM=(OPTLIST,DDLIST),VL=1
LINKZAP2  LINK  EP=AMASPZAP,PARAM=(0,DDLIST),VL=1
L  13,SAVEAREA+4   LOAD ADDRESS OF PREVIOUS SAVEAREA
RETURN (14,12),T,RC=0 RETURN TO CALLER

OPTLIST  DC  H'0'      NO OPTIONS ARE PASSED TO AMASPZAP
DDLIST  DS  0H        ALIGN DDNAMES TO HALFWORD BOUNDARY
DC  H'48'        LENGTH OF THE CHARACTER STRING
*    CONTAINING DDNAME OVERIDES
DC  24XL1'00'     FIRST 24 CHARACTERS ARE IGNORED
DC  CL8'TESTLIBR'  CHANGE SYSLIB FILE TO DDNAME OF TESTLIBR
DC  8XL1'00'      USE SYSIN FILE FOR INPUT OF CONTROL
*    STATEMENTS
DC  CL8'PRINTOUT' CHANGE SYSPRINT FILE TO DDNAME OF
*    PRINTOUT
SAVEAREA  DC  18F'0'   REGISTER SAVEAREA
END
```

Figure 69. Sample assembler code for dynamic invocation 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
- DUMP or DUMPT
- IDRDATA
- NAME
- RECORD
- REP
- SETSSI
- VERIFY

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 625.

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 CCCCccccHRR, where CCCCccc 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:** `ABSDUMP|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:

```
NAME member
ABSDUMP|ABSDUMPT 1 99999999
```

**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 xxxxxx**
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:
xxxxxx
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.
Example: Using the BASE control statement

This example 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.

```
//MODIFY JOB MSGLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSIN DD *
NAME IEFMCVOL IEFCVOL2
BASE 0398
IDRDATA MOD04
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.

**SYasin 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 DUMP's 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 `ccccchhhhrr`, 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, REP and SETSSI 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 `CCCCccccHRR`, where `CCCCcccc` 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.
   - `cccc` 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.

**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 AMASZPZAP 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.

---

Example: Entering SPZAP control statements through console

This example shows how to enable SPZAP control statements to be entered through the console.

```bash
//CONSOLIN JOB MSGLEVEL=(1,1)
//STEP EXEC PGM=AMASPZAP
//SYSPRINT DD SYSOUT=A
//SYSLIB DD DSNAME=SYS1.LINKLIB,DISP=OLD
//SYSIN DD *

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.

{DUMP|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 625). 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.
Example: Using the DUMP control statement with a class name

The following example 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:

```
//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_*
```

**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:

```
xxxxxxxx
```

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

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 nnnnnnnn
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 VERI|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.

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:
SPZAP

xyynnnn
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:
xx - change level
yy - flag byte
nnnn - modification serial number

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 606.

{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.
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 70 on page 626 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.

Note: 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 71 on page 626 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.
**CCCHR-** 002201108 RECORD LENGTH- 0850 MEMBER NAME IEHMVSN CSEC NAME IEHMVSN

**CCCHR-** 002201108 RECORD LENGTH- 0850 MEMBER NAME IEHMVSN CSEC NAME IEHMVSN

DUMP IEHMVSN ALL

Figure 70. Sample formatted hexadecimal dump

**CCCHR- 002201108 RECORD LENGTH- 0850 MEMBER NAME IEHMVSN CSEC NAME IEHMVSN

**CCCHR- 002201108 RECORD LENGTH- 0850 MEMBER NAME IEHMVSN CSEC NAME SUTFPL59

DUMP IEANUCOS SUTFPL59

AMA1131 COMPLETED DUMP REQUIREMENTS

AMA1101 ANASPZAP PROCESSING COMPLETED

Figure 71. Sample translated dump

Figure 72 on page 628 shows CSECT output (obtained through DUMP/DUMPT) for a program object module.
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 73** shows output for a member of a PDSE data library. **ABSDUMPT 0001 0500** would have been preceded by a **NAME membername** statement (not shown).

**Note:** There are no **CCHHR** values. **RECORD NUMBER:** shows the 8 digit value of the relative record number of the member being printed. **RECORD LENGTH:** shows the length of the record, while **MEMBER NAME:** shows the member name as it appears on the **NAME membername** statement.
Figure 73. Sample translated dump for PDSE data library
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 18, “Problem Documentation Upload Utility,” on page 637.

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 (DSNATYPE=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.

The following topics describe AMATERSE:
- “Planning for AMATERSE”
- “Invoking AMATERSE” on page 632 including JCL statements and return codes
- “Invoking AMATERSE from a problem program” on page 634
- “Additional considerations for AMATERSE” on page 634 such as restrictions and allocation considerations.

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 [http://techsupport.services.ibm.com/390/trsmain.html](http://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

- 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 634 for the exceptions to this rule.

Invoking AMATERSE

Figure 74 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 74. 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:

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:

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
634 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 635 and “Space
considerations” on page 635.

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:

<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 device.</td>
</tr>
<tr>
<td>36</td>
<td>Buffer storage obtain failure.</td>
</tr>
<tr>
<td>64</td>
<td>Severe error. Abend with 1111.</td>
</tr>
<tr>
<td>99</td>
<td>System or user abend occurred.</td>
</tr>
</tbody>
</table>
AMATERSE

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 75 shows how to invoke AMATERSE using alternate DDNAMES:

```
*    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(L'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(L'DDNAME9-DDNAMEET') Length of data
    DDNAME9 DS 0C DDNAME override list
    DC 5LB'0' Not used by AMATERSE
    SYSUT1 DC C'L'MYPRINT' Instead of SYSPRINT
    DC XLB'0' Not used by AMATERSE
    SYSUT2 DC C'L'MYSYSUT1' Instead of SYSUT1
    SYSUT3 DC C'L'MYSYSUT2' Instead of SYSUT2
    DDNAME9 DS 0C End of list
```

Figure 75. Example of 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 headingaddr.
AMATERSE also supports DDNAMES SYSPRINT, SYSUT1, SYSUT2, and SYSUT3, but not DDNAMES SYSPIN 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 can only handle data sets with a LRECL of more than 32K but less than 64K when only 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 18. 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 using File Transfer Protocol (FTP) to send one large data set to IBM FTP sites. This utility sections the input file data set (such as stand-alone dump data set) into smaller data sets that are compressed and sent in parallel using multiple, simultaneous FTP sessions. This results in shorter transmission time for very large data sets. You can also encrypt the data sets.

There are two work files for each FTP session (the "A" file and the "B" file). Each "A" work file is filled by copying records from the input file. When the "A" file is full, the FTP sessions are started in parallel. At the same time, each "B" work file is filled by copying records from the input file. When the "B" file is full and the transfer of the "A" file is complete, transfer of the next "B" file starts. This process continues between the "A" and the "B" files, until everything in the input file is sent.

You can have up to 20 FTP sessions running simultaneously. 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.

If the work data sets are very small in relationship to the input data set, you can end up with too many files on the IBM FTP sites. For example, if you are sending a 100 GB z/OS stand-alone dump and make the work data set size 1 MB, you create 100,000 files on the IBM FTP site, which exceeds the IBM limit of 999 files. This also causes a lot of delay by starting and stopping the FTP sessions for each file.

If the work data sets are very large in relationship to the input file size, the amount of overlap time is decreased. When the program first starts, it must fill the "A" work files before it starts transmitting any data, which means the copy time is not overlapping with data that needs to be sent through FTP. 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.

The PDUU always compresses the input data before it is written to the work data sets, therefore it is not necessary to use a tool such as AMATERSE or TRSMAIN to compress the input data set before using the PDUU to send it to the IBM FTP site. In addition, 192-bit triple Data Encryption Standard (DES) can be requested by using the CIPHER_KEY keyword. Without the keyword, the data is just compressed. With the keyword, the data is compressed, and then encrypted.

Encryption is provided by the CP Assist for Cryptographic Functions (CPACF), DES/TDES Enablement (feature 3863) and is available on all processors starting with the z990 (2084) and z890 (2086). CPACF, feature 3863 enables clear key DES and TDES instructions on all supported CPs. The encryption algorithm used for
Planning to use PDUU

Use the PDUU as the primary utility for sending large volumes of documentation, such as stand-alone dumps, to the IBM FTP site. The encryption capability ensures that the transfer occurs in a secure manner. 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. If you have previously used the PDUU, shipped as the MTFTPS stand-alone program from [www-01.ibm.com/support/docview.wss?uid=isg3T1011823](www-01.ibm.com/support/docview.wss?uid=isg3T1011823), 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.

Prerequisites and restrictions for PDUU

You must properly configure z/OS Communications Server to use the FTP client program. See the topic on [Transferring files using FTP](www.ibm.com/systems/z/os/zos/bkserv/r11pdf/#zarchpops) in [z/OS Communications Server: IP Configuration Guide](www.ibm.com/systems/z/series/ibmsysaids). 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 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 and variable, blocked and unblocked, unspanned record formats (RECFM) = F, FB, FBS, V, VB)
- Data sets with records containing ISO/ANSI or machine code control characters
- Data sets in cylinder-managed space.

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)
- Spanned record formats (VS/VBS)
- Partitioned data sets (PDS) and partitioned data sets extended (PDSE)
- z/OS UNIX files
- Any data set with an undefined-length record format (RECFM)=U.

JCL statements for PDUU

The JCL statements for the PDUU are:
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 638.

The sequential data set to transfer to IBM. For additional details, see “Prerequisites and restrictions for PDUU” on page 638.

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 638.

PDUU is managed through the following SYSIN statements with these guidelines:

- Use an asterisk (*) in the first column 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, 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.

The name of the TCP/IP system to transfer the files to using FTP. One through 64 characters, dotted decimal format is allowed, no default value, can contain blanks, and it must be specified.

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, SC31-8780]. For example, to trace output (-d) and use a specific ftpdata_filename (-f"//'WES.MYFTP.DATA'"):

```
TARGET_SYS=-d -f"//'WES.MYFTP.DATA'" testcase.boulder.ibm.com
```

Use the -p parameter to specify an alternate IP stack.

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. 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.

The password for the USERID on the target system. One through 64 characters and the default value is blanks.
If using a proxy server, this can be the USERID and PASSWORD for the proxy server in the format userid@password.

**ACCOUNT**
The account data that is sent when an FTP session is started.

**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**
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_dsname BECAUSE DATA SET CHARACTERISTICS DO NOT MEET COMPRESSION CRITERIA, ALLOCATION CONTINUES
```

**WORK_DSN_SIZE**
The maximum size of the work files in megabytes. One through four decimal digits and the default is 100 MB.

**KEEP_WORK**
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.

**DATACLAS**
The data class to use when allocating the work files on the sending system. One through eight characters with no default value.

**STORCLAS**
The storage class to use when allocating the work files on the sending system. One through eight characters with no default value.

**CC_FTP**
The number of parallel FTP 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.

**DIRECTORY**
The directory on the target system where the files will be sent with FTP. One through 32 characters, with no default, can contain blanks, and you must specify the directory.

**PMR**
The PMR number with which this file is associated. This field must be 13 numeric or uppercase characters, specify in the form xxxx.yyy.zzz, and define the variables as:
**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.

**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**

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.

**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 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.

This section describes the following examples:

- “Example 1: Simple FTP connection” on page 642
- “Example 2: FTP connection using a proxy server” on page 642
- “Example 3: FTP connection using a proxy server with proxy user ID” on page 643
- “Example 4: Using a proxy server with the FTPCMDS DD statement” on page 643
Example 1: Simple FTP connection
The following JCL example 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 is 500 MB.

```
//FTP EXEC PGM=AMAPDUPL
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSUT1 DD DISP=SHR,DSN=H44IPCS.WESSAMP.TRKS055K 
//SYSIN DD * 
USERID=anonymous 
PASSWORD=anonymous 
TARGET_SYS=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 
//
```

Example 2: FTP connection using a proxy server
In this example, 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.

```
//FTP EXEC PGM=AMAPDUPL 
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSUT1 DD DISP=SHR,DSN=H44IPCS.WESSAMP.TRKS055K 
//SYSIN DD * 
USERID=anonymous@testcase.boulder.ibm.com 
PASSWORD=proxyuser@proxypass 
TARGET_SYS=your.proxy.server.name 
TARGET_DSN=wessamp.bigfile 
WORK_DSN=wes.ftpout 
CC_FTP=03 
WORK_DSN_SIZE=500 
DIRECTORY=/toibm/mvs/ 
PMR=12345.123.123 
//
```
Example 3: FTP connection using a proxy server with proxy user ID
In this example, 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.

```
//FTP EXEC PGM=AMAPDUPL
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=*
//SYSPUT1 DD DISP=SHR,DSN=H44IPCS.WESSAMP.TRKS055K
//SYSIN DD *
USERID=anonymous@proxyuser@testcase.boulder.ibm.com
PASSWORD=proxyuser@proxypass
TARGET_SYS=proxy.server.name
TARGET_DSN=wessamp.bigfile
WORK_DSN=workspace
CC_FTP=03
WORK_DSN_SIZE=500
DIRECTORY=/toibm/mvs/
PMR=99999.000.000
```

Example 4: Using a proxy server with the FTPCMDS DD statement
In this example, 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.

```
//FTP EXEC PGM=AMAPDUPL
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=*
//SYSPUT1 DD DISP=SHR,DSN=H44IPCS.WESSAMP.TRKS055K
//FTPDMOD DD DISP=SHR,DSN=WES.FTPCMDS.DATA
//SYSIN DD *
USERID=proxyid@testcase.boulder.ibm.com
PASSWORD=proxypass
TARGET_SYS=proxy.server.name
TARGET_DSN=SVCD
WORK_DSN=HLQ.FTPOUT
CC_FTP=03
WORK_DSN_SIZE=500
DIRECTORY=/toibm/mvs/
PMR=99999.000.000
```

The following example show the typical format of the FTPCMDS data set:
Example 5: Using a proxy server with a port specification on the TARGET_SYS parameter

This example 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.

```
FTP specifying port 2121 on TARGET_SYS
  //FTP    EXEC PGM=AMAPDUPL
  //SYSUDUMP DD SYSOUT=*  //SYSPRINT DD SYSOUT=*  //SYSPUT DD DISP=SHR,Dsn=H44IPCS.WESSAMP.TRKS055K  
  //FTPCMDS dd *  //SYSIN DD *
  user anonymous pw userid@company.com
  //SYSIN DD *
  USERID=proxyuser@testcase.boulder.ibm.com
  PASSWORD=proxypass
  TARGET_SYS=proxy.server.name 2121
  TARGET_DSN=SVCD
  WORK_DSN=HLQ.FTPOUT
  CC_FTP=03
  WORK_DSN_SIZE=500
  DIRECTORY=/toibm/mvs/
  PMR=99999.000.000
  CIPHER_KEY=PMR99999sad
```

Example 6: Forcing PASSIVE mode using the FTPCMDS inline DD statement

The following example 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.
 FTP forcing PASSIVE mode

```plaintext
//FTP EXEC PGM=AMAPDUPL
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSUT1 DD DISP=SHR,DSN=H441PC5.WESSAMP.TRKS055K 
//FTPCMD DD *
LOCsite FwFriendly 
//SYSIN DD *
USERID=proxyuser@testcase.boulder.ibm.com 
PASSWORD=proxypass 
TARGET_SYS=proxy.server.name 
TARGET_DSN=SVCD 
WORK_DSN=HLQ.FTPOUT 
CC_FTP=03 
WORK_DSN_SIZE=500 
DIRECTORY=/toibm/mvs/ 
PMR=99999.999.000 
CIPHER_KEY=PMR99999sad 
//
```

**Example 7: Using a userid.NETRC data set**

The following example 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.


**FTP using a userid.NETRC data set**

```plaintext
//FTP EXEC PGM=AMAPDUPL
//SYSUDUMP DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSUT1 DD DISP=SHR,DSN=H441PC5.WESSAMP.TRKS055K 
//SYSIN DD *
TARGET_SYS=-f"://WES.MYFTP.DATA" * testcase.boulder.ibm.com
PMR=99999.999.000 
DIRECTORY=/toibm/mvs/ 
TARGET_DSN=wes.gb01tst 
work_dsn=wes.ftpout 
cc_ftp=03 
WORK_DSN_SIZE=500 
//
```

For this instance, the userid.NETRC data set consists of one line:
```
machine testcase.boulder.ibm.com login anonymous password ibmusr@ibm.com
```

The FTP.DATA data set contains:
```
;***********************************************************************
;*
NETRCLEVEL 2
;*
```
Example 8: Using the DEBUG statement

The following example adds the DEBUG DD statement, which creates a data set that contains the message data as described in "Debug DD statement" on page 641.

FTP connection with the DEBUG DD statement

```
//FTP EXEC PGM=AMAPDUPL
//SENDSTP EXEC PGM=AMAPDUPL
//SYSPRINT DD SYSOUT=* 
//DEBUG  DD DSN=PDUU.DEBUG,DISP=(,CATLG),
       // UNIT=SYSALLDA,SPACE=(CYL,(1,1),RLSE) 
//SYSUT1 DD DISP=SHR,DSN=H44IPCS.WESSAMP.TRKS055K
//SYSIN   DD *
USERID=anonymous
PASSWORD=anonymous
TARGET_SYS=testcase.boulder.ibm.com
TARGET_DSN=wessamp.bigfile
WORK_DSN=wes.ftpout
WORK_DSN_SIZE=500
DIRECTORY=/toibm/mvs
PMR=12345.123.123
```

Return codes for PDUU

Upon completion, PDUU places one of the following return codes in general purpose register (GPR) 15:

Table 27. Return codes for z/OS Problem Documentation Upload Utility

<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 operation</td>
</tr>
<tr>
<td>64</td>
<td>Severe error in file operation</td>
</tr>
<tr>
<td>99</td>
<td>System or user abend occurred</td>
</tr>
</tbody>
</table>
Chapter 19. 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 not yet incorporated into the system.

  To eliminate the duplicate dumps, use dump analysis and elimination (DAE). See "Using DAE to suppress dumps."

- **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 657.

- **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 657.

- **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 657.

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 658.

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.

This topic describes suppressing dumps using DAE as follows:

- "Performing dump suppression" on page 648
  - "Managing rapidly recurring dumps" on page 650
- "Planning for DAE dump suppression” on page 651
  - "Selecting or creating an ADYSETxx parmlib member” on page 651
  - "Defining a DAE data set” on page 653
- "Accessing the DAE data set” on page 654
  - "Generating a suppressed dump” on page 654
- "Stopping, starting, and changing DAE” on page 656

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.
Dump suppression

- 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.

*Required symptoms* 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>SDWACSCT</td>
<td>CSECT/name</td>
<td>RIDS/name</td>
</tr>
</tbody>
</table>

*Optional symptoms* 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/Udddd</td>
<td>AB/Udddd</td>
</tr>
<tr>
<td>Recovery routine name</td>
<td>SDWAREXN</td>
<td>REXN/name</td>
<td>RIDS/name#R</td>
</tr>
</tbody>
</table>
Symptom | SDWA Field | MVS Keyword | RETAIN Keyword
---|---|---|---
Failing instruction area | FI/area | VALU/Harea |
PSW/register difference | REGS/hhhhh | REGS/hhhhh |
Reason code, accompanying the abend code or from the REASON parameter of the macro that requests the dump | HRC1/nmmm | PRCS/nmmm |
Subcomponent or module subfunction | SDWASC | SUB1/name | VALU/Cname |

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 653 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.
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.
- 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 following table 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>
<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.
Dump suppression

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.

Example: An ADYSETxx Member for a System in a Sysplex
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)
```

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
656 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.

Example: An ADYSETxx Member with GLOBAL
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)
```

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.
Dump suppression

- 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.

   **Example: DAE Data Set for Single System**
   
   The sample DD statement 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,BLSIZE=0),
   UNIT=3390,SPACE=(TRK,(6,2))
   ```

   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.

   **Example: DAE Data Set Shared by Sysplex Systems**
   
   The sample DD statement 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,BLSIZE=0),
   UNIT=3390,SPACE=(TRK,(12,2))
   ```

   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](#).
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 userid 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. The following discussion 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 the table below indicates the system where the TSO user is issuing the TAKEDUMP request.

<table>
<thead>
<tr>
<th>Start State</th>
<th>TSO</th>
<th>Final State</th>
</tr>
</thead>
<tbody>
<tr>
<td>SY1</td>
<td>SY2</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>S2</td>
<td>S2</td>
</tr>
<tr>
<td>S1</td>
<td>G1</td>
<td>S1</td>
</tr>
<tr>
<td>S1</td>
<td>G2</td>
<td>G2</td>
</tr>
<tr>
<td>G2</td>
<td>S2</td>
<td>S2</td>
</tr>
<tr>
<td>00</td>
<td>*</td>
<td>SY1</td>
</tr>
</tbody>
</table>

Notes:
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 658 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.
Dump suppression

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
```

Where:

- `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:

```
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 ADYSET04 parmlib member:

```
SET DAE=04
```

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:
```
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:
```
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:

```
CMD=SET SLIP=xx
```

<table>
<thead>
<tr>
<th>SLIP Parameter</th>
<th>Dumps Suppressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTION=NODUMP</td>
<td>All dumps</td>
</tr>
<tr>
<td>ACTION=NOSVCD</td>
<td>SVC dumps</td>
</tr>
<tr>
<td>ACTION=NOSYSA</td>
<td>ABEND SYSABEND dumps</td>
</tr>
<tr>
<td>ACTION=NOSYSM</td>
<td>ABEND SYSDUMP dumps</td>
</tr>
<tr>
<td>ACTION=NOSYSU</td>
<td>ABEND SYSUDUMP dumps</td>
</tr>
</tbody>
</table>

For example, to suppress SVC dumps and ABEND SYSDUMP dumps for abend code X'B37', add the following to IEASLPxx:

```
SLIP SET,COMP=B37,ACTION=(NOSVCD,NOSYSM),END
```

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.

Reference

See `z/OS MVS Programming: Assembler Services Reference ABE-HSP` for the ABEND macro.

Using installation exit routines to suppress dumps

An installation can add installation exit routines 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 SYSDUMP 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.
Dump suppression

<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 SYSDUMP 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 DSNAME parameter on a dump DD statement to DUMMY to suppress the dump.</td>
</tr>
</tbody>
</table>

References

- See z/OS MVS Installation Exits for IEAVTABX and IEAVTSEL.
- See z/OS JES2 Installation Exits for the JES2 exit 4 routine.
- See z/OS JES3 Customization for the JES3 IATUX34 exit 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 657.
- **An ABEND macro without a DUMP parameter.** See “Using an ABEND macro to suppress dumps” on page 657.
- **An MVS installation exit routine that suppresses the dump.** See “Using installation exit routines to suppress dumps” on page 657.
- **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 SYSDCOND in the PROBDESC area and the IEASDUMPQUERY 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 SYSDCOND, the dump on the other system is not written because of either of the following on the other system:
  - No IEASDUMPQUERY routine exists
  - No IEASDUMPQUERY 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.

References
- See z/OS Security Server RACF Security Administrator’s Guide for the FACILITY class to control access to program dumps.
- See z/OS MVS System Commands for the DUMP, DUMPDS, and SLIP commands.
- See z/OS MVS Installation Exits for the IEAVTABX and IEAVTSEL exit routines.
- See z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDU for the SDUMPX macro.
- See z/OS MVS Programming: Authorized Assembler Services Guide for the IEASDUMPQUERY routine.
- See z/OS JES2 Installation Exits for the JES2 exit 4 routine.
- See z/OS JES3 Customization for the JES3 IATUX34 exit routine.
Dump suppression
Chapter 20. 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.

Major topics

The following topics describe messages:

- "Producing messages"
- "Receiving messages" on page 662
- "Planning message processing for diagnosis" on page 664

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
- WTO macro to write a message to the operator
- WTOR macro to write a message to the operator and request a reply

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

Reference

- 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
- Output data set

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.

Example: Symptom Dump Output

The following example 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

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 F0000008 000055F8 00000004 00F06A40
GPR 4-7 00ACE980 00AFF030 00A0CFF8 FD000000
GPR 8-11 00AFF1B0 80AD2050 00000000 00AFF030
GPR 12-15 40006FDE 00005FB0 80F06A90 00006FDB
END OF SYMPTOM DUMP

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 SYSDUMP 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.

References

- See Chapter 9, “Master trace,” on page 219 for information on master trace.
- See z/OS MVS JCL Reference for the JOB statement.
- See Chapter 5, “ABEND dump,” on page 137 for information about the ABEND 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 IEAVMXIT.
- 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 IEAVMXIT.
- 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 the following situations:
• 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)
The following table lists ways to suppress symptom dumps for ABEND dumps.
These ways suppress only message IEA995I; symptom dumps continue to appear
in other locations.

<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>IEADM00</td>
</tr>
<tr>
<td>SYSUDUMP ABEND</td>
<td>CHNGDUMP SET,SYSUDUMP,SDATA=(NOSYM)</td>
<td>IEADMP00</td>
</tr>
</tbody>
</table>

Reference
• 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 IEAVMXT.
• 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.
Messages

- See [z/OS MVS System Commands](#) for the CONTROL V and the CHNGDUMP operator command.
Appendix. Accessibility

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Department H6MA, Building 707
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Poughkeepsie, NY 12601-5400
USA

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size.

Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. Refer to z/OS TSO/E Primer, z/OS TSO/E User's Guide and z/OS ISPF User's Guide Vol I for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

z/OS information

z/OS information is accessible using screen readers with the Library Server versions of z/OS books in the Internet library at:

http://www.ibm.com/systems/z/os/zos/bkserv/
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This manual primarily documents information that is NOT intended to be used as Programming Interfaces of z/OS.

This manual also documents intended Programming Interfaces that allow the customer to write programs to obtain the services of z/OS. This information is identified where it occurs, either by an introductory statement to a chapter or section or by the following marking:

Programming Interface information

End of Programming Interface information

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Various z/OS elements, such as DFSMS, HCD, JES2, JES3, and MVS, contain code that supports specific hardware servers or devices. In some cases, this device-related element support remains in the product even after the hardware devices pass their announced End of Service date. z/OS may continue to service element code; however, it will not provide service related to unsupported hardware devices. Software problems related to these devices will not be accepted for service, and current service activity will cease if a problem is determined to be associated with out-of-support devices. In such cases, fixes will not be issued.

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