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Have the following information available so that Customer Support can begin working on your issue immediately:

- product information
  - product name
  - product version (release number)
  - license number and password (trial or permanent)
- operating system and environment information
  - machine type
  - operating system type, version, and service pack or other maintenance level such as PUT or PTF
  - system hardware configuration
  - serial numbers
  - related software (database, application, and communication) including type, version, and service pack or maintenance level
- sequence of events leading to the issue
- commands and options that you used
- messages received (and the time and date that you received them)
  - product error messages
  - messages from the operating system, such as file system full
  - messages from related software
License key and password information

If you have questions about your license key or password, use one of the following methods to get assistance:

- Send an e-mail message to customer_support@bmc.com.
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About this book

This book provides all information required by the user of the BMC Fast Path Recovery Utility product. This includes the following:

- functional overview of the product
- product usage and maintenance procedures

Fast Path Recovery Utility provides a fast method of recovering all data entry databases (DEDBs) and main storage databases (MSDBs) with complete integrity so a cold start of the IBM® IMS™ system can be performed. Fast Path Recovery Utility performs the following tasks:

- automatically selects and acquires, without any user intervention, all information and resources needed for successful recovery
- performs the recovery functions
- produces a set of comprehensive audit trail reports
- provides override capability so the user can specify the recovery control information, such as the Checkpoint-ID and the log data sets to be used in the recovery process

Like most BMC documentation, this book is available in printed and online formats. To request printed books or to view online books and notices (such as release notes and technical bulletins), see the support website at http://www.bmc.com/support.

**NOTE**

Online books are formatted as PDF or HTML files. To view, print, or copy PDF books, use the free Adobe Reader from Adobe Systems. If your product installation does not install the reader, you can obtain the reader at http://www.adobe.com.

The software also offers online Help. To access Help, press F1 within any product or click the Help button in graphical user interfaces (GUIs).
Related publications

The following related publications supplement this book and the online Help:

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<th>Category</th>
<th>Document</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>installation documents</td>
<td><strong>BMC Products for IMS Installation Guide</strong></td>
<td>provides installation procedures and optional post-installation procedures for database administrators and technical support personnel involved with the initial installation and maintenance installation of Fast Path Indexer/EP and other BMC Fast Path products for IMS</td>
</tr>
<tr>
<td>notices</td>
<td><strong>release notes, flashes, technical bulletins</strong></td>
<td>provides updates to the installation instructions and last-minute product information</td>
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From the BMC Support Central website ([http://www.bmc.com/support](http://www.bmc.com/support), you can

- download a zipped set of documentation PDFs from each product’s EPD page
- link to the BMC Documentation Center ([https://webapps.bmc.com/infocenter/index.jsp](https://webapps.bmc.com/infocenter/index.jsp)) to browse documentation sets, or to view video demos (short overviews of selected product concepts, tasks, or features)
- view individual product documents (books and notices) within the “A – Z Supported Product List”

You can order hardcopy documentation from your BMC sales representative or from the support site. You can also subscribe to proactive alerts to receive e-mail messages when notices are issued.

Conventions

This book uses the following special conventions:

- All syntax, operating system terms, and literal examples are presented in this typeface.
- Variable text in path names, system messages, or syntax is displayed in *italic* text:
testsys/instance/fileName

- The symbol => connects items in a menu sequence. For example, Actions => Create Test instructs you to choose the Create Test command from the Actions menu.

- Revision bars in the document mark changes that clarify or correct existing information or that provide new information. Revision bars do not mark editorial changes, formatting changes, or corrections of typographical errors unless these updates significantly affect your use of the information.

# Syntax statements

The following example shows a sample syntax statement:

```
COMMAND KEYWORD1 [KEYWORD2 | KEYWORD3] KEYWORD4={YES | NO} fileName...
```

The following table explains conventions for syntax statements and provides examples:

<table>
<thead>
<tr>
<th>Item</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items in italic type represent variables that you must replace with</td>
<td><code>alias</code></td>
</tr>
<tr>
<td>a name or value. If a variable is represented by two or more</td>
<td><code>databaseDirectory</code></td>
</tr>
<tr>
<td>words, initial capitals distinguish the second and subsequent</td>
<td><code>serverHostName</code></td>
</tr>
<tr>
<td>words.</td>
<td></td>
</tr>
<tr>
<td>Brackets indicate a group of optional items. Do not type the</td>
<td><code>[tableName, columnName, field]</code></td>
</tr>
<tr>
<td>brackets when you enter the option. A comma means that you can</td>
<td><code>[full, -incremental, -level]</code></td>
</tr>
<tr>
<td>choose one or more of the listed options. You must use a comma to</td>
<td>(UNIX)</td>
</tr>
<tr>
<td>separate the options if you choose more than one option.</td>
<td></td>
</tr>
<tr>
<td>Braces indicate that at least one of the enclosed items is</td>
<td>`{DBDName</td>
</tr>
<tr>
<td>required. Do not type the braces when you enter the item.</td>
<td>`UNLOAD device={disk</td>
</tr>
<tr>
<td></td>
<td>`{ -a</td>
</tr>
<tr>
<td>A vertical bar means that you can choose only one of the listed</td>
<td>`{commit</td>
</tr>
<tr>
<td>items. In the example, you would choose either commit or cancel.</td>
<td>`{commit</td>
</tr>
<tr>
<td></td>
<td>(UNIX)</td>
</tr>
<tr>
<td>An ellipsis indicates that you can repeat the previous item or</td>
<td><code>columnName ...</code></td>
</tr>
<tr>
<td>items as many times as necessary.</td>
<td></td>
</tr>
</tbody>
</table>
The following figure shows the standard format for syntax diagrams:

```
statement begins      command      statement continued on next line

COMMAND

statement continues  required item  optional item

KEYWORD

required choice      optional choice

variableValue

variableValue

multiple choices

statement ends

variableValue

variableValue

variableValue

variableValue
```

The following example illustrates the syntax for a DELETE statement. Because the FROM keyword, alias variable, and WHERE clause are optional, they appear below the main command line. In contrast, the tableName variable appears on the command line because the table name is required. If the statement includes a WHERE clause, the clause must contain a search condition or a CURRENT OF clause. (The searchCondition variable appears on the main line for the WHERE clause, indicating that this choice is required.)

```
DELETE

FROM

tableName

alias

WHERE

searchCondition

CURRENT OF

cursorName

;  
```
The following guidelines provide additional information about syntax diagrams:

- Read diagrams from left to right and from top to bottom.
- A recursive (left-pointing) arrow above a stack indicates that you may choose more than one item in the stack.
- An underlined item is a default option.
- If a diagram shows punctuation marks, parentheses, or similar symbols, you must enter them as part of the syntax. Asterisks are exceptions. An asterisk in a diagram indicates a reference note.
- In general, IBM MVS™ commands, keywords, clauses, and data types are displayed in uppercase letters. However, if an item can be shortened, the minimum portion of the MVS command or keyword might be displayed in uppercase letters with the remainder of the word in lowercase letters (for example, CANcel).
- The following conventions apply to variables in syntax diagrams:
  - Variables typically are displayed in lowercase letters and are always italicized.
  - If a variable is represented by two or more words, initial capitals distinguish the second and subsequent words (for example, databaseName).

Summary of changes

For detailed information about enhancements, changes, and corrections that are included in your version of the product, see the product release notes. The release notes are available from the BMC Support Central page (http://www.bmc.com/support).
Summary of changes
Introduction

In order to present a general introduction to the Fast Path Recovery Utility product, the following topics are discussed in this chapter:

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Features ......................................................................... 20
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Functional advantages .............................................. 21
Recovery process ......................................................... 22
Emergency restart failure ........................................... 24
Product restriction ...................................................... 24

Overview

Fast Path Recovery Utility is a valuable tool for operations and technical support personnel responsible for the operation and recovery functions of IMS systems. Fast Path Recovery Utility functions as follows:

- automatically selects and acquires, without any user intervention, all information and resources needed for successful recovery
- performs recovery functions
- produces a set of comprehensive audit trail reports
- provides override capability, allowing you to specify recovery control information such as the Checkpoint-ID and the log data sets to be used for recovery
Features

Fast Path Recovery Utility provides a fast method of recovering all data entry databases (DEDBs) and main storage databases (MSDBs) with complete integrity so that a cold start of the IMS system can be performed. Fast Path Recovery Utility is used for restart/recovery in these conditions:

- when an emergency restart of IMS fails
- when cold-starting an IMS system is more expedient than emergency-restarting the system

For example, when an application logic problem causes a program to mistakenly loop, messages will be inserted into the message queue at each iteration. When the message queue is full, an IMS failure occurs. In this situation, an emergency restart of IMS might not be the best solution. Fast Path Recovery Utility can be used to recover the database prior to an IMS cold start.

Fast Path Recovery Utility offers the following features:

- fast and easy to use
- supports multiple area data sets (MADS)—up to seven copies of an area data set (ADS)
- provides automated selection of the recovery parameters and dynamic allocation of required data sets, eliminating potential errors (recovery parameters and data sets can be specified)
- produces comprehensive audit trail reports
- requires no source code modifications to any user or IMS program or control block (because IMS program integrity is maintained, new exposures are not introduced)

Benefits

Fast Path Recovery Utility can prevent prolonged downtime normally experienced after an emergency restart failure. In addition, Fast Path Recovery Utility offers the following benefits:

- increases application availability
- reduces the time and resources required for recovery
simplifies and standardizes the recovery process without compromising system integrity

automates the MSDB recovery process by rebuilding the MSDBINIT data set

Functional advantages

After an emergency restart failure, the following problems hinder conventional database recovery, which uses the IMS Database Recovery (DFSURDB0) utility:

- The conventional utility can recover only one data set per execution.

  This limitation causes delays that result from the following requirements:

  — DFSURDB0 must be run once for each area of the database.

  — DFSURDB0 can recover only one copy of a multiple-area data set (MADS) for each execution.

- The utility uses all system log data sets (SLDS) and OLDS created since the last image copy of the area.

  Because each execution of DFSURDB0 requires the log data sets, one of the following limitations results:

  — If parallel recovery jobs are run, the overhead of creating and maintaining DSLOGS must be incurred.

  — To avoid the DSLOGS overhead, the area recovery jobs must be run sequentially.

- DFSURDB0 can recover only an ADS from the last image copy of the area.

  Updates to the database since the last image copy must be reapplied to the database, a procedure that can be time-consuming and unnecessary.

Fast Path Recovery Utility achieves significant performance improvement, reducing elapsed time, because of the following functional advantages:

- selects the optimal checkpoint from which to apply database updates (similar to emergency restart processing)

  This approach significantly reduces the number of updates that have to be applied.
Recovery process

Fast Path Recovery Utility consists of the following object modules, which are link-edited into two load modules. All modules are written in assembler language. The two modules operate independently of IMS and perform the following functions:

- **TSSAFR1 (Extract Processing)**
  - determines the appropriate restart checkpoint
  - determines which online log data sets (OLDS) are required
  - extracts recovery data from log data sets to a user-specified number of output data sets

- **TSSAFR2 (DEDB Recovery)**
  - dynamically allocates the required area data sets (ADS)
  - applies any required updates to all copies of the ADS

*Figure 1* shows the process required to complete a database recovery. The process for database recovery uses a two-step approach, using two program modules, TSSAFR1 (Extraction) and TSSAFR2 (DEDB Recovery). This two-step approach was chosen to provide maximum parallelism and reduce elapsed time for the recovery.

The time required to recover all databases is a function of the user-controlled IMS system checkpoint frequency, the number of databases and areas defined to IMS, the volume of database updates, and the user-selected degree of parallelism in the recovery process.
If you are not using block level sharing in the IMS environment, a cold start of the IMS system can begin after the MSDB recovery job is complete (after TSSAFR1 and DBFDBDR0) and can run concurrently with the DEDB recovery jobs.

Figure 1  Fast Path Recovery Utility recovery process
Emergency restart failure

To ensure database integrity if an emergency restart of an IMS system fails, the following activities must be performed before a cold start of the system:

- All DEDBs must be forward-recovered to ensure that the following actions occur:
  - The DEDB management area control block (DMAC) is updated on the physical area data set (DMACXNTS and DMACXVAL, DMACOCNT, any EQEs).
  - Any updates pending completion of an output thread are applied.
  - The current sequential dependent buffer is written to the physical area data set.

- The MSDBINIT data set must be recovered by using the checkpoint data sets (MSDBC1P and MSDBC2P) and the log records of any MSDB changes since the last checkpoint.

- Batch backout of uncommitted full-function database updates must be performed for each program specification block (PSB) that was active at IMS system failure.

These database recovery activities can take 7 to 12 hours, depending on the number of databases and areas to be recovered, the volume of log data set records to be processed, and the degree of sophistication of the environment.

Fast Path Recovery Utility provides a facility for rapidly recovering all Fast Path databases with complete integrity so system availability is restored quickly.

Product restriction

In an IBM IMS/ESA® environment, Fast Path Recovery Utility cannot recover ADS being updated by a high-speed sequential processing (HSSP) batch message processing (BMP) program with the HSSP image copy option activated. If Fast Path Recovery Utility detects 5947 (HSSP image copy update bit map) log records for an ADS, it issues a warning message, indicating that manual recovery is required.
System overview

This chapter describes the Fast Path Recovery Utility system environment, system requirements, and program considerations.

The following topics are discussed in this chapter:

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System environment

Fast Path Recovery Utility programs and macros run on any CPU that is compatible with the IBM z/Architecture® (as outlined in the z/Architecture Principles of Operation). Fast Path Recovery Utility programs operate under any version of MVS/XA and MVS/ESA. All input/output operations use QSAM, BSAM, and VSAM.

Fast Path Recovery Utility programs run in a virtual storage region. Region size for TSSAFR1 (Selection and Extract Processing) is approximately 2048 KB, which includes the requirements for the program, access method modules, and buffers. TSSAFR2 (DEDB Recovery) requires a virtual storage region of approximately 2048 KB.
System requirements

Fast Path Recovery Utility requires the following system resources.

Hardware

Fast Path Recovery Utility operates on any processor that supports the MVS/ESA operating system. It requires the same hardware as the IBM IMS/ESA Database Manager product.

BMC licenses each product to run on a specific CPU.

Operating system

You can use Fast Path Recovery Utility with the IBM z/OS® operating system.

Fast Path Recovery Utility is written in assembler language within the constraints of the OS/VS Assembler.

IMS

Your site must have a license for the IMS/ESA Database Manager. You can use Fast Path Recovery Utility with the following versions and releases of IMS:

- IBM supported versions of IMS
- all releases of DBRC

Program considerations

Fast Path Recovery Utility programs and associated utility modules are written in assembler language. They do not require source code modifications to any user or IMS module or control block.

APF authorization is required only for block-level sharing support.
Fast Path Recovery Utility requires the following programs for installation, operation, and maintenance:

- **z/OS**
  
  Fast Path Recovery Utility supports all IBM-supported versions of z/OS and will support new versions as they become available from IBM.

- **IMS/ESA**
  
  Fast Path Recovery Utility supports all versions of IMS/ESA and will support new versions as they become available from IBM.

- **OS/VS utility programs**

- **OS/VS linkage editor**

- **OS/VS access method services**

- **(optional) IBM supported versions of DB2®**
This chapter describes how to use the Fast Path Recovery Utility Data Extraction utility (TSSAFR1), including its control statement, JCL, memory and DASD requirements, and how the recovery parameters and required data sets are selected.

The following topics are discussed in this chapter:

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Overview

TSSAFR1 is an OS/VS batch program that accesses the Checkpoint-ID Table in the first record of the restart data set (RDS) and selects the lowest of the following values:

- current checkpoint (BCPCCKID)
- LCRE checkpoint (BCPLCKID)
- fast path checkpoint (BCPFCKID)
This approach is similar to the logic used by IMS during emergency restart processing.

You can specify the option RDS=NO and provide a Checkpoint-ID in the same format as on an /ERE command. Typically, this option would be chosen if the RDS is unusable. The correct Checkpoint-ID can be found in the DFS994I message on the IMS hardcopy log or the JES log of the failed IMS session. If you are unsure about specifying a particular checkpoint, specify an earlier checkpoint.

**RECON data set selection**

TSSAFR1 dynamically allocates the three RECON data sets if the data sets are not specified in the JCL stream. BMC Software recommends dynamic allocation.

TSSAFR1 searches the library referenced by the STEPLIB DD statement, to locate the DFSMDA members, and obtains the data set name associated with each ddname (RECON1, RECON2, RECON3). RECON3 is optional.

The RECON data sets are allocated and opened (TSSAFR1 does not issue a Reserve against the pack on which they reside during this process). Empty RECON data sets (spare data sets) are discarded. A VSAM open error 160(A0) is encountered for the empty RECON data sets, and an IEC161I message is printed in the job log.

TSSAFR1 selects the RECON data set with the highest use count. If all use counts are equal, TSSAFR1 selects the last RECON data set that is opened. Unselected RECON data sets are closed and ignored.

---

**NOTE**

Use of a specific RECON data set can be forced by providing a RECONUSE DD statement in the JCL stream.

---

**Log data set selection**

TSSAFR1 dynamically allocates the required log data sets. To determine the required log data sets, TSSAFR1 performs several tasks:

- TSSAFR1 references, in order, the PRIOLDS, IPRIOLDS, SECOLDS, and ISECOLDS records in the selected RECON data set.
Log records

TSSAFR1 selects a log data set if its Checkpoint-ID date and time stamp is equal to or greater than the log open date and time stamp value and less than the log close date and time stamp value.

If a selected log data set has errors flagged in the RECON entry or a log close date and time stamp value of zero, the program replaces the data set with a log data set from a subsequent RECON record type in the search hierarchy.

If DBRC=NO is specified, you must specify the SLDS or OLDS data sets through JCL statements. SLDS are processed before OLDS. Missing log data sets or duplicate log data results in log sequence errors.

Log records

Table 1 lists the IMS log records that the product uses to determine DEDB recovery information.

<table>
<thead>
<tr>
<th>IMS release</th>
<th>Log records</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMS/ESA version 9.1 and later</td>
<td>07, 08, 47, 3730, 3801, 4001, 4006, 4030, 4084, 4086, 4087, 4089, 5607, 5637, 5638, 5921, 5922, 5923, 5937, 5938, 5947, 5950, 5953, 5957</td>
</tr>
</tbody>
</table>

Table 2 lists the log records that the product uses to determine which processing scheduling tables (PSTs) were active and which full-function PSBs need to be backed out.

<table>
<thead>
<tr>
<th>IMS Release</th>
<th>Log records</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMS/ESA version 9.1 and later</td>
<td>18, 41, 4C01, 4C02, 5050</td>
</tr>
</tbody>
</table>
TSSAFR1 program

TSSAFR1 (Data Extraction) is an OS/VS batch program that performs the following functions:

- selects the recovery parameters
- dynamically allocates the required data sets
- generates a user-specified number of output files containing information required by TSSAFR2 for DEDB recovery

Program options

TSSAFR1 includes the following program options:

- TSSAFR1 can close the IMS log if it has not been closed previously.
- TSSAFR1 can submit the MSDB recovery job with the required log data sets automatically through the internal reader to rebuild the MSDBINIT data set.
- If PSBLIST=YES is specified, a report that lists all active PSTs is generated, and PSBs that require backout are identified.
- If the DBRCCTL DD statement is present, database recovery control (DBRC) statements are generated for registered database descriptions (DBDs) that are referenced by PSBs requiring backout. Referenced DBDs are set to Backout Required by the optional DSPURX00 step. This step ensures that the online system does not use full-function databases that require batch backout until the backout completes.

For IMS Version 6.1 and above, information about each full-function database set to Backout Required is passed to TSSAFR2 in the DEDB01 data set.

Program function

TSSAFR1 processing is shown in Figure 1 on page 23.

TSSAFR1 accesses the IMS resources (RDS, RECONs, and the appropriate OLDS) to determine the optimal checkpoint for recovery and to generate the required data for recovering the databases.
If DBRC is at the SHARECTL level and DEDBs are not block-level-shared, TSSAFR1 generates CHANGE.SUBSYS SSID(---) STARTRCV and ENDRECOV commands, as well as a CHANGE.DBDS DBD(---) AREA(---) RECOV command for each registered area allocated to the failed IMS system.

TSSAFR1 generates one DEDB recovery record for the DEDB master area control block control interval (DMAC CI) for each area data set that was open for update. DEDB recovery records for the DMAC CI are not generated for area data sets that are open for read-only access or area data sets that are opened after the selected checkpoint.

Every 5950 (DEDB updated), 5953 (DEDB updated by utility), or 5957 (local/global portion of DMAC updated) log record encountered after the checkpoint causes a DEDB recovery record to be generated.

An output file is assigned to each DBD name/DMAC name as it is required. Files are assigned sequentially, from 1 to the maximum value specified in the DEDB=nn keyword on the control statement. When this value is reached, file assignment starts again at 1. The maximum number of files to specify is a function of the degree of recovery concurrency desired (the number of OS initiators available for TSSAFR2 job streams).

If MSDB=YES or MSDB=AUTO is specified, TSSAFR1 selects the log data sets required for MSDB recovery by interrogating the MSDBCPn data sets. From the MSDBCPn data sets, TSSAFR1 determines the oldest Checkpoint-ID and the selected RECON data set.

If MSDB=YES is specified, TSSAFR1 prints a list of the required log data sets only. The MSDB recovery job must be created and submitted manually.

If MSDB=AUTO is specified, TSSAFR1 prints a list of the required log data sets and uses the skeleton JCL provided by the JCLLIB1 DD statement to build the MSDB recovery JCL stream. The JCL stream is submitted automatically through the internal reader.

If the DB2CTL=YES control statement is supplied in an IMS/ESA environment, the information used to produce the External Sub-system Update Reject report is included in all DEDBnn output files for TSSAFR2 processing. In addition, TSSAFR1 generates external subsystem data for input to TSSAFR2, regarding a two-phase commit for full-function backout.

**JCL requirements**

TSSAFR1 is executed as a standard OS/VS job. An EXEC statement and DD statements that define the input and output data sets are required.
All output files are blocked to the maximum size of the output device unless they are overridden in the execution JCL. Because the blocking factor is determined at execution, standard labels must be used on all output data sets except SYSPRINT and REPORTS. Sample JCL is shown in Figure 2.

Figure 2  Sample TSSAFR1 JCL (part 1 of 2)

```plaintext
//TSSAFR1  JOB ....etc
//*
//**********************************************
//*  FRU - FIRST RECOVERY JOB  **  
//**********************************************
//*
//FR1    EXEC PGM=TSSAFR1,REGION=2048K
//****
//*  EXTRACT REQUIRED DATA  **
//****
//**********************************************
//STEPLIB DD DSN=BMC.FRU.FPSLIB,DISP=SHR
//         DD DSN=IMSVS.RESLIB,DISP=SHR
//IMSRDS  DD DSN=IMSVS.RDS,DISP=SHR
//IMSRDS2 DD DSN=IMSVS.RDS2,DISP=SHR   (optional)
//SYSPRINT DD SYSOUT=*  
//REPORTS  DD SYSOUT=*  
//SYSSIN DD *
...
... control statements ...
//*
//FR1SYSIN DD *
...
... control statements ...
//*
//DEDBnn DD DSN=BMC.FRU.DEDBnn,  
//        DISP=(NEW,CATLG),  
//        UNIT=SYSDA,  
//        SPACE=(CYL,(50,5),RLSE)
//DBRCCTL  DD DSN=BMC.FRU.DBRCCTL,  (optional)
//        DISP=(NEW,CATLG),  
//        UNIT=SYSDA,  
//        SPACE=(CYL,(2,1),RLSE)
//*
//MSDBCP1 DD DSN=IMSVS.MSDBCP1,DISP=SHR  (optional)
//MSDBCP2 DD DSN=IMSVS.MSDBCP2,DISP=SHR  (optional)
//MSDBCP3 DD DSN=IMSVS.MSDBCP3,DISP=SHR  (optional)
//MSDBCP4 DD DSN=IMSVS.MSDBCP4,DISP=SHR  (optional)
//JCLLIB1 DD DSN=BMC.FRU.FPSSAMP(FRUMSDB),DISP=SHR  (optional)
//INTRDR DD SYSOUT=(A,INTRDR),DCB=BLKSIZE=80  (optional)
//*
//RECON1 DD DSN=IMSVS.RECON1,DISP=SHR  (optional)
//RECON2 DD DSN=IMSVS.RECON2,DISP=SHR  (optional)
//RECONUSE DD DSN=IMSVS.RECONn,DISP=SHR  (optional)
//*
//SLDSLOG DD DSN=IMSVS.SLDSLOGP,DISP=SHR,DCB=BUFNO=5  (optional)
//SLDSLOGS DD DSN=IMSVS.SLDSLOGS,DISP=SHR,DCB=BUFNO=5  (optional)
//OLDSLOG DD DSN=IMSVS.DFSOLPnn,DISP=SHR,DCB=BUFNO=5  (optional)
```
Figure 2  Sample TSSAFR1 JCL (part 2 of 2)

```
//OLDLSLOGS DD DSN=IMSVS.DFSOLSn, DISP=SHR, DCB=BUFNO=5 (optional) 
//* 
//DFSWSADO DD DSN=IMSVS.WADSO, DISP=SHR (optional) 
//DFSWSAD1 DD DSN=IMSVS.WADSI, DISP=SHR (optional) 
//* 
//DBRC  EXEC PGM=DSPURX00, REGION=2048K 
//****************************************************************************** 
//  UPDATE DBRC  ** 
//****************************************************************************** 
//STEPLIB DD DSN=IMSVS.RESLIB, DISP=SR  
//IMS   DD DSN=IMSVS.DBDLIB, DISP=SR  
//SYSPRINT DD SYSOUT=* 
//SYSIN  DD DSN=BMC.FRU.DBRCTL, DISP=SR 
```

TSSAFR1 uses the following JCL statements:

**EXEC**

This statement must be in the form:

```
EXEC PGM=TSSAFR1, REGION=2048K
```

**STEPLIB DD**

A concatenation of the following libraries:

- load library containing the Fast Path Recovery Utility programs
- IMS RESLIB library
- library containing the DFSMDA members for RECON data sets and write ahead data sets (WADS) data sets

**IMSRDS DD / IMSRDS2 DD**

Required if RDS=YES is specified. Defines the IMS restart data set (RDS) or a backup of the restart data set taken when the IMS system failed. This data set resides on a direct access device and is opened for input only. If the IMSRDS2 DD statement is also present in extended recovery facility (XRF) environments, both data sets are opened and the most current RDS is selected before checkpoint selection.

**SYSPRINT DD**

Defines the messages report output data set. The data set can reside on a direct access device or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.
**REPORTS DD**

Defines the audit control output report data set. This data set can reside on a direct access device or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.

**SYSIN DD**

Defines the mandatory control statement input data set. This data set can reside on a direct access device, or it can be routed through the input stream.

**FR1SYSIN DD**

Defines the alternate control statement input data set. This data set can reside on a direct access device, or it can be routed through the input stream.

**DEDBnn DD**

_(optional)_ Defines the output data set for the generated DEDB recovery records. One DEDBnn DD statement must exist for each output file defined by the DEDB=nn parameter on the CTL control statement. These data sets can reside on a direct access device or tape. Default data control block (DCB) attributes are the same as the maximums for an OLDS. Use LRECL=30716 and BLKSIZE=30720.

**DBRCCTL DD**

_(optional)_ Defines the generated DBRC control statement data set. This data set must reside on a direct access device. DCB attributes are set by TSSAFR1 as RECFM=FB, LRECL=80, and BLKSIZE=6000.

If present, the data set defined by this DD statement contains the following DBRC control statements:

- For IMS 3.1 or earlier, a CHANGE.DB DBD(??) SSID(??) BACKOUT(??) statement is generated for each registered full-function database referenced by a program specification block (PSB) that requires backout. These statements are generated only if PSBLIST=YES is specified.

- If DBRC is at the SHARECTL level, CHANGE.SUBSYS SSID(??) STARTRCV and ENDRECOV commands are generated.

- A CHANGE.DBDS DBD(??) AREA(??) RECOV command is generated for each registered ADS that requires recovery.
MSDBCP1 DD / MSDBCP2 DD and MSDBCP3 DD / MSDBCP4 DD

Required if MSDB=YES or MSDB=AUTO is specified. Defines the optional MSDB checkpoint data set. If MSDBCP3 and MSDBCP4 DD statements are present in an XRF environment, the most current pair is selected before MSDB Checkpoint-ID selection.

JCLLIB1 DD

Required if MSDB=AUTO is in force. Defines an optional input data set when MSDB=AUTO is specified that contains skeleton JCL for the MSDB Recovery Utility. (A sample of the required MSDB recovery skeleton JCL is provided in Figure 3 on page 38.) This data set is read by using QSAM. If the skeleton JCL is a member of a PDS, the DSN=field must include the member name. This data set should reside on a direct access device.

INTRDR DD

Required if MSDB=AUTO is specified. Defines the optional internal reader if MSDB=AUTO is specified. The MSDB recovery JCL is submitted for execution through this internal reader.

RECON1 DD / RECON2 DD / RECON3 DD

(optional) Defines the RECON data sets. These DD statements can be omitted if DBRC=NO is specified or if dynamic allocation of these data sets is desired. BMC recommends dynamic allocation. RECON3 can be omitted if it defines the spare RECON data set. (If an I/O error is encountered on the RECON data set, use the RECONUSE DD statement.)

RECONUSE DD

(optional) Defines the RECON data set that is interrogated during execution of the utility. This DD statement should be used only to force the utility to use a specific RECON data set when I/O errors are encountered on the most current RECON data set.

SLDSLOG DD

(optional) Defines the primary SLDS, if any, that are required for the recovery operation. This DD statement should be used only when DBRC=NO is specified and the log data sets required for recovery are provided manually. The log data sets must be concatenated in ascending date/time sequence.
**SLDSLOGS DD**

*(optional)* This statement is for dual log support. The statement defines the secondary SLDS, if any, that are required for the recovery operation. This DD should only be used when DBRC=NO is specified and the log data sets required for recovery are provided manually. The log data sets must be concatenated in ascending date/time sequence.

**OLDSLOG DD**

*(optional)* Defines the primary OLDS, if any, that are required for the recovery operation. If DBRC=NO is specified, this ddname should be included in the JCL stream with all required log data sets concatenated in date/time sequence. If RDS=YES and DBRC=YES are in force, any required OLDS are dynamically allocated to this ddname and this statement must be omitted from the JCL stream.

**OLDSLOGS DD**

*(optional)* This statement is for dual log support. The statement defines the secondary OLDS, if any, that are required for the recovery operation. If DBRC=NO is specified, this ddname should be included in the JCL stream with all required log data sets concatenated in date/time sequence. If RDS=YES and DBRC=YES are in force, any required OLDS are dynamically allocated to this ddname and this statement must be omitted from the JCL stream.

---

**NOTE**

All SLDS log records are processed before the OLDS log records if log information is provided through DD statements.

**DFSWADSn DD**

*(optional)* Defines the write ahead data sets (WADS), if any, that are required to close the system log. These DD statements should be specified only if the DFSMDA members are unavailable.

---

**MSDB skeleton JCL**

Sample MSDB recovery skeleton JCL is shown in Figure 3.

**Figure 3 Sample MSDB recovery skeleton JCL (part 1 of 2)**

```bash
//TSSMSDB JOB .....etc
//*
/****************************************************************************
//** MSDB RECOVERY SKELETON JCL **
```
TSSAFR1 searches the input stream read from JCLLIB1 for an &&IEFRDER or &&stepname.IEFRDER statement. If one of these statements is encountered, the appropriate DD statements are built and substituted for the && statement. This allows automatic submission of multi-step JCL streams or procedures in which the MSDB recovery step is not the last step in the job stream.

If no && statement is encountered, TSSAFR1 generates the IEFRDER DD statement after all statements in JCLLIB1 have been processed. You do not have to place the IEFRDER DD statement at the bottom of the skeleton JCL; you can place it anywhere after the STEPLIB DD statement.

## Control statements

The format of the control statements for TSSAFR1 is shown in Figure 4 on page 40.

Keywords and their associated parameter values can be coded in free-format (columns 1 to 72), 80-byte statements if certain syntactical rules are followed:

- Control statement keywords (CTL) must start in column 1.
- Multiple CTL control statements can be provided.
- A keyword=value specification cannot span control statements.
An equals sign must separate all keywords from their associated parameter values. The equals sign must not be preceded by blanks but can be followed by one or more blanks.

Parameter values must be separated from the next keyword by one or more blanks, a comma, or a comma followed by one or more blanks.

If duplicate keywords occur, the last one encountered is the value used.

**Figure 4  Sample TSSAFR1 control statements**

```plaintext
CTL IMSID= xxxx , DEDB= 2 , MSDB= NO AUTO , DBRC= YES NO

CTL RDS= YES NO , CHKPT= yyddd/hhmmss , TBLNENT= 500 nnnnn

CTL LOGSEQ= YES NO , PSBLIST= NO YES , DB2CTL= NO YES , CLOSE= YES NO
```

Use the following control statements for TSSAFR1:

**CTL**

Identifies the control statement type. This value must start in column 1.

**IMSID**

Specifies the subsystem ID (SSID), which is the IMS name of the IMS system to be recovered. In an XRF environment, this is the RSENAME.

**RDS**

*(optional)* Specifies whether to use the restart data set (RDS) to select the Checkpoint-ID for recovery. Valid values are YES and NO. The default is YES.

- If YES is specified, the Checkpoint-ID record is read from the RDS and the checkpoint for start of recovery is selected by using similar logic as DFSRBCP0 (ERE).
- If NO is specified, the RDS is not accessed and TSSAFR1 expects the CHKPT=keyword statement to be present. RDS=NO, CHKPT=yyddd/hhmmss should be used only if the restart data set is unusable.

**CHKPT**

Required if RDS=NO is specified. Provides the Checkpoint-ID from which forward recovery begins. The format is yyddd/hhmmss (the format as issued on the IMS DFS994I message).

**DBRC**

*(optional)* Specifies whether to interrogate DBRC to determine the data set names and VOLSERs of the log data sets used for recovery. Valid values are YES and NO. The default is YES.

If DBRC=NO is specified, the utility expects DD statements to provide the log data set information and CLOSE is set to NO. This provides fast recovery even if the RECON data sets are unusable.

**MSDB**

*(optional)* Specifies provision of MSDB recovery information. The default is YES. Valid values follow:

- **NO** ignores MSDB recovery processing
- **YES** provides a list of the log data sets required for MSDB recovery by performing the following tasks:
  - interrogates the MSDBCPn data sets to select the oldest Checkpoint-ID
  - interrogates the selected RECON data set to obtain the required log data sets
- **AUTO** provides a list of the log data sets required for MSDB recovery (as in YES), and builds and submits the MSDB recovery JCL stream

**TBLENT**

*(optional)* Specifies the number of internal DMAC control table entries. One table entry must exist for each DEDB area (DMAC) defined in ACBLIB. Valid values are 1 to 32767. The value is derived from the system log. The value of TBLENT value is also used to control the maximum number of areas written to each DEDBnn recovery file. The value of TBLENT is used with the value of DEDB to create internal data tables.
DEDB

*(optional)* Specifies the desired number of DEDB recovery data output files. The number of files to specify depends on the following factors:

- degree of recovery concurrency desired (the number of OS initiators available for TSSAFR2 job streams)
- number of area data sets to be recovered

Under block-level sharing, the first output file is used exclusively for block-level shared DEDB recoveries. Valid values are 1 to 99. The default is 2.

LOGSEQ

*(optional)* Specifies whether to use sequence-checking when reading records. Use LOGSEQ=NO with discretion. Valid values are YES and NO. The default is YES.

PSBLIST

*(optional)* Specifies whether to report the active PSTs at the time of abend. If PSBLIST=YES is specified, active PSBs at the time abend are reported and PSBs requiring backout are identified. Valid values are YES and NO. The default is NO.

DB2CTL

*(optional; for IMS/ESA only)* Specifies whether to include the external subsystem report data in the output file(s). Valid values are YES and NO. The default is NO.

If you specify this keyword in an environment other than IMS/ESA, Fast Path Recovery Utility issues the following message and a return code of 4 or higher:

*TSSA0155W, CONTROL STATEMENT NOT SUPPORTED IN THIS ENVIRONMENT*

CLOSE

*(optional)* Specifies invoking DFSULTR0 if IMS terminated abnormally and the last system log was not closed. Valid values are YES or NO. The default is YES.

**NOTE**

If DBRC is set to DBRC=NO, then CLOSE is forced to CLOSE=NO.
Return codes

TSSAFR1 writes messages to the SYSPRINT data set that fully explain the results of program execution. The return codes are listed in Table 3.

Table 3  TSSAFR1 return codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>DEDB recovery information is generated successfully. MSDB information is generated or MSDB=NO is specified. No PSBs require backout.</td>
</tr>
<tr>
<td>4</td>
<td>DEDB recovery information is generated successfully. MSDB information is generated or MSDB=NO is specified. Backout is required for PSBs.</td>
</tr>
<tr>
<td>8</td>
<td>DEDB recovery information is generated successfully. MSDB warning messages are generated. No PSBs require backout.</td>
</tr>
<tr>
<td>12</td>
<td>DEDB recovery information is generated successfully. MSDB warning messages are generated. Backout is required for PSBs.</td>
</tr>
</tbody>
</table>

**NOTE**
Because of changes to support batch backout for full-function databases, TSSAFR2 execution might be required even though no DEDBs require recovery.

Reports

TSSAFR1 produces the following extraction reports:

- IMS/VS Fast Recovery Utility Messages
- DEDB Area Status
- DEDB Output File Control
- Active Regions at Time of Abend
The IMS/VS Fast Recovery Utility Messages report, shown in Figure 5, provides information about the parameters and options specified for a recovery.

Figure 5  IMS/VS Fast Recovery Utility Messages report (part 1 of 2)

DATE: 96/06/02   TIME: 18:06  IMS/VS FAST RECOVERY UTILITY MESSAGES (TSSAFRI REL:4.2)

TSSA0101I - RECOVERY UTILITY PARAMETERS:
- SUBSYS : OLBA
- DBRC : YES
- RDS : YES
- DEDB : 4
- MSDB : YES
- PSBLIST: YES
- LOGSEQ : YES
- TBLENT : 500

TSSA0102I - RDS SELECTED: IMSRDS

TSSA0103I - DEDB RECOVERY CHECKPOINT-ID: 94020/1316268

TSSA0104I - RECON DATASET SELECTED: RECON2

TSSA0105I - DEDB RECOVERY LOG DATASET LIST:
- TYPE  ----OPEN-----  ----CLOSE----  VOLSER  DSNAME
- PRIOLDS 94020 1316241  94020 1414140          CLD991.TD.QFR.OLDSP09

TSSA0140I - MSDB DATASET SELECTED: MSDBCP1

TSSA0143I - MSDB RECOVERY CHECKPOINT-ID: 94020/1256019

TSSA0145I - MSDB RECOVERY LOG DATASET LIST:
- TYPE  ----OPEN-----  ----CLOSE----  VOLSER  DSNAME
- PRIOLDS 94020 1243486  94020 1257432          CLD991.TD.QFR.OLDSP07
- PRIOLDS 94020 1257432  94020 1316241          CLD991.TD.QFR.OLDSP08
- PRIOLDS 94020 1316241  94020 1414140          CLD991.TD.QFR.OLDSP09

TSSA0147I - PROCESSING SUMMARY:
- NO. LOG RECORDS READ : 9,392
- NO. LOG RECORDS USED (4084) : 17
- NO. LOG RECORDS USED (4086) : 29
- NO. LOG RECORDS USED (4087) : 7
- NO. LOG RECORDS USED (4098) : 1
- NO. LOG RECORDS USED (5921) : 0
- NO. LOG RECORDS USED (5922) : 0
- NO. LOG RECORDS USED (5923) : 0
- NO. LOG RECORDS USED (5950) : 2,902
- NO. LOG RECORDS USED (5953) : 0
- NO. LOG RECORDS USED ( 07 ) : 0
- NO. LOG RECORDS USED ( 08 ) : 0
- NO. LOG RECORDS USED ( 37 ) : 0
The IMS/VS Fast Recovery Utility Messages report includes the information provided in Table 4.

**Table 4  IMS/VS Fast Recovery Utility Messages report segments**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECOVERY UTILITY PARAMETERS</td>
<td>the parameters that are in effect for this execution of the utility</td>
</tr>
<tr>
<td>RDS SELECTED</td>
<td>the name of the selected restart data set</td>
</tr>
<tr>
<td>DEDB RECOVERY CHECKPOINT-ID</td>
<td>the selected or specified Checkpoint ID that is used as the starting point for DEDB recovery</td>
</tr>
<tr>
<td>RECON DATASET SELECTED</td>
<td>the ddname of the RECON data set that is selected or specified</td>
</tr>
<tr>
<td>DEDB RECOVERY LOG DATASET LIST</td>
<td>list of the log data sets required for DEDB recovery</td>
</tr>
<tr>
<td></td>
<td>This list is not reported if DBRC=NO is specified and log data sets are provided through DD statements.</td>
</tr>
<tr>
<td>MSDB DATASET SELECTED</td>
<td>the name of the MSDB data set selected</td>
</tr>
<tr>
<td>MSDB RECOVERY CHECKPOINT-ID</td>
<td>the selected Checkpoint-ID that must be used as the starting point for MSDB recovery</td>
</tr>
<tr>
<td>MSDB RECOVERY LOG DATASET LIST</td>
<td>a list of the log data sets that are required for MSDB recovery</td>
</tr>
<tr>
<td></td>
<td>This is not reported if DBRC=NO is specified.</td>
</tr>
<tr>
<td>PROCESSING SUMMARY</td>
<td>the total log records read and log records of each type selected</td>
</tr>
</tbody>
</table>

**DEDB Area Status Report**

The DEDB Area Status Report, shown in Figure 6, provides information about the status of each DMAC that is defined to the IMS/VS system at the time of a system failure.

**Figure 6  DEDB Area Status Report (part 1 of 2)**

<table>
<thead>
<tr>
<th>DBDNAME</th>
<th>DATASET NAME</th>
<th>AREA#</th>
<th>DMACNAME</th>
<th>FILE#</th>
<th>AREADDN</th>
<th>STATUS</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZBCMA00D</td>
<td>I0BV01A.ZBCMA01D</td>
<td>1</td>
<td>ZBCMA01D</td>
<td>1</td>
<td>ZBCMA01D</td>
<td>RECOVERY RECORDS GENERATED (1)</td>
<td>1</td>
</tr>
</tbody>
</table>
The DEDB Area Status Report includes the information provided in Table 5.

### Table 5  
**DEDB Area Status Report segments (part 1 of 2)**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DBDNAME</strong></td>
<td>the DBD name of the database in which the area is defined</td>
</tr>
<tr>
<td><strong>AREA#</strong></td>
<td>the associated area number</td>
</tr>
<tr>
<td><strong>DMACNAME</strong></td>
<td>the DMAC name of the area</td>
</tr>
<tr>
<td><strong>FILE#</strong></td>
<td>the file number (DEDBnn) of the file containing any DEDB recovery records that were generated</td>
</tr>
</tbody>
</table>
The DEDB Output File Control Report, shown in Figure 7, provides information about the number of recovery records that are written to each output file for each DEDB area.

### Table 5  DEDB Area Status Report segments (part 2 of 2)

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREADDN</td>
<td>the area ddname</td>
</tr>
<tr>
<td></td>
<td>For areas registered with DBRC, this name is the ddname that is registered in DBRC. For areas that are not registered with DBRC, this name is the ddname that is in the DBD (DD1).</td>
</tr>
<tr>
<td>STATUS</td>
<td>DMAC status can be one of the following states:</td>
</tr>
<tr>
<td></td>
<td>- NOT USED/INITIALIZED—The area data sets (ADSs) associated with this DMAC were not opened before the IMS system failure. Because the ADSs were not open, they do not require recovery.</td>
</tr>
<tr>
<td></td>
<td>- CLOSED PRIOR TO IMS FAILURE—ADSs were closed successfully before the IMS system failure. They do not require recovery.</td>
</tr>
<tr>
<td></td>
<td>- NOT UPDATED - RECOVERY NOT REQUIRED—ADS(s) were open in read only mode, or they were opened after the selected Checkpoint-ID, but were not updated.</td>
</tr>
<tr>
<td></td>
<td>- RECOVERY RECORDS GENERATED (Z,ZZZ,ZZ9)—The area was open and had been updated. The count of the number of DEDB update records generated is provided. At least one recovery record is built for any DMAC that was open when the checkpoint was taken. This record contains the DMAC information.</td>
</tr>
<tr>
<td>AREA DATASET NAME</td>
<td>the name of the ADS used</td>
</tr>
</tbody>
</table>

### DEDB Output File Control Report

The DEDB Output File Control Report, shown in Figure 7, provides information about the number of recovery records that are written to each output file for each DEDB area.

### Figure 7  DEDB Output File Control Report (part 1 of 2)

<table>
<thead>
<tr>
<th>DATE: 96/06/02 TIME: 18:06</th>
<th>DEDB OUTPUT FILE CONTROL REPORT (TSSAFR1 REL:4.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILE DDNAME</td>
<td>DBDNAME</td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>DEDB01</td>
<td>ZBCMA00D</td>
</tr>
<tr>
<td>ZLONA00D</td>
<td>3</td>
</tr>
<tr>
<td>ZPDA000D</td>
<td>2</td>
</tr>
<tr>
<td>ZPDA000D</td>
<td>6</td>
</tr>
<tr>
<td>ZPDA000D</td>
<td>10</td>
</tr>
<tr>
<td>ZPDA000D</td>
<td>14</td>
</tr>
<tr>
<td>ZPDA000D</td>
<td>18</td>
</tr>
</tbody>
</table>
The DEDB Output File Control Report includes the information provided in Table 6.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILE DDNAME</td>
<td>the ddname of the output file</td>
</tr>
<tr>
<td>DBDNAME</td>
<td>the DBD name of the database that is being recovered</td>
</tr>
<tr>
<td>AREA#</td>
<td>the area number of the ADS that is being recovered</td>
</tr>
<tr>
<td>DMACNAME</td>
<td>the DMAC name of the area that is being recovered</td>
</tr>
<tr>
<td>#ADS’S</td>
<td>the number of ADS that must be updated for this area</td>
</tr>
<tr>
<td>#RECORDS</td>
<td>the total number of DEDB recovery records that are generated for this area</td>
</tr>
<tr>
<td>#CONTROL</td>
<td>the total number of control records generated for this file</td>
</tr>
<tr>
<td>#REJECTS</td>
<td>the total number of reject records that are generated for this file</td>
</tr>
</tbody>
</table>

The file total might be greater than the sum of the number of records generated for each DBD. This difference is caused by the presence of extraneous recovery records that are ignored by TSSAFR2 (for example, records written for an area that was subsequently closed by IMS).

The file total does not match the number of records processed by the Sort. This difference is caused by the presence of area allocation records (required by TSSAFR2) that are not included in the record counts.

The number is the same for all DEDBnn files.
Active Regions at Time of Abend report

The Active Regions at Time of Abend report, shown in Figure 8, provides a list of all PSTs that are active at the time of abend. It is generated only if PSBLIST=YES is specified. It is used to identify PSBs that require full-function backout.

**Figure 8  Active Regions at Time of Abend report**

<table>
<thead>
<tr>
<th>REGI</th>
<th>PSBNAME</th>
<th>TRANCODE</th>
<th>COMMENT</th>
<th>DBD LIST</th>
<th>CHKPT-ID</th>
<th>TIMESTAMP</th>
<th>JOBNAME</th>
<th>STEPNAME</th>
<th>PGMNAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>POLB0000</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>POLB0000</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>POLB0000</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>POLB0000</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>POLB0000</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TLON0001</td>
<td>BACKOUT</td>
<td>REQUIRED</td>
<td>ZLONACCT</td>
<td>ZLONCTL1</td>
<td>ZLONHIST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>POLB0001</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>POLB0001</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>POLB0001</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>TOLBSCAN</td>
<td>BACKOUT</td>
<td>NOT REQUIRED</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Active Regions at Time of Abend report includes the information provided in Table 7.

**Table 7  Active Regions at Time of Abend report segments (part 1 of 2)**

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGI</td>
<td>the active region ID</td>
</tr>
<tr>
<td>PSBNAME</td>
<td>the name of the PSB that was active</td>
</tr>
<tr>
<td>TRANCODE</td>
<td>the name of the transaction that was active</td>
</tr>
<tr>
<td>COMMENT</td>
<td>the status of the PSB/transaction can be one of the following states:</td>
</tr>
<tr>
<td></td>
<td>■ BACKOUT REQUIRED</td>
</tr>
<tr>
<td></td>
<td>■ BACKOUT MAY BE REQUIRED</td>
</tr>
<tr>
<td></td>
<td>■ BACKOUT NOT REQUIRED</td>
</tr>
<tr>
<td></td>
<td>■ NO ACTIVE PROGRAM</td>
</tr>
</tbody>
</table>
Table 7  Active Regions at Time of Abend report segments (part 2 of 2)

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBD LIST</td>
<td>the names of all DBDs referenced by the PSB/transaction</td>
</tr>
<tr>
<td></td>
<td>DD statements for these DBDs must be provided to the backout utility.</td>
</tr>
<tr>
<td>CHKPT-ID</td>
<td>if the region contained a batch message processing (BMP) program, this field contains the ID of the last completed checkpoint</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>if the region contained a BMP that issued symbolic checkpoints, this field contains the date and time of the last completed checkpoint</td>
</tr>
<tr>
<td>JOBNAME</td>
<td>the job name of the BMP that issued the symbolic checkpoint call</td>
</tr>
<tr>
<td>STEPNAME</td>
<td>the step name of the BMP that issued the symbolic checkpoint call</td>
</tr>
<tr>
<td>PGMNAME</td>
<td>the program name of the BMP that issued the symbolic checkpoint call</td>
</tr>
</tbody>
</table>
DEDB Recovery utility (TSSAFR2)

This chapter describes how to use the Fast Path Recovery Utility DEDB Recovery utility (TSSAFR2), including its memory, DASD, control statement, and JCL requirements, and generated reports.

The following topics are discussed in this chapter:

Overview ....................................................... 51
Program options .................................................. 52
JCL requirements ............................................... 52
Control statement ............................................... 57
Return codes ................................................... 59
Reports .......................................................... 59
  DEDB ADS Recovery Status Report .......................... 60
  External Sub-System Update Reject Report ................. 63
Recovery procedure .......................................... 63

Overview

TSSAFR2 is an OS batch program that applies the sorted data entry database (DEDB) recovery records generated by TSSAFR1 to one or more copies of each DEDB area data set (ADS). Multiple ADSs (MADS) capability is fully supported. To reduce the recovery elapsed time, multiple recovery jobs should be run concurrently. For block-level shared DEDB recovery, the IRLM must be active.

The TSSAFR2 program performs the following tasks:

- dynamically allocates the required ADSs
- applies the DEDB recovery records
- closes the data sets
- creates DBRC control statements
TSSAFR2 dynamically allocates the required DEDB area data sets and applies any database updates:

- updates to the DEDB master area control block (DMAC)
- any updates resulting from an incomplete output thread
- writing of the current sequential dependent buffer, if required

**Program options**

TSSAFR2 includes the following program options:

- If a DBRCCTL DD statement is present, TSSAFR2 provides the option to generate DBRC control statements to correctly set the recovery status for each registered area.

- If DBRC is at SHARECTL level and DEDBs use block-level sharing, the following commands are generated for each restored area allocated to the failed IMS system:

```
CHANGE.SUBSYS SSID(value) STARTRCV/ENDRECOV
CHANGE.DBDS DBD(value) AREA(value) RECOV
```

In addition, the following command is created for each full-function database that had Backout Required set by TSSAFR1:

```
CHANGE.DB DBD(value) SSID(value) NOBACK
```

For block-level shared DEDBs, TSSAFR2 allocates the data sets with DISP=SHR. For all other DEDBs, TSSAFR2 allocates the data sets with DISP=OLD.

- If the DB2CTL=YES control statement is specified in TSSAFR1 in an IMS/ESA environment, and external subsystem commit failures or units of recovery are present, an external subsystem update reject report is generated.

- If the SORT=YES control statement is specified in a block-level shared environment, IMS Resource Lock Management (IRLM) reject locks are purged for the failed IMS system (IRLM must be active).

**JCL requirements**

TSSAFR2 is executed as a standard OS/VS job. Sample JCL is shown in Figure 9.
Figure 9  Sample TSSAFR2 JCL (part 1 of 2)

//TSSAFR2  JOB ....etc
//******************************************************************************
//  **  FRU - SECOND RECOVERY JOB    **
//******************************************************************************
//SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR  
//FR2 EXEC PGM=TSSAFR2,REGION=2048K
//******************************************************************************
//  **  APPLY RECOVERY DATA    **
//******************************************************************************
//STEPLIB DD DSN=BMC.FRU.FPSLIB,DISP=SHR
// DD DSN=IMVS.RESLIB,DISP=SHR
//SYSPRINT DD SYSOUT=*  
//REPORTS DD SYSOUT=*  
//FRDDATA DD DSN=BMC.FRU.DEDBnn,DISP=SHR
//DBRCCTL DD DSN=BMC.FRU.DBRCCTLn, (optional)
//      DISP=(NEW,CATLG),
//      UNIT=SYSDA,
//      SPACE=(CYL,(2,1),RLSE)
//STADBCTL DD SYSOUT=* (optional)
//SYSIN DD * (optional)
... control statements ...
//FR2SYSIN DD * (optional)
... control statements ...
//areaddname DD DSN=BMC.OVERRIDE.VSAM,DISP=SHR (optional)
//******************************************************************************
//DFSRESLB DD DSN=IMVS.RESLIB,DISP=SHR (optional)
//IMSACB DD DSN=IMVS.ACBLIB,DISP=SHR (optional)
//MODSTAT DD DSN=IMVS.MODSTAT,DISP=SHR (optional)
//MODSTAT2 DD DSN=IMVS.MODSTAT2,DISP=SHR (optional)
//IMSACBA DD DSN=IMVS.ACBLIBA,DISP=SHR (optional)
//IMSACBB DD DSN=IMVS.ACBLIBB,DISP=SHR (optional)
//IEFRDER DD DSN=BMC.FRU.IMSLOG,DISP=(NEW,KEEP),
//     UNIT=SYSDA,SPACE=(CYL,(2,1),RLSE)
//DFSVSAM DD * (optional, required for SYSPLEX)
... control statements ...
//******************************************************************************
//RECON1 DD DSN=IMVS.RECON1,DISP=SHR (optional)
//RECON2 DD DSN=IMVS.RECON2,DISP=SHR (optional)
//******************************************************************************
//SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR (optional)
//SORTWK01 DD UNIT=SYSDA,SPACE=(CYL,(30,10)) (optional)
//SORTWK02 DD UNIT=SYSDA,SPACE=(CYL,(30,10)) (optional)
//SORTWK03 DD UNIT=SYSDA,SPACE=(CYL,(30,10)) (optional)
//******************************************************************************
//EXEC PGM=DSPURX00,REGION=2048K,
//      COND=((2,EQ,FR2),(6,EQ,FR2),(10,EQ,FR2))
******************************************************************************
/******  UPDATE DBRC  ***/
TSSAFR2 JCL requires the following EXEC and DD statements:

**EXEC**

This statement must be in the following form:

```
EXEC PGM=TSSAFR2,REGION=2048K
```

**STEPLIB DD**

A concatenation of the following libraries:

- load library containing the Fast Path Recovery Utility programs
- IMS RESLIB library
- library containing the DFSMDA members for the RECON data sets

**NOTE**

Block-level sharing requires APF authorization.

**SYSPRINT DD**

Defines the output messages data set. This data set can reside on a direct access device (DASD) or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.

**REPORTS DD**

Defines the output Audit Control report data set. This data set can reside on a direct access device or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.

---

**NOTE**

Although DD statements for the ADSs can be included in the JCL stream, BMC recommends dynamic allocation.

---

---

**Figure 9  Sample TSSAFR2 JCL (part 2 of 2)**

```
//**************************************************************
//STEPLIB  DD DSN=IMSVS.RESLIB,DISP=SHR
//IMS      DD DSN=IMSVS.DBDLIB,DISP=SHR
//SYSPRINT DD SYSOUT=*  
//SYSIN    DD DSN=BMC.FRU.DBRCCTLn,DISP=SHR
```
FRDDATA DD

Defines the sorted input data set containing the DEDB recovery records that are to be applied to one or more ADSs. This data set must be sorted prior to TSSAFR2 processing. To sort the data set, use either an external sort step prior to TSSAFR2 or use a SORT=YES control card to generate an internal sort. Refer to other DD statements (SYSOUT, SORTLIB, and SORTWORK) that are required for an internal sort. The sort control cards for an external sort are as follows:

```
SORT FIELDS=(5,26,CH,A)
```

DBRCCTL DD

*(optional)* Defines the generated DBRC control statement data set. This data set contains a CHANGE.DBDS statement for the registered ADS that was referenced. It correctly sets the recovery status of each ADS (RECOV or NORECOV). A CHANGE.DB NOBACK statement is generated for each registered full-function database that was marked **Backout Required** by TSSAFR1 (generated from the DEDB01 data set only). This data set must reside on DASD. The assumed format is as follows:

```
DCB=(RECFM=FB,LRECL=80,BLKSIZE=6000)
```

SYSIN DD

*(optional)* Defines the input control statement data set. This data set can reside on DASD, or it can be routed through the input stream.

FR2SYSIN DD

*(optional)* Defines the alternate input control statement data set. This data set can reside on DASD, or it can be routed through the input stream.

STADBCTL DD

*(optional)* Specifies that the IMS commands /STA DB and /STA AREA are generated for each area that has been recovered successfully. This data set can reside on DASD or a printer, or it can be routed through the output stream. This DD statement is only valid in an IMS/ESA environment. Use RECFM=FB and LRECL=80.

areaddname DD

*(optional)* Specifies the VSAM data set to which TSSAFR2 applies updates for the area ddname. This DD statement is valid only in an IMS/ESA environment.
DFRESLB DD

*(optional)* Defines the authorized IMS RESLIB library. This DD statement is required if IMS participates in block-level sharing.

MODSTAT DD / MOSDSTAT2 DD

*(optional)* Defines the MODSTAT data set. If this DD statement is used, the JCL procedure must also contain a DD statement for the current ACBLIB as indicated in the MODSTAT data set (IMSACBA or IMSACBB). If both DD statements are present, the most current MODSTAT data is selected.

IEFRDER DD

*(optional)* Defines the primary output log data set. This DD statement is required when IMS participates in block-level sharing.

DFSVSAMP DD

*(optional)* If you are using the Coupling Facility in a Sysplex environment, this DD statement is required. Specify the CFNAMES control statement and its appropriate parameters only; no other control card should be included in the specified member because of restricted support in a batch environment. There are no restrictions if you have applied IBM APAR PQ33455. Refer to the IBM publication, *IMS System Definition Reference*, for the explanation of the CFNAMES control statement. This data set can reside on DASD, or it can be routed through the input stream.

SYSOUT DD

*(optional)* Defines the sort output message data set. This DD statement should be specified if SORT=YES.

SORTLIB DD

*(optional; installation dependent)* Defines the sort modules required to run the sort utility. It is not required if the sort product library was specified in the LINKLIST during installation.

SORTWORK nn DD

*(optional; installation dependent)* Defines the sort work data sets that are needed for sorting recovery records into key sequence. The number of sort work data sets depends on the size and number of the recovery records. These DD statements must be specified if SORT=YES.
RECON1 DD / RECON2 DD / RECOND3 DD

(optional) Define the required RECON data sets if IMS participates in block-level sharing. These DD statements can be omitted if dynamic allocation of these data sets is desired. BMC recommends dynamic allocation. RECON3 can be omitted if it defines the spare RECON data set.

Control statement

The format of the optional control statement for TSSAFR2 is shown in Figure 10.

Keywords and their associated parameter values can be coded in free-format statements (columns 1 to 72), if certain syntactical rules are followed:

- Keyword parameter sets must be contained in one control statement.
- An equals sign must separate all keywords from their associated parameter values. The equals sign must not be preceded by blanks but can be followed by one or more blanks.
- Parameter values must be separated from the next keyword by one or more blanks, a comma, or a comma followed by one or more blanks.
- If duplicate keywords occur, the last one encountered is the value that is used.

Figure 10  Sample TSSAFR2 Control Statement

```
[START= (dbdname,dmacname)],  [STOP= (dbdname,dmacname)] ,
[SUF=Q], [GSG=gsgname], [TMI=tminame]
```

Use the following control statements for TSSAFR2:

**START**

(optional) Specifies the DBD name and the DMAC name of the ADSs for which the recovery operation is to begin.
STOP

(optional) Specifies the DBD name or DMAC name of the ADS that is the last data set to be recovered. If only one ADS is to be recovered, START and STOP will contain the same value.

**NOTE**

All copies of a MADS area are processed if a specific DBD name or DMAC name is specified.

DDNAME

(optional) This keyword is used in an IMS/ESA environment that specifies whether TSSAFR2 should check for DD statements in the JCL. This keyword overrides the ADS name to which the recovery data is applied.

TOKNTBL

(optional) This keyword is used in an IMS/ESA environment that specifies the number of entries in the rejected recovery token table. The maximum permissible value is 32,767. The value is derived if SORT=YES; the default is 500.

SORT

(optional) Specifies whether to invoke a sort for the extracted recovery records. Valid values for TOKNTBL are derived.

SORT=YES activates block-level sharing support. System information required for block-level sharing recovery (for example, IMSID, IRLMID) is derived from the recovery log records during SORT processing. The default is SORT=NO. Refer to DD statements SYSOUT, SORTLIB, and SORTWORK.

SUF

(optional) Used for block-level sharing, this statement specifies the DFSVNUC suffix character specified in the IMSGEN macro. The default is 0.

GSG

(optional) Valid only with a block-level sharing recovery. GSG is a 1- to 8-character name used to specify the global service group name used by an RSR complex. There is no default value.
TMI

*(optional)* Valid only with a block-level sharing recovery. TMI is a 1- to 4-character name used to specify the transport manager subsystem and the subsystem name for an RSR active or tracking subsystem. There is no default value.

Return codes

TSSAFR2 writes numbered messages to the SYSPRINT data set that fully explains the results of program execution. The return codes are listed in Table 8.

**Table 8  TSSAFR2 Return Codes**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>All ADSs were recovered successfully.</td>
</tr>
<tr>
<td>2</td>
<td>All ADSs were recovered successfully. No DBRC control statements were written to DBRCCTL.</td>
</tr>
<tr>
<td>4</td>
<td>Warning messages were issued for some ADSs processed.</td>
</tr>
<tr>
<td>6</td>
<td>Warning messages were issued for some ADSs processed. No DBRC control statements were written to DBRCCTL.</td>
</tr>
<tr>
<td>8</td>
<td>Recovery failed for one or more ADSs processed.</td>
</tr>
<tr>
<td>10</td>
<td>Recovery failed for one or more ADSs processed. No DBRC control statements were written to DBRCCT.</td>
</tr>
</tbody>
</table>

Reports

TSSAFR2 program generates the following reports:

- DEDB ADS Recovery Status Report
- External Sub-System Update Reject Report
DEDB ADS Recovery Status Report

The DEDB ADS Recovery Status Report, shown in Figure 11, provides information about the status of each ADS after recovery has been attempted.

Figure 11  DEDB ADS Recovery Status Report

The contents of the DEDB ADS Recovery Status Report are defined in Table 9.

Table 9  DEDB ADS Recovery Status Report segments (part 1 of 3)

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBDNAME</td>
<td>the name of the DBD that contains this area</td>
</tr>
<tr>
<td>DMACNAME</td>
<td>the name of the area (DD1 in the DBD)</td>
</tr>
<tr>
<td>AREA#</td>
<td>the number associated with this area</td>
</tr>
<tr>
<td>AREADDN</td>
<td>the ddname registered with DBRC or the DMAC name (if not registered with DBRC)</td>
</tr>
<tr>
<td>RECOVERY STATUS</td>
<td>the status of the recovery attempt</td>
</tr>
<tr>
<td></td>
<td>After attempting to allocate and open the ADSs, and after applying the DEDB recovery records, the recovery status of each ADS is one of the following:</td>
</tr>
<tr>
<td></td>
<td>■ NOT REQUIRED—Recovery for an ADS was not required for one of the following reasons:</td>
</tr>
<tr>
<td></td>
<td>— The ADS was closed successfully before the IMS system failure.</td>
</tr>
<tr>
<td></td>
<td>— The ADS was allocated as read only.</td>
</tr>
<tr>
<td></td>
<td>— The ADS was opened for update processing after the selected DEDB Recovery Checkpoint, but no updates were committed. For block-level shared DEDBs, the CUSN in the CI is compared to the recovery record. If the CI CUSN equals the recovery record CUSN plus 1, recovery of the CI is not required.</td>
</tr>
<tr>
<td></td>
<td>— The ADS was excluded from recovery processing by the control statements provided to TSSAFR2.</td>
</tr>
</tbody>
</table>
Table 9  DEDB ADS Recovery Status Report segments (part 2 of 3)

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RECOVERY STATUS</strong></td>
<td>▪ COMPLETED SUCCESSFULLY—The ADS was allocated successfully, opened, and all recovery records were successfully applied.</td>
</tr>
<tr>
<td><em>(continued)</em></td>
<td>▪ COMPLETED WITH WARNINGS—The ADS was allocated successfully, opened, and recovery records were applied, but one of the following conditions was encountered:</td>
</tr>
</tbody>
</table>
### RECOVERY STATUS (continued)

- **FAILED**—Recovery for an ADS failed for one of the following reasons:
  - TSSAFR2 was unable to allocate the ADS.
  - An open error was encountered on the ADS.
  - A VSAM I/O error was encountered when only a single copy of an ADS was present, more than 10 I/O errors occurred on a copy of a MADS area, or the I/O error occurred on the same CI in all copies of a MADS.
  - An HSSP image copy (HSSP I/C) was active on the ADS. No database updates were applied. If an HSSP I/C is active, the ADS must be recovered by using the IMS database recovery utility.
  - The ADS participates in block-level sharing and block-level sharing was not active. No database updates were applied. Recover ADSs that participate in block-level sharing by using the IMS database recovery utility.
  - A CI was read and found to have a record definition field/control interval definition field (RDF/CIDF) error. Fast Path Recovery Utility could not correct this condition.
  - The DMCB could not be found in the ACBLIB for a block-level shared DEDB.
  - The DMAC could not be found in the DMCB for a block-level shared DEDB.

### # UPDATES

- the number of DEDB recovery records applied to this ADS

### WARNING/ERROR MESSAGES

- the following types of warning or error messages are possible:
  - Allocation Messages - refer to the *OS/VS MVS System Programming Library: Job Management Manual, Svc 99 Error Codes*
  - VSAM Messages - refer to the *OS/VS Virtual Storage Access Method (VSAM) Programmer’s Guide*
  - Severe I/O Error - The ADSC flags indicated that an I/O error occurred on the DMAC CI. Recovery was not attempted.
  - RDF/CIDF - record definition field/control interval definition field. Error correction occurred of a successful relative byte address (RBA).
  - RDF/CIDF error correction of a failed RBA
External Sub-System Update Reject Report

TSSAFR2 produces the External Sub-System Update Reject Report, shown in Figure 12. In an IMS/ESA environment, TSSAFR2 generates this report by using information obtained from TSSAFR1 through the DB2CTL control statement. This control statement supplies information that can determine the IMS recovery units and associated database updates that are not applied. See “Recovery procedure” on page 63 for the BMC recommended recovery procedure.

Figure 12 External Sub-System Update Reject Report

<table>
<thead>
<tr>
<th>DATE: 96/12/10 TIME: 10:15</th>
<th>EXTERNAL SUB-SYSTEM UPDATE REJECT REPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTERNAL SUB-SYSTEM ID:DB2V</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IMS RECOVERY TOKEN (NID)</th>
<th>PGM/PSB</th>
<th>REJECT REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMSA 0000001400000001</td>
<td>DIVDP1</td>
<td>SYNCH FAILURE</td>
</tr>
<tr>
<td>IMSA 0000002A000001A9</td>
<td>DIVDP2</td>
<td>SYNCH FAILURE</td>
</tr>
<tr>
<td>IMSA 000000BF000001DE</td>
<td>DIVDP2</td>
<td>INCOMPLETE U-O-R</td>
</tr>
<tr>
<td>IMSA 000000CB00000012</td>
<td>DIVDP9</td>
<td>RE-SYNCH FAILURE</td>
</tr>
<tr>
<td>IMSA 000000CD000000FE</td>
<td>DIVDP9</td>
<td>SYNCH FAILURE</td>
</tr>
</tbody>
</table>

The External Sub-System Update Reject Report includes the information provided in Table 10.

Table 10 External Sub-System Update Reject Report segments

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXTERNAL SUB-SYSTEM ID</td>
<td>the name of the external subsystem</td>
</tr>
<tr>
<td>IMS</td>
<td>the SSID (the IMS name) of the system to be recovered</td>
</tr>
<tr>
<td>RECOVERY TOKEN (NID)</td>
<td>the value of the IMS Recovery Token or network identifier (NID)</td>
</tr>
<tr>
<td>PGM/PSB</td>
<td>the program or PSB name</td>
</tr>
<tr>
<td>REJECT REASON</td>
<td>the IMS rejection reason</td>
</tr>
</tbody>
</table>

Recovery procedure

BMC recommends that you use the following recovery process:

1. Run the Fast Path Recovery Utility jobs (TSSAFR1 and TSSAFR2).
2. Examine the External Sub-system Update Reject report from TSSAFR2 (see Figure 12).
3. Note which external subsystems have had updates rejected.
4 Determine whether the subsystem has any INDOUBT units-of-recovery.

5 Match the NIDs on the External Sub-System Update Reject Report with the INDOUBT units-of-recovery.

6 Abort the matched INDOUBT units-of-recovery.

7 Ignore NIDs not matched with the INDOUBT units-of-recovery.

8 Evaluate each INDOUBT unit-of-recovery with no matching entry on the External Sub-System Update Reject Report. INDOUBT units-of-recovery with no matching entry on this report can probably be COMMITED, but as external influences such as batch backout, INDOUBT units-of-recovery existing before the IMS failure, and manual intervention through the IMS /CHA SUBSYSTEM command.
Operational information

This chapter provides a list of preparation and planning activities, environment-specific fast recovery activity checklists, and problem resolution guidelines to be used with Fast Path Recovery Utility.

The following topics are discussed in this chapter:

Preparation and planning .............................................. 65
Fast Recovery activity checklists ..................................... 66
  Fast Recovery activity checklist #1 ................................. 67
  Fast Recovery activity checklist #2 ................................. 69
  Fast Recovery activity checklist #3 ................................. 71
Unusable RDS ............................................................ 74
Unusable log data sets .................................................. 74
RECON data set errors .................................................. 74
  I/O error on one RECON data set ................................. 74
  I/O errors on both RECON data sets ......................... 75
Periodic testing ......................................................... 75

Preparation and planning

To avoid the loss of critical data required by Fast Path Recovery Utility, the following data sets should be backed up after every IMS system failure (not ERE failure):

- The first record of the restart data set (RDS). This record can be backed up to a small three-cycle generation data group (GDG) by using IDCAMS REPRO with COUNT(1).

- The main storage data base (MSDB) checkpoint data sets (MSDBCP1 and MSDBCP2) should be backed up to a three-cycle GDG. This backup can be done with IEBGENER.
To minimize preparation time when Fast Path Recovery Utility is required, BMC Software recommends that the following JCL streams be set up and tailored:

- **Execution JCL for TSSAFR1.** The only mandatory control statement keyword is IMSID. Two output files for DEDB recovery should satisfy most requirements. The IMSRDS DD statement should reference the backup of the RDS.

- If MSDB=AUTO, use the MSDB recovery skeleton JCL.

- **Execution JCL for TSSAFR2.** The JCL stream should contain two sets of execution JCL, one for each DEDB recovery file created. A single TSO SUBMIT command submits both recovery jobs.

**NOTE**

DEDBnn files created by TSSAFR1 cannot be concatenated as input to TSSAFR2.

Fast Path Recovery Utility should not be used in the following scenarios:

- **After an IMS session has been terminated successfully (IMS was brought down normally).** If you must run Fast Path Recovery Utility, specify RDS=NO and provide the CHKPT-ID.

- **With DBRC=YES after a failed IMS system has been cold-started.** If you must run Fast Path Recovery Utility, specify RDS=NO with the CHKPT-ID, DBRC=NO and manually provide the system log data sets (SLDS) and online data sets (OLDS) required for the recovery.

# Fast Recovery activity checklists

Three separate checklists are available to describe the actions and sequence of events that are required to successfully use Fast Recovery Utility. These checklists describe the steps needed to execute the recovery of Fast Path areas, MSDBs and full-function databases requiring batch backout.

Each checklist is environment-specific. Depending on whether you are using block-level sharing, the Fast Path Virtual Storage Option (VSO), or both, the number and sequence of procedural steps will be unique. Table 11 shows which checklist you must use based on the data sharing and storage options used in your IMS environment.

In Table 11, the column heading “Shared VSO” refers to databases that utilize block level sharing (DBRC SHARLEVEL 2 or 3) and that reside in the Coupling Facility.
Chapter 5  Operational information  67

The checklists listed in Table 11 are presented on the following pages.

**Fast Recovery activity checklist #1**

Complete the following steps to cold start IMS systems that do not utilize block level sharing (for example, DBRC Share Level 0 or 1).

---

**WARNING**

Do not attempt an IMS ERE after Fast Path Recovery Utility has been run.

---

**To cold start IMS systems**

1. Close the IMS log data set, if required.

   This step can be bypassed if the keywords CLOSE=YES and DBRC=YES are specified in the SYSIN DD input stream for program TSSAFR1. If an attempted IMS ERE has failed, the IMS log data set probably has been closed already by the IMS ERE process.

---

**NOTE**

DBRC must always be notified when the IMS log data set has been closed. If DBRC is not notified, the IMS cold start will fail.

---

2. Execute the TSSAFR1 job stream.

   If TSSAFR1 does not complete successfully, correct any errors and rerun the job stream.

---

<table>
<thead>
<tr>
<th>DBRC SHARLEVEL</th>
<th>Using VSO?</th>
<th>Using shared VSO?</th>
<th>Use this checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 or 1 (Data Level)</td>
<td>No</td>
<td>n/a</td>
<td>“Fast Recovery activity checklist #1” on page 67</td>
</tr>
<tr>
<td>0 or 1 (Data Level)</td>
<td>Yes</td>
<td>n/a</td>
<td>“Fast Recovery activity checklist #2” on page 69</td>
</tr>
<tr>
<td>2 or 3 (Block Level)</td>
<td>Yes</td>
<td>No</td>
<td>“Fast Recovery activity checklist #2” on page 69</td>
</tr>
<tr>
<td>2 or 3 (Block Level)</td>
<td>Yes</td>
<td>Yes</td>
<td>“Fast Recovery activity checklist #3” on page 71</td>
</tr>
</tbody>
</table>
Execute the MSDB recovery utility, if required.

Input to the MSDB recovery utility is the list of log data sets indicated by TSSAFR1 within the SYSPRINT Messages. If the MSDB=AUTO keyword was specified in the TSSAFR1 SYSIN DD input stream, ensure that MSDB recovery completed successfully.

**TIP**

Step 4 and step 5 can be performed concurrently.

Cold start the IMS subsystem using *either* of the following restart commands:

- Use the /ERE COLDSYS IMS restart command to release all DBRC authorization from all databases.

- Use of the /ERE COLDDBASE IMS restart command will necessitate performing additional tasks, because it will cause IMS to:
  - analyze IMS log records during start-up
  - mark the areas recovered by FRU as “Recovery Needed”
  - flag all related Area Datasets (ADS) as being “UNAVAIL” in DBRC

These activities will cause IMS to issue the following message:

```
DFS2574I AREA=areaname STOPPED, RECOVERY NEEDED
```

In order to make the FRU-recovered areas available after executing the IMS /ERE COLDDBASE command, you must complete and issue the following DBRC commands for each recovered area after IMS has been restarted:

```
CHANGE.DBDS AREA(areaname) NORECOV
CHANGE.ADS DBD(dbdname) AREA(areaname) ADDN(areaddname) AVAIL
```

After issuing the DBRC commands, you can optionally create an Online Image Copy (OIC) of the areas. Doing so will shorten the time needed to forward recover an area should it become necessary.

Perform database recoveries.

If required, run full-function backout. If the PSBLIST=YES keyword was specified in the SYSPIN DD input stream of TSSAFR1, a list of program specification blocks (PSBs) requiring backout will be produced.
6 Execute the TSSAFR2 job streams. As these jobs complete, review output from TSSAFR2 and issue IMS /STO AREA commands for any areas which have warning or errors messages associated with them.

7 Start IMS message regions and data communications.

8 Take corrective action on any areas where TSSAFR2 issued a warning or error message. Issue IMS /STA AREA commands for these areas as corrective action is completed.

---

**Fast Recovery activity checklist #2**

Complete the following steps to cold start IMS systems that utilize block level sharing (for example, DBRC Share Level 2 or 3).

---

**WARNING**

Do not attempt an IMS ERE after Fast Path Recovery Utility has been run.

---

**To cold start IMS systems**

1 Close the IMS log data set, if required.

This step can be bypassed if the keywords CLOSE=YES and DBRC=YES are specified in the SYSIN DD input stream for program TSSAFR1. If an attempted IMS ERE has failed, the IMS log data set probably has been closed already by the IMS ERE process.

**NOTE**

DBRC must always be notified when the IMS log data set has been closed. If DBRC is not notified, the IMS cold start will fail.

2 Execute the TSSAFR1 job stream.

If TSSAFR1 does not complete successfully, correct any errors and rerun the job stream.
3 Execute the MSDB recovery utility, if required.

Input to the MSDB recovery utility is the list of log data sets indicated by TSSAFR1 within the SYSPRINT Messages. If the MSDB=AUTO keyword was specified in the TSSAFR1 SYSIN DD input stream, ensure that MSDB recovery completed successfully.

4 Perform database recoveries.

If required, run full-function backout. If the PSBLIST=YES keyword was specified in the SYSIN DD input stream of TSSAFR1, a list of program specification blocks (PSBs) requiring backout will be produced.

5 Execute the TSSAFR2 job streams. As these jobs complete, review output from TSSAFR2. Take corrective action on any areas where TSSAFR2 issued a warning or error message.

6 Cold start the IMS subsystem using either of the following restart commands:

- Use the /ERE COLDSYS IMS restart command to release all DBRC authorization from all databases. The OVERRIDE keyword might be required.

- Use of the /ERE COLDBASE IMS restart command will necessitate performing additional tasks, because it will cause IMS to:

  — analyze IMS log records during start-up
  — mark the areas recovered by FRU as “Recovery Needed”
  — flag all related Area Datasets (ADS) as being “UNAVAIL” in DBRC

These activities will cause IMS to issue the following message:

DFS2574I AREA = areaname STOPPED, RECOVERY NEEDED

In order to make the FRU-recovered areas available after executing the IMS /ERE COLDBASE command, you must complete and issue the following DBRC commands for each recovered area after IMS has been restarted:

| CHANGE.DBDS AREA(areaname) NORECOV |
| CHANGE.ADS DBD(dbdbname) AREA(areaname) ADDN(areaddname) AVAIL |

After issuing the DBRC commands, you can optionally create an Online Image Copy (OIC) of the areas. Doing so will shorten the time needed to forward recover an area should it become necessary.

7 Start IMS message regions and data communications.
Fast Recovery activity checklist #3

Complete the following steps to cold start IMS systems that utilize block level sharing (for example, DBRC Share Level 2 or 3) and the Shared Fast Path Virtual Storage Option (VSO) utilizing the Coupling Facility as its caching mechanism.

--- WARNING ---
Do not attempt an IMS ERE after Fast Path Recovery Utility has been run.

To cold start IMS systems

1 Close the IMS log data set, if required.

This step can be bypassed if the keywords CLOSE=YES and DBRC=YES are specified in the SYSIN DD input stream for program TSSAFR1. If an attempted IMS ERE has failed, the IMS log data set probably has been closed already by the IMS ERE process.

--- NOTE ---
DBRC must always be notified when the IMS log data set has been closed. If DBRC is not notified, the IMS cold start will fail.

--- TIP ---
Step 2 and step 3 can be performed concurrently.

2 Invalidate coupling facility cache structures.

In order to avoid data corruption to FRU-recovered areas by VSO updates being applied after the FRU recovery, the cache structures must be invalidated in one of two ways depending on IMS subsystem availability. perform Step B.

A If any of the IMS subsystems sharing the VSO areas is still active and available, issue the following IMS command on any one of the available IMS subsystems for each VSO area to invalidate cache structures:

```
/VUNLOAD AREA areaname
```

Then skip step 2B and proceed directly to step 3.
If none of the IMS subsystems sharing the VSO areas are active and available, issue the following MVS display command on the coupling facility structures in question to determine whether the MVS command is needed to delete the cache structure:

```
D XCF,STR,STRNAME=(cfstr1,cfstr2)
```

where the cfstr1 and cfstr2 are the coupling facility cache structure names that are defined for the area in DBRC.

**WARNING**

If the state of the connection to any IMS subsystem is listed as any status other than FAILED-PERSISTENT, do not proceed with the remaining steps on this checklist. You must first determine why z/OS is recognizing a different connection status for an IMS subsystem.

If the state of the connection to all IMS subsystems is listed as FAILED-PERSISTENT, issue the following z/OS command on any z/OS image that is connected to the coupling facility:

```
SETXCF FORCE, CONNECTION,STRNAME=cfstr1,CONNAME=ALL
```

This command will delete the connection and invalidate the contents of the coupling facility to prevent the flushing of outdated cached data to DASD.

Since the command shown above allows only one coupling facility structure name (cfstrx), you must repeat the command on each coupling facility structure associated with the Shared VSO area.

3 Execute the TSSAFR1 job stream.

If TSSAFR1 does not complete successfully, correct any errors and rerun the job stream.

4 Execute the MSDB recovery utility, if required.

Input to the MSDB recovery utility is the list of log data sets indicated by TSSAFR1 within the SYSPRINT Messages. If the MSDB=AUTO keyword was specified in the TSSAFR1 SYSIN DD input stream, ensure that MSDB recovery completed successfully.
5 Perform database recoveries.

If required, run full-function backout. If the PSBLIST=YES keyword was specified in the SYSIN DD input stream of TSSAFR1, a list of program specification blocks (PSBs) requiring backout will be produced.

Execute the TSSAFR2 job streams. As these jobs complete, review output from TSSAFR2. Take corrective action on any areas where TSSAFR2 issued a warning or error message.

6 Cold start the IMS subsystem using either of the following restart commands:

- Use the /ERE COLDSYS IMS restart command to release all DBRC authorization from all databases. The OVERRIDE keyword might be required.

- Use of the /ERE COLDBASE IMS restart command will necessitate performing additional tasks, because it will cause IMS to:
  
  — analyze IMS log records during start-up
  — mark the areas recovered by FRU as “Recovery Needed”
  — flag all related Area Datasets (ADS) as being “UNAVAIL” in DBRC

These activities will cause IMS to issue the following message:

*DFS2574I* AREA = *areaname* STOPPED, RECOVERY NEEDED

In order to make the FRU-recovered areas available after the IMS /ERE COLDBASE command, you must complete and issue the following DBRC commands for each recovered area after IMS has been restarted:

```
CHANGE.DBDS AREA(areaname) NORECOV
CHANGE.ADS DBD(dbdbname) AREA(areaname) ADDN(areaddname) AVAIL
```

After issuing the DBRC commands, you can optionally create an Online Image Copy (OIC) of the areas. Doing so will shorten the time needed to forward recover an area should it become necessary.

7 Start IMS message regions and data communications.
Unusable RDS

If an open error or I/O error is encountered on the RDS, or the first record is not the Checkpoint-ID Table, specify RDS=NO, CHKPT=yyddd/hhmmss on the TSSAFR1 control statement and rerun the utility.

The previous Checkpoint-ID can be found in the DFS994I message on the IMS hardcopy log or in the JES log of the failed IMS session.

Unusable log data sets

If an I/O error is encountered on a selected log data set and TSSAFR1 is unable to automatically recover from the secondary log data set, perform the following steps:

1. Issue the LIST.LOG ALL command to get a list of all log data sets from DBRC.

2. Rerun TSSAFR1, specifying DBRC=NO, and provide the correct log data sets (in date/time order) through the appropriate DD statements (SLDSLOG or OLDSLOG).

NOTE

All SLDS log records are processed before the OLDS log records if log information is provided through DD statements.

RECON data set errors

This section details the RECON data set errors that might occur.

I/O error on one RECON data set

If an I/O error is encountered on the selected RECON data set, Fast Path Recovery Utility can be directed to use the alternate RECON data set by providing a RECONUSE DD statement in the execution JCL. Specify the alternate RECON data set on the RECONUSE DD statement, and rerun TSSAFR1.
I/O errors on both RECON data sets

If I/O errors are encountered on both RECON data sets, perform the following steps:

1. Specify DBRC=NO on the TSSAFR1 utility control statement.

2. Provide the required log data sets concatenated in date/time sequence through the appropriate DD statements (SLDSLOG and/or OLDSLOG).

   To determine the required log data sets, you can find all DFS3257I messages, including the first one before the Checkpoint-ID, on the IMS hardcopy log or the JES output for the failed IMS session.


Periodic testing

TSSAFR1 (the first recovery job) is sensitive to changes in the following IMS macros and control blocks:

- ILOGREC
- DBFLSR
- DBFDOCL
- DBFLGRSF
- DFSETPCP
- DBFADSC
- DBFDMHR
- DBFDMAC
- BCPID
- DBFSLRT
- DFSRLSE
- DFSXFER

TSSAFR2 is not sensitive to IMS changes.

BMC recommends periodic testing of TSSAFR1 (especially after IMS maintenance is applied).
To simplify periodic testing

1 Use the following control statement keywords with randomly selected SLDS or OLDS log data sets through the SLDSLOG and OLDSLOG DD statements:

```
CTL IMSID=????,DEDB=2,PSBLIST=YES
CTL DBRC=NO,RDS=NO,CHKPT=999999/999999
```

A CHKPT-ID of all 9s causes TSSAFR1 to select and use the first checkpoint encountered. If the selected log does not contain a checkpoint, message TSSA3536E is issued. If the log does not contain a complete checkpoint, message TSSA3538E is issued.

2 If either of the messages from step 1 are issued, repeat the test with different log data sets.

   If TSSAFR1 completes successfully, the IMS maintenance had no effect on TSSAFR1.

3 If problems are encountered or log error messages (TSSA3540E) are issued, use sample JCL AAPFR1X to reassemble and link TSSAFR1. If the problem persists, contact BMC Customer Support.

4 During implementation of a new IMS Put Level, include complete Fast Path Recovery Utility testing as outlined in Chapter 7, “Testing considerations.”
This chapter describes the three testing utilities supplied with Fast Path Recovery Utility. Use these utilities in an IMS/ESA environment only. These utilities are IMS release sensitive.

The following topics are discussed in this chapter:

**TSSAFR7 Program**

- Fast Path Recovery Utility Log Analysis report ........................................ 77
- JCL requirements .................................................................................. 79
- Control statements ................................................................................ 81

**TSSAFR8 program**

- JCL requirements .................................................................................. 83
- Control statements ................................................................................ 84

**TSSAFR9 program**

- JCL requirements .................................................................................. 86
- Control statements ................................................................................ 87

---

**TSSAFR7 Program**

TSSAFR7 reads the sorted output file created by TSSAFR1 (DEDBnn DD statement), and produces the Fast Path Recovery Utility Log Analysis report.

**Fast Path Recovery Utility Log Analysis report**

The Fast Path Recovery Utility Log Analysis report contains a list of recovery tokens that will be rejected by TSSAFR2 and a list of update records that will be applied. Figure 13 shows a sample report.
Use **TSSAFR7** control statements to restrict the update report to any of the following items:

- specific database
- specific area
- specific RBA
- any combination of database, area, or RBA

A data set that contains a machine-readable list of the report records can be created. You can use this data set to perform comparisons with **TSSAFR8**.

---

**Figure 13  Fast Path Recovery Utility Log Analysis report**

<table>
<thead>
<tr>
<th>DATE: 96/15/8</th>
<th>TIME: 11:02</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>TYPE</th>
<th>IMS RECOVERY TOK</th>
<th>RGN</th>
<th>LOG SEQ#</th>
<th>DBDNAME</th>
<th>AREA</th>
<th>CI</th>
<th>RBA</th>
<th>OFF</th>
<th>LGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>3730</td>
<td>BMC4</td>
<td>00000001 00000000 01</td>
<td>00000071</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3701</td>
<td>BMC4</td>
<td>00000001 00000000 01</td>
<td>00000072</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3738</td>
<td>BMC4</td>
<td>00000001 00000001 01</td>
<td>00000078</td>
<td></td>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
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<td>00000088</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5957</td>
<td>00000000 00000000 01</td>
<td>0000009A</td>
<td>DIVDS0 1</td>
<td>00001000 0000 00B8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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</tr>
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<td>5937</td>
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<td>000000A0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>BMC4</td>
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<td>000000A2</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3738</td>
<td>BMC4</td>
<td>00000030 00000000 01</td>
<td>000000A7</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
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<td>BMC4</td>
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</tr>
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<td>0000015B</td>
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</tr>
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<td>0000017F</td>
<td>DIVDS0 1</td>
<td>00001000 009C 001C</td>
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<td></td>
</tr>
<tr>
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<td>0000018E</td>
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<td>00001000 009C 001C</td>
<td></td>
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<td></td>
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<td>5957</td>
<td>00000030 00000000 00</td>
<td>0000018F</td>
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</tr>
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<td>00000191</td>
<td>DIVD13 1</td>
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<td></td>
</tr>
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<td>00000271</td>
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<td>0000027D</td>
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<td>00000288</td>
<td>DIVD12 1</td>
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<td></td>
</tr>
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<td>5957</td>
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<td>00000293</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5957</td>
<td>00000030 00000000 00</td>
<td>0000029F</td>
<td>DIVD12 2</td>
<td>00001000 009C 001C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Fast Path Recovery Utility Log Analysis report provides information about the databases that were updated and the commit point for each unit of recovery. The fields listed in Table 12 appear on the report.

Table 12  Fast Path Recovery Utility Log Analysis report fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>the IMS log record type</td>
</tr>
<tr>
<td>IMS RECOVERY TOKEN</td>
<td>the network identifier (NID) assigned by IMS to this unit-of-recovery</td>
</tr>
<tr>
<td>RGN</td>
<td>the region/processing scheduling table (PST) number associated with this log record</td>
</tr>
<tr>
<td>LOG SEQ#</td>
<td>the four-byte log sequence number assigned by IMS</td>
</tr>
<tr>
<td>DBDNAME</td>
<td>the DBD name of the database being updated by this log record</td>
</tr>
<tr>
<td>AREA</td>
<td>the area number of the area data set (ADS) being updated by this log record</td>
</tr>
<tr>
<td>CI RBA</td>
<td>the relative byte address (RBA) of the control interval (CI) being updated</td>
</tr>
<tr>
<td>OFF</td>
<td>the offset from the start of the CI of the data that was changed</td>
</tr>
<tr>
<td>LGTH</td>
<td>the length of the data being changed</td>
</tr>
</tbody>
</table>

JCL requirements

Figure 14 shows a sample of TSSAFR7 JCL.

Figure 14  Sample TSSAFR7 JCL (part 1 of 2)

```plaintext
//TSSAFR7  JOB ............
/*
//STEP01 EXEC PGM=TSSAFR7,REGION=1024K
//STEPLIB DD DSN=BMC.FRU.FPSLIB,DISP=SHR
//SYSPRINT DD SYSOUT=*  
//FRDDATA DD DSN=BMC.FRU.DEDB01,DISP=SHR
//OUTDD DD DSN=BMC.FRU.FR7DATA,DISP=(NEW,CATLG),
//       UNIT=SYSDA,SPACE=(CYL,(10,5),RLSE)
//SYSIN DD *
... control statement ...
/*
/* The sort step is required only if the OUTDD DD
/* statement is provided to TSSAFR7
*/
//STEP02 EXEC PGM=SORT,REGION=2048K
//SYSOUT DD SYSOUT=*  
//SORTIN DD DSN=BMC.FRU.FR7DATA,DISP=SHR
//SORTOUT DD DSN=BMC.FRU.FR7DATA,DISP=SHR
//SYSIN DD *
```
TSSAFR7 JCL uses the following EXEC and DD statements:

**EXEC**

This statement must be in the form:

```plaintext
EXEC PGM=TSSAFR7,REGION=1024K
```

**STEPLIB DD**

Contains the load library containing the Fast Path Recovery Utility programs.

**SYSPRINT DD**

Defines the messages and report data set. The data set can reside on a direct access device or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.

**FRDDATA DD**

Defines the sorted input data sets containing the DEDB Recovery records produced by TSSAFR1.

**OUTDD DD**

*(optional)* Defines the optional output data set that contains a machine-readable form of the report produced.

**SYSIN DD**

*(optional)* Defines the optional input control statement data set. This data set can reside on a direct access device or card reader, or it can be routed through the input stream.
The format of the optional control statements for TSSAFR7 is shown in Figure 15. These optional control statements provide a mechanism to filter the output generated by TSSAFR7 to any of the following items:

- a specific database
- area
- RBA
- any combination of the database, area, or RBA

Keywords and their associated parameter values can be coded in free-format statements (columns 1 to 72), if certain syntactical rules are followed:

- An equals sign must separate all keywords from their associated parameter values. The equals sign must not be preceded by blanks, but can be followed by one or more blanks.

- Parameter values must be separated from the next keyword by one or more blanks, a comma, or a comma followed by one or more blanks.

**Figure 15  Sample TSSAFR7 control statement**

```
[ DBD=xxxxxx ] [ AREA=nnnn ] [ RBA=xxxxxxxx ]
```

Use the following control statements for TSSAFR7:

**DBD**

*(optional)* Restricts the report (and OUTDD data set if provided) contents to records relating directly to the eight-character DBD name.

**AREA**

*(optional)* Allows specification of a four-character decimal number relating to the area number (DMACARID) of the DBD (if DBD was specified) or all databases (if DBD was not specified) that should be included in the report.

**RBA**

*(optional)* Allows specification of up to an eight-character hexadecimal number relating to the CI RBA to be included in the report. If neither DBD nor AREA keywords were specified, updates to the CI RBA for all databases and areas are reported.
TSSAFR8 program

TSSAFR8 provides an interface to the IBM module DFSURI00 to restrict the output of the report generated by DFSUR100. The IBM DB recovery routine uses the DFSUR100 module to perform the following actions:

- read IMS log records
- determine which log records to apply to the area being recovered

The DFSUR100 module produces a report containing the updates that would be applied if an IBM DB recovery were being performed. By using TSSAFR8 control statements, you can use the TSSAFR8 program to restrict the report to any of the following records:

- from a specific IMS checkpoint
- from a specific log record sequence number
- for a specific database
- for a specific area
- for a specific RBA
- any combination of the records

Due to changes made in IMS 5.1 by APAR PN81907 (or equivalent APAR for other levels of IMS), the DBD and AREA control parameters are required SYSIN input. No report will be generated unless these parameters are included. This change will only allow TSSAFR8 to report on a single area during each execution. If this fix has not been applied to your IMS system, then DBD and AREA are optional SYSIN input.

TSSAFR8 produces the Fast Path Recovery Utility Log Analysis report (Figure 13 on page 78).

NOTE
TSSAFR7 and TSSAFR9 produce the same report.

As an option, a data set that contains a machine-readable list of the report records can be created. You can use this data set to perform comparisons with TSSAFR7.
JCL requirements

Figure 16 shows a sample of TSSAFR8 JCL.

**Figure 16  Sample TSSAFR8 JCL**

```plaintext
//TSSAFR8   JOB ....ETC...
///F  ********************
///  FAST RECOVERY LOG ANALYZER
///  *
///  VALID KEYWORDS: CHKPT=YYDDD/HHMMSS
///  DBD=         
///  AREA=        
///  RBA=         
///  SEQNO=       
///  ******************
///
///STEP01   EXEC PGM=TSSAFR8,REGION=2048K
///STEPLIB  DD DSN=BMC.FRU.FPSLIB,DISP=SHR
///        DD DSN=IMSVS.RESLIB,DISP=SHR <== REQUIRED FOR IMS 6.1
///SYSPRINT DD SYSPRINT,DISP=SHR
///LOGDD   DD DSN=IMSVS.DFSOLP00,DISP=SHR
///OUTDD   DD DSN=BMC.FRU.FR8DATA, DISP=(NEW,CATLG,DELETE),
///         UNIT=SYSDA,SPACE=(CYL,(30,10),RLSE)
///
///SYSSIN  DD *
///        EDITED(OPTIONAL)
///.... CONTROL STATEMENTS ....
///
///SORT    EXEC PGM=SORT,REGION=2048K,PARM='CORE=MAX'
///********************
/// THIS SORT STEP IS REQUIRED ONLY IF THE *
/// OUTDD DD STATEMENT WAS PROVIDED IN **
/// THE TSSAFR8 STEP **
///*******************
///SORTLIB  DD DSN=SYS1.SORTLIB,DISP=SHR
///SYSOUT  DD SYSOUT=* 
///SORTIN   DD DSN=BMC.FRU.FR8DATA,DISP=SHR
///SORTOUT  DD DSN=BMC.FRU.FR8DATA,DISP=SHR
///SYSSIN  DD *
///SORT FIELDS=(59,23,CH,A),EQUALS
///
/*
EXEC PGM=TSSAFR8,REGION=1024K
```

TSSAFR8 JCL uses the following EXEC and DD statements:

**EXEC**

This statement must be in the form:

```plaintext
EXEC PGM=TSSAFR8,REGION=1024K
```
Control statements

STEPLIB DD

Contains the load library containing the Fast Path Recovery Utility programs.

SYSPRINT DD

Defines the messages and report data set. The data set can reside on a direct access device or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.

LOG DD

Defines the IMS OLDS or SLDS to be used as input.

OUTDD DD

(optional) Defines the optional output data set that contains a machine-readable form of the report produced.

SYSIN DD

(optional) Defines the optional input control statement data set. This data set can reside on a direct access device, or it can be routed through the input stream.

Control statements

Figure 17 shows the format of the optional control statements for TSSAFR8.

These optional control statements provide a mechanism to filter the output generated by TSSAFR8 from a specific IMS checkpoint, IMS log record sequence number, specific database, area, or RBA, or any combination.

Keywords and their associated parameter values can be coded in free-format statements (columns 1 to 72), if certain syntactical rules are followed:

- All keywords must be separated from their associated parameter values by an equals sign. The equals sign must not be preceded by blanks but can be followed by one or more blanks.

- Parameter values must be separated from the next keyword by one or more blanks, a comma, or a comma followed by one or more blanks.

Figure 17  Sample TSSAFR8 control statements

[ DBD=xxxxxx ] [ AREA=nnnn ] [ RBA=xxxxxxxx ]
[ CHKPT=yyddd/hhmmss ] [ SEQNO=xxxxxxxx ]
Use the following control statements for TSSAFR8:

**CHKPT**

*(optional)* Provides TSSAFR8 with a starting point within the log data set. It must be in the format **yyddd/hhmmss**, which is the same format used with TSSAFR1.

**SEQNO**

*(optional)* Allows specification of a hexadecimal number relating to the IMS log record sequence number from which TSSAFR8 is to begin reporting. This number is eight digits in IMS versions previous to IMS 5.1 and 16 digits in IMS 5.1 and later.

**DBD**

Allows you to limit the contents of the report (and the OUTDD data set, if provided) to a database that you specify. For this keyword, provide an eight-character DBD name.

**AREA**

Allows you to limit the contents of the report to a specific area (in all databases or, if you include the DBD keyword, in the specified database). For this keyword, enter the area's four-character decimal number (DMACARID).

**RBA**

*(optional)* Allows specification of up to an eight-character hexadecimal number relating to the CI RBA to be included in the report. If neither the DBD nor AREA keywords were specified, updates to the CI RBA for all databases and areas are reported.

---

**TSSAFR9 program**

TSSAFR9 reads an IMS log data set and produces a report of all log records that TSSAFR1 will use to produce update records for TSSAFR2. All COMMIT and SYNCH records are generated with the associated failure records.

Use TSSAFR9 control statements to restrict the update report to any of the following records:

- updates from a specific IMS checkpoint
- updates from a specific log record sequence number
- updates for a specific database
JCL requirements

- updates for a specific area
- updates for a specific RBA
- any combination of updates

Because the COMMIT and SYNCH log records do not relate directly to database update, these records are always reported and are filtered out only if a specific IMS checkpoint or IMS log record sequence number is used. No facility exists to create a data set that contains a machine-readable list of the update records.

TSSAFR9 produces the Fast Path Recovery Utility Log Analysis report shown in Figure 13 on page 78.

**NOTE**

TSSAFR7 and TSSAFR9 produce the same report.

JCL requirements

Figure 18 shows a sample of TSSAFR9 JCL.

Figure 18  Sample TSSAFR9 JCL

```plaintext
//TSSAFR9  JOB ....ETC...
//*
//******************************************************************************
// *  FAST RECOVERY LOG ANALYZER       **
// *                                  **
// *  VALID KEYWORDS: CHKPT=YYDDDD/HHMMSS **
// *                  DBD=               **
// *                  AREA=             **
// *                  RBA=              **
// *                  SEQNO=           **
//******************************************************************************
//*
//STEP01   EXEC PGM=TSSAFR9,REGION=2048K
//STEPLIB  DD DSN=BMC.FRU.FPSLIB,DISP=SHR
//       DD DSN=IMSVS.RESLIB,DISP=SHR
//SYSPRINT DD SYSOUT=*`
//LOGDD   DD DSN=IMSVS.DFSOLP00,DISP=SHR`
//*
//SYSIN    DD *<=------(OPTIONAL)
.... CONTROL STATEMENTS ....
//*
```
TSSAFR9 JCL uses the following EXEC and DD statements:

**EXEC**

This statement must be in the form:

```
EXEC PGM=TSSAFR9,REGION=1024K
```

**STEPLIB DD**

Contains the load library containing the Fast Path Recovery Utility programs.

**SYSPRINT DD**

Defines the messages and report data set. The data set can reside on a direct access device or printer, or it can be routed through the output stream. Use RECFM=FBA and LRECL=133.

**LOGDD**

Defines the IMS OLDS or SLDS to be used as input.

**Control statements**

Figure 19 shows the format of the optional control statements for TSSAFR9.

These optional control statements provide a mechanism to filter the output generated by TSSAFR9 from a specific IMS checkpoint, IMS log record sequence number, specific database, area, or RBA, or any combination of the five.

Keywords and their associated parameter values can be coded in free-format statements (columns 1 to 72), if certain syntactical rules are followed:

- All keywords must be separated from their associated parameter values by an equals sign. The equals sign must not be preceded by blanks but can be followed by one or more blanks.

- Parameter values must be separated from the next keyword by one or more blanks, a comma, or a comma followed by one or more blanks.

**Figure 19  Sample TSSAFR9 control statements**

```
[ DBD=xxxxxx ] [ AREA=nnnn ] [ RBA=xxxxxxxxx ]
[ CHKPT=yyddd/hhmmss ] [ SEQNO=xxxxxxxxxxxxxxxxx ]
```
Use the following control statements for TSSAFR9:

**CHKPT**

*(optional)* Provides TSSAFR9 with a starting point within the log data set. It must be in the format `yyddd/hhmmss`, which is the same format used with TSSAFR1.

**SEQNO**

*(optional)* Allows specification of a hexadecimal number relating to the IMS log record sequence number from which TSSAFR9 is to begin reporting. This number is 16 digits long.

**DBD**

Allows you to limit the contents of the report (and the OUTDD data set, if provided) to a database that you specify. For this keyword, provide an eight-character DBD name.

**AREA**

Allows you to limit the contents of the report to a specific area (in all databases or, if you include the DBD keyword, in the specified database). For this keyword, enter the area’s four-character decimal number (DMACARID).

**RBA**

*(optional)* Allows specification of up to an 8-character hexadecimal number relating to the CI RBA to be included in the report. If neither the DBD nor AREA keywords were specified, updates to the CI RBA for all databases and areas are reported.
Testing considerations

This chapter describes Fast Path Recovery Utility (FRU) testing considerations. Recovering a data entry database (DEDB) area after an IMS system failure by using Fast Path Recovery Utility is functionally equivalent to recovering the area by using the IMS Recovery utility (DFSURDB0).

The following topics are discussed in this chapter:

Introduction ............................................................... 89
Testing procedure ....................................................... 90

Introduction

One method of verifying a Fast Path Recovery Utility recovery is to compare the image copy of an area recovered by Fast Path Recovery Utility with the image copy of an area recovered by the DFSURDB0 recovery utility.

The following exceptions to an exact physical comparison exist:

- The image copy header records will differ (the image copy date/time stamp will not be the same).

- The DEDB master area control block control interval (DMAC CI) might contain minor differences after offset +5C. These fields will be reset by IMS at the next area data set (ADS) open.

- The current sequential dependent buffer, and any sequential dependent buffers waiting completion of an output thread at the time of the selected Checkpoint-ID, will be logically the same (from the perspective of the DEDB Sequential Dependent Scan utility) but can be physically different.
Testing procedure

After an IMS system fails (or has been modified down), perform the following steps:

1. Execute the Fast Path Recovery Utility recovery as described in Chapter 4, “DEDB Recovery utility (TSSAFR2)” but do not restart the IMS system.

2. Take an image copy of selected area data sets.

3. Run the BMC Fast Path Analyzer/EP product against selected areas.

   For more information, see the Fast Path Offline Suite User Guide.

4. Define new VSAM clusters for the selected areas (with different data set names), and perform a complete forward recovery by using the previous image copy and all required log data sets.

5. Take an image copy of the recovered area data sets.

6. Run Fast Path Analyzer/EP product against the recovered areas.

7. Compare Fast Path Analyzer/EP reports from the Fast Path Recovery Utility recovered area to those from the DFSURDB0 recovered area.

   The reports, including all statistics, will be identical.

8. Compare the image copy of the Fast Path Recovery Utility recovered area to the image copy of the DFSURDB0 recovered area (use IEBCOMPR or an equivalent comparison program).

   Except for the physical differences outlined previously, the copies will be identical.

These physical differences are caused by the following processing differences:

- During recovery, DFSURDB0 reads the CI (which will contain old sequential dependent part (SDEP) segments if the SDEP part has wrapped) and applies the 5950 records for each SDEP segment that was inserted into the CI. IMS always logs the segment data plus one byte of binary zeros (the extra byte of binary zeros will terminate the Scan utility).

- During a Fast Path Recovery Utility recovery, a DEDB update record that contains the entire CI (the image of the buffer at the selected checkpoint) is applied plus any SDEP inserts after the checkpoint. Because IMS preformats a new SDEP buffer to binary zeros, the SDEP data from the previous cycle is not present.
9 To further verify the contents of the sequential dependent part of an area, perform the following steps:

A Run the DEDB Sequential Dependent Scan utility against the Fast Path Recovery Utility recovered area, and save the output data set.

B Delete the Fast Path Recovery Utility recovered area, and rename the DFSURDB0 recovered area to the correct data set name.

C Run the IBM DEDB Sequential Dependent Scan utility against the renamed area.

The number of sequential dependents written out, as well as the output file contents, will be identical.

10 To further verify the logical content of the Fast Path Recovery Utility recovered area, run an unload of the Fast Path Recovery Utility recovered area against an unload of the DFSURDB0 recovered area.

The number of segments unloaded from each area data set will be identical.
Maintenance

This chapter describes the procedures to follow when applying maintenance to the Fast Path Recovery Utility (FRU) product.

The following topics are discussed in this chapter:

Introduction .............................................................. 93
TSSAFR1x maintenance procedure ................................... 94
TSSAFR7, TSSAFR8, and TSSAFR9 maintenance procedure .......... 96

Introduction

Use these maintenance procedures for either of the following situations:

- You are upgrading to a new IMS program update tape (PUT) level.
- You receive error message TSSA3540E when running TSSAFR1x.

**NOTE**
The $x$ represents the IMS version. For example, TSSAFR19 represents IMS version 9.1, and TSSAFR1A represents IMS version 10.1.

Message TSSA3540E usually results from a change in the format of an IMS log record caused by IMS maintenance. This condition requires only a reassembly of the log record processing module.

**WARNING**
Because Fast Path Recovery Utility is usually needed in an outage situation, BMC recommends that you run TSSAFR1x as described in Chapter 7, “Testing considerations” every time IMS maintenance is applied, as part of the IMS quality assurance test. This precaution helps prevent recovery problems during critical times.
Because the testing utilities (TSSAFR7, TSSAFR8, and TSSAFR9) also process IMS log records, follow the maintenance process for these modules whenever TSSAFR1x must be reassembled. These module maintenance procedures ensure IMS maintenance level consistency among all Fast Path Recovery Utility log reader programs.

**TSSAFR1x maintenance procedure**

After IMS maintenance has been applied, TSSAFR1x should be reassembled and linked to pick up any IMS Log record changes.

**NOTE**

TSSAFR1x must be assembled and run with the same level of IMS.MACLIB that the IMS log records were created from. If you have different levels of IMS PUT maintenance for different IMS systems, you will need to keep a separate TSSAFR1x module in sync with each IMS system.

**To apply TSSAFR1x maintenance**

1. Choose one of the following methods to reassemble and link the TSSAFR1x modules:
   - Use the installation customization job ($C30DOPT) that is provided by the BMC Installation System, and only run the Fast Path Recovery Utility steps to reassemble and link the modules.
     
     The maintenance procedure is complete.
   
   - Edit and submit the FR1XASM sample JCL member that is provided in the sample library FPSSAMP (if you selected separate libraries for the installation) or the sample library IMSAMP (if you selected merged libraries for the installation).
     
     Continue to step 2 and complete the remainder of the steps.

2. Edit the following information in the FR1XASM member:
   - Supply a JOBCARD that adheres to your site standards.
   - Modify the SYSLIB DD data set names:
     
     - Modify the BMC.FRU.IMASM/FPSSASM source library to reflect the name you assigned.
- Modify the BMC.FRU.IMMAC/FPSMAC macro library to reflect the name you assigned.

- Modify the IMSVS.ADFSMAC and IMSVS.SDFSMAC macro libraries to reflect the same IMS data set names that you used in your IMS generation procedure.

- Add the library containing the ASMMSP macro to the SYSLIB concatenation.

C Modify the SYSIN DD statement in the ASM step to reflect the name (BMC.FRU.IMASM/FPSASM) you assigned to the source data set. Modify the TSSAFR1x member name to reflect your IMS version and release level.

<table>
<thead>
<tr>
<th>Member name</th>
<th>IMS version</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSSAFR19</td>
<td>9.1</td>
</tr>
<tr>
<td>TSSAFR1A</td>
<td>10.1</td>
</tr>
<tr>
<td>TSSAFR1B</td>
<td>11.1</td>
</tr>
<tr>
<td>TSSAFR1C</td>
<td>12.1</td>
</tr>
</tbody>
</table>

D Modify the LKED step SYSLMOD DD data set name to reflect the Fast Path Recovery Utility program data set name (BMC.FRU.FPSLIB, if you selected separate libraries for the installation or IMLIB, if you selected merged libraries for the installation). Modify the TSSAFR1x member name to reflect your IMS level.

E Modify the LKED step SYSLIN DD statement link-edit control cards for TSSAFR1x to reflect the IMS version and release level.

<table>
<thead>
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<td>11.1</td>
</tr>
<tr>
<td>TSSAFR1C</td>
<td>12.1</td>
</tr>
</tbody>
</table>

3 Submit the job to perform the assembly and link of TSSAFR1x. When the job is completed, ensure the condition code for the ASM and LKED steps is zero.

4 If a non-zero condition code is returned, ensure that correct data sets and member names have been supplied for the ASM and LKED steps, correct any errors, and rerun the job. If the problem persists, contact BMC Customer Support.
TSSAFR7, TSSAFR8, and TSSAFR9 maintenance procedure

After IMS maintenance has been applied, TSSAFR7, TSSAFR8, and TSSAFR9 should be reassembled and linked to pick up any IMS log record changes.

**NOTE**

TSSAFR7, TSSAFR8, and TSSAFR9 must be assembled and run with the same level of IMS.MACLIB that the IMS log records were created from. If you have different levels of IMS PUT maintenance for different IMS systems, you will need to keep a separate TSSAFR7, TSSAFR8, and TSSAFR9 modules in sync with each IMS system.

**To apply TSSAFR7, TSSAFR8, and TSSAFR9 maintenance**

1. Choose one of the following methods to reassemble and link TSSAFR7, TSSAFR8, and TSSAFR9:

   - Use the installation customization job ($C30DOPT) that is provided by the BMC Installation System, and only run the Fast Path Recovery Utility steps to reassemble and link the modules.

     The maintenance procedure is complete.

   - Edit and submit the FR7XASM sample JCL member that is provided in the sample library FPSSAMP (if you selected separate libraries for the installation) or the sample library IMSAMP (if you selected merged libraries for the installation).

     Continue to step 2 and complete the remainder of the steps.

2. Edit the following information in the FR7XASM member:

   A. Supply a JOBCARD that adheres to your site standards.

   B. Modify the SYSLIB DD data set names:

      - Modify the BMC.FRU.IMASM/FPSASM source library to reflect the name you assigned.

      - Modify the BMC.FRU.IMMAC/FPSMAC macro library to reflect the name you assigned.

      - Modify the IMSVS.ADFSMAC and IMSVS.SDFSMAC macro libraries to reflect the same IMS data set names you used in your IMS generation procedure.
C Modify the SYSIN DD statement in the ASM step to reflect the name of the (BMC.FRU.IMASM/FPSASM) you assigned to the source data set. The member name will be either TSSAFR7, TSSAFR8 or TSSAFR9 for the step.

D Modify the LKED step SYSLMOD DD data set name to reflect the Fast Path Recovery Utility program data set name (BMC.FRU.FPSLIB, if you selected separate libraries for the installation or IMLIB, if you selected merged libraries for the installation). The member name will be either TSSAFR7, TSSAFR8 or TSSAFR9.

3 Submit the job to perform the assembly and link of TSSAFR7, TSSAFR8 and TSSAFR9. When the job is completed, ensure the condition code for the ASM and LKED steps is zero.

4 If a non-zero condition code is returned, ensure that correct data sets and member names have been supplied for the ASM and LKED steps, correct any errors, and rerun the job. If the problem persists, contact BMC Customer Support.
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