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  - 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)
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About this book

This book provides all information required by the user of the BMC Fast Path Restart Control Facility product. This includes the following:

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

The Fast Path Restart Control Facility is a valuable aid for Master Terminal Operators (MTOs) and operations and technical support personnel involved in IBM® IMS™ system operation and administration. It significantly reduces the scope, complexity and number of decisions made by an MTO during IMS system restarts.

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.

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**NOTE**

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View individual product documents (books and notices) within the “A – Z Supported Product List”

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## 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:

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

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).
Introduction to Fast Path Restart Control Facility

The following topics are discussed in this chapter:

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Overview

The way in which an IMS system is restarted can directly affect the integrity of the databases in the IMS system. This is especially true when the previous IMS session was abnormally terminated, and where IMS fast path MSDBs are used.

Determining which databases require recovery and then successfully completing all the necessary processing can be a complex task. The potential for errors is greatly increased when these recoveries are but one of the many tasks typically facing the Master Terminal Operator (MTO) after a vital IMS system has failed.

The BMC Fast Path Restart Control Facility (RCF) product is a comprehensive, automated mechanism that ensures the integrity of IMS databases and critical system data sets during the restart of an IMS control region.
How Fast Path Restart Control Facility works

Fast Path Restart Control Facility rapidly and completely ensures the integrity of all databases defined in an IMS system and the reasonability of the intended IMS restart command. This is accomplished through automated analysis of the current IMS system status and invocation of any required database recoveries.

Fast Path Restart Control Facility is a standard OS job step that precedes the control region step in the IMS job stream or started-task JCL procedure. It assesses the current state of the IMS system and performs any required recovery activities.

If IMS is started with AUTO=YES, Fast Path Restart Control Facility performs the following functions:

- Ensures that MSDB integrity can be maintained
  
  If MSDB integrity will be compromised by an AUTO=YES restart, RCF will automatically take corrective action.

- Ensures that the RDS is usable by IMS

- Ensures that the set of MSDB checkpoint and RDS data sets used by the surveillance system are present and usable in an IMS-XRF environment

When IMS is started with AUTO=NO, Fast Path Restart Control Facility determines if the IMS system is a partner in an IMS-XRF active complex. If so, and this is a restart for the surveillance system, a standard restart of that system will be performed. If DBRC indicates the surveillance system is active, DBRC is notified it is no longer active.

If the restart is for a non-XRF system or for the active partner system in an IMS-XRF Complex, Fast Path Restart Control Facility automatically performs the following tasks:

- Invokes DFSULTR0 to close the last OLDS, if required

- Invokes DBRC to indicate IMS abnormally terminated, if required
  
  This removes the necessity to specify OVERRIDE in the IMS restart command.

- Deletes, reallocates and restores the MSDBCPn data set from the most optimal source (the other MSDBCPn data set, MSDBDUMP, or a back-up data set) if an MSDB checkpoint data set is flagged as unusable
Invokes DBFDBDR0 to create an up-to-date MSDBINIT data set

— If IMS terminated normally, an Unload is performed.

— If IMS terminated abnormally, the RECONs are interrogated to determine the log data sets needed, and DBFDBDR0 is invoked to perform a RECOVER function.

Selects the most optimal IMS restart command or validates a user-entered restart command and passes it to the IMS control region

Optionally, invokes the BMC Software Fast Path Recovery Utility (FRU) product to recover all DEDBs, and schedules any required full-function database backouts

Benefits

Fast Path Restart Control Facility delivers the following benefits:

- Ensures the integrity and the usability of MSDBs and related system data sets
- Automates all DEDB and full-function database recovery functions
- Reduces the number and complexity of decisions required during IMS restarts
- Minimizes down-time after an IMS system failure
- Simplifies and standardizes IMS system start-up procedures
- Prevents loss of data integrity due to incomplete, or omitted, database recoveries
- Ensures correctness of the restart procedures and command options for the IMS systems in an IMS-XRF Complex
- Eliminates IMS restart failures due to system resource damage or unavailability
- Prevents the selection of an incorrect IMS restart command and the resultant loss of data integrity or IMS system restart failure

The facilities provided by the RCF minimize the MTOs duties and involvement during IMS system restart by automatically determining the processing necessary to ensure database integrity and a successful restart of the IMS system.
Features

Fast Path Restart Control Facility is fast, efficient and easy to use. The product has the following features:

- Ensures that an IMS system is restarted correctly and that database integrity is fully maintained
- Causes minimal IMS system start-up overhead
- Fully supports the database access methods and features available in IBM IMS/ESA® systems
- Ensures the integrity of the additional RDS and MSDB checkpoint data sets used in an IMS-XRF environment for IMS/ESA
- Provides complete, automated recovery of IMS databases
  The IMS database recovery utilities are used for MSDBs and Full-Function databases. Full-Function batch backout is limited to OLDS allocation. RCF is designed to use the BMC Software Fast Recovery Utility product (FRU) for DEDBs.
- Provides a window for MSDB maintenance activities
- Rationalizes and controls the back-up of all MSDB related data sets
- Provides automatic determination of IMS system resource and database status, and dynamic allocation of required data sets, thus eliminating potential errors
- Requires no source code modifications to any user or IMS program or control block
  Because IMS program integrity is not affected, no new exposures are introduced.
- Provides automatic notification to DBRC of an IMS abnormal termination
System overview

This chapter describes the Fast Path Restart Control Facility (RCF), its general structure, processing steps, system considerations, programming considerations, and performance considerations.

The following topics are discussed in this chapter:

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General structure

Fast Path Restart Control Facility significantly improves database integrity assurance and IMS restart command selection by performing the following tasks:

- Automatically determining the current status of the IMS system resources and databases.

- Simplifying and reducing the number of decisions that the MTO must make.

- Ensuring that all required database recoveries are successfully completed prior to the restart of the IMS system.

- Providing the correct required restart command to the IMS system without MTO intervention.
Table 1 lists the functional components in the product.

**Table 1  Functional components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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<tr>
<td>TSSRCF1</td>
<td>analyzes the current IMS system status, determines the type of restart that should be performed, allows the MTO to validate this decision or suggest an alternative, and invokes any required database recoveries</td>
</tr>
<tr>
<td>TSSUMPFF</td>
<td>uses the services of the MVS/XA Message Processing Facility and MGCR SVC to pass the selected restart command to the IMS system</td>
</tr>
</tbody>
</table>

Figure 1 gives an overview of a typical IMS control region JCL procedure with the Fast Path Restart Control Facility installed.

**Figure 1  IMS JCL procedure**
Several problems exist that affect consistently successful and timely IMS system restarts and database integrity:

- IMS Fast Path main storage databases (MSDBs) are exceptionally sensitive to potential corruption due to incorrect operational procedures. Failure to execute the MSDB dump recovery utility prior to an IMS system cold start results in the loss of MSDB integrity.

- The IMS log datasets required for recovering MSDBs are a superset of those required for other database recovery processing, since MSDBs are recovered starting at the older of the checkpoint values in the MSDBCPx datasets. The omission of any required log data set is not detected by the recovery utility. An MSDBCPx data set that was scratched, or had an I/O error, must be reallocated, and restored from the correct source (for example, other MSDBCPx data set, MSDBDUMP or the most recent back-up of the MSDBCPx data set in error).

- Determining which databases require recovery or backout, and then successfully completing all the necessary processing can be a complex task at any time. The potential for errors is greatly increased when these recoveries are but one of the tasks facing the MTO after a vital IMS system has failed and must be restarted without delay.

- The IMS Recovery utility (DFSURDB0) can only recover one area data set per execution. This means that the utility must be run once for each area of each database requiring recovery. In addition, since the utility will recover only one copy of an area data set per execution. Any DEDB databases defined with multiple area data sets (MADS) will require additional executions of the recovery utility, or use of the IMS Fast Path area data set create utility (DBFADSC0), or an IDCAMS REPRO to recover the remaining data sets.

- The IMS system restart commands are sufficiently complex, so in non-typical situations, the incorrect command or an incorrect set of options might be inadvertently selected or a required option might be omitted.

## Processing steps

Fast Path Restart Control Facility uses the following processing steps:

1. Determines if the IMS system is a partner in an IMS-XRF complex, and if so, whether it is the active or the surveillance system.

   If it is the latter, the IMS system will be restarted using a standard /ERE BACKUP command.
2. Determines the IMS status in the DBRC RECON data set.

   If the subsystem is active, it will be reset to abnormally terminated. If this is a restart of a surveillance system which is active, it will be reset to inactive and all remaining steps bypassed.

3. Verifies the usability and contents of the RDS.

   In an IMS-XRF Complex, the usability and contents of the IMSRDS2 data set are also verified. If the RDS (or RDS2) data set is empty, a FORMAT RS command will be forced. If AUTO=YES was specified, it will be changed to AUTO=NO.

4. Verifies the usability of all required MSDB related datasets if Main Storage Databases are used by the IMS system being restarted.

5. Validates that the IMS system date is reasonable by the RDS and MSDBCPx dates.

   After an IMS system has been started with the wrong date, DBRC will not allow IMS to be restarted with an earlier date. (This can occur if the CPU clock is set incorrectly at IPL time or if JCL changes result in use of the incorrect RDS or RECON data sets.)

6. Validates that the MSDBCPx data sets are usable and current (for example, contain a date/time-stamp in the header record equal to the Current CHKPT-ID in the RDS).

   If an MSDBCPx data set has been marked unusable by IMS, RCF will delete it, allocate a new MSDBCPx data set, and copy the contents of the newer of the other MSDBCPx data set, MSDBDUMP, or an MSDBCPx back-up data set into it. If the RCF cannot delete the problem MSDBCPx data set (the device is off-line), the old MSDBCPx data set will be uncataloged and the MTO notified. RCF will then attempt to allocate the new data set on the user-specified primary volume. If this fails, an attempt will be made using the user-specified secondary volume.

   If neither of the MSDBCPx datasets is current, AUTO=NO will be forced.

7. If AUTO=YES is still in effect at this point, processing by RCF is complete and the remaining steps are bypassed.

**NOTE**

The remaining processing steps apply only to an AUTO=NO restart of either a non-XRF IMS system or the active partner in an IMS-XRF Complex.

8. Invokes DFSULTR0 to close the last OLDS if IMS terminates abnormally.
9. Selects the most optimal IMS control region restart command based on the status of the MSDB checkpoint and RDS data sets or validates a user-specified restart command.

The operator can always specify an alternative to the restart command recommended by RCF, but it will always be validated by RCF for correctness by the state of the terminated IMS system and the associated system data sets.

10. Invokes DBFDBDR0 to create a current MSDBINIT data set.

If IMS terminated normally, an unload is performed. For an abnormal IMS termination, the RECONs are interrogated to determine the log data sets required for DBFDBDR0 to perform the RECOVER function.

11. (optional) Invokes the BMC Fast Path Recovery Utility (FRU) product to recover the DEDBs if the selected or specified IMS restart command indicates a cold start and the previous IMS session terminated abnormally.

If the user wishes to run Fast Path Recovery Utility or another DEDB recovery procedure independently (for example, TFRU=NO is specified), Fast Path Restart Control Facility will pause until informed that DEDB recovery has been completed.

12. If Fast Path Recovery Utility was invoked to perform the DEDB recoveries, RCF automatically performs batch backout for all full-function databases that require it.

Batch backout is limited to OLDS allocation only.

13. Provides the IMS restart command to the IMS control region via the M.P.F. facility of MVS/XA in response to the DFS810A WTOR message issued during IMS system initialization.

---

**System considerations**

Fast Path Restart Control Facility requires the following system resources.

**Hardware**

Fast Path Restart Control Facility operates on any CPU that is compatible with the IBM z/Architecture® (as outlined in the z/Architecture Principles of Operation). 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 Restart Control Facility with the IBM z/OS® operating system. The product’s programs operate under any version of z/OS that provides the message processing facility and the MGCR SVC. All input/output operations use QSAM, BPAM, or VSAM.

IMS

Your installation must have a license for the IMS/ESA Database Manager. You can use Fast Path Restart Control Facility with the following versions and releases of IMS:

- all supported releases of IMS
- all releases of DBRC

APF authorization

All Fast Path Restart Control Facility programs must reside in an APF-authorized load library. RCF does not support block level sharing.

Storage

Fast Path Restart Control Facility programs execute in a virtual storage region. Typical usage starts at 2048K, which includes requirements for the RCF programs, recovery utility subtasks, and access method control blocks and buffers.

Program considerations

Fast Path Restart Control Facility programs are written in Assembler language within the constraints of the OS/VS Assembler. The product requires no source code modifications to any user or IMS module.
Fast Path Restart Control Facility requires the following programs for installation, execution and maintenance:

- OS/VS System Control program
- IMS/ESA (Fast Path Restart Control Facility supports all versions of IMS/ESA and will support new versions as they become available from IBM.)
- OS/VS utility programs and OS/VS linkage editor
- Fast Path Recovery Utility (FRU)

Fast Path Restart Control Facility supports an IMS-XRF complex.
Program descriptions

This chapter provides a description of the Fast Path Restart Control Facility (RCF) programs and how they relate to each other.

The following topics are discussed in this chapter:

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Program modules

Fast Path Restart Control Facility is composed of three executable load modules and a macro-generated nonexecutable load module containing an information table. These modules are listed in Table 2. All modules in this table are coded in Assembler language.
Fast Path Restart Control Facility is the main program of Fast Path Restart Control Facility. It is actually composed of two programs (TSSRCF1 and TSSMCF1) and a series of utility subroutines. The TSSRCF1 component performs system status data collection. It also oversees any required full-function or DEDB database recoveries and IMS restart command selection processing. The TSSMCF1 component analyzes the status of MSDB-related data sets and performs any processing necessary to ensure their integrity.

RCF issues WTO messages to the MVS system console during processing to detail the actions being performed. It uses WTOR messages to request the MTO to provide information that RCF is unable to obtain and to allow the MTO to make decisions about the processing to be performed where options are available.

**NOTE**

Where a list of options is presented to the MTO, they are in most-to-least desirable order in terms of quickly and successfully restarting the IMS system.

TSSRCF1 performs the following steps:

1. **TSSRCF1** determines whether an RCF-built ENQ is present in this CEC for this IMS system.
   
   If one is found, it is deleted using DEQ. This ensures that it will not be used erroneously by TSSUMPF as a restart command for this IMS system.

2. If TRCF=N was specified (for example, do no RCF processing), TSSRCF1 terminates normally with a return code 10.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSSRCF1</td>
<td>Information collection and process control</td>
<td>performs system status data collection and oversees any required database recovery and IMS restart command selection processing</td>
</tr>
<tr>
<td>TSSUMPF</td>
<td>MVS/XA MPF exit routine</td>
<td>passes the selected restart command to the IMS control region during system initialization</td>
</tr>
<tr>
<td>TSSRCF2</td>
<td>DEDB Recovery/Batch Backout notification</td>
<td>notifies RCF of DEDB recovery and batch backout job stream completion</td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>Data Set allocation information table</td>
<td>contains data set allocation information required by RCF during MSDB and DEDB recovery processing</td>
</tr>
</tbody>
</table>
3. IMS invokes the internal utility TSSUPFC to determine if the IMS system is a partner in an IMS-XRF Complex by examining the PARM in the JCL for the control region step.

If so, the appropriate DFSHSBxx member is read from the IMS PROCLIB data set referenced in the control region step to determine the RSENAME being used by the IMS-XRF complex partner systems. This ensures both that the required member is present and that information can be correctly extracted, if required, from the DBRC RECON data sets.

4. RCF dynamically allocates and reads the BCPT record from the RDS data set referenced by the control region.

This is done to gather checkpoint-ID information and to determine the nature of the previous IMS system shutdown.

5. In an XRF environment, TSSRCF1 also allocates and examines the RDS2 data set. The data set with the highest BCPT record RDS switch count value is selected.

- If one restart data set is usable (for example, contains a valid BCPT record) and the other is empty or contains an invalid BCPT record, RCF forces a restart command that includes a FORMAT RS specification. This ensures that the surveillance partner system in the XRF Complex will also restart successfully if a takeover should occur.

- If RCF determines that the restart is not in XRF mode but the RDS data set has previously been used in an IMS-XRF complex, a restart command for a cold start with an RDS format will be forced. This ensures that all processing required to assure database integrity is correctly performed when falling back to non-XRF mode and that the IMS system restart will be successful.

6. If the RDS is usable and not empty, RCF validates the BCPT record checkpoint-IDs against the current CPU date/time stamp.

This ensures that the IMS system is not restarted when the MVS system clock is incorrectly set or when the IMSRDS DD statement in the control region job-step specifies an incorrect data set.

7. RCF reads the DBRC RECON data sets to determine the subsystem status.

- If the active system is being restarted and the RECON subsystem record indicates IMS is active, DBRC is called to change it to indicate IMS abnormally terminated.

- If the surveillance system is being restarted and the RECON subsystem record indicates the surveillance system is active, DBRC is called to change it to indicate no backup system is active.
8. If the processing is for an XRF Partner system, RCF determines whether this is a restart of the surveillance system.

If an automatic restart is being done (for example, AUTO=Y is specified in the control region PARM), AUTO=N is forced. The RCF sets up an MVS ENQ block containing a standard surveillance system restart command (/ERE BACKUP) to be used as a reply to the DFS810A message issued by that control region. No further processing is required or performed.

9. TSSRCF1 calls the internal utility TSSUJLU to extract information about the MSDBINIT DD statement in the JCL for the IMS control region step.

If this DD statement is absent, there are no MSDBs defined in this IMS system.

10. If an MSDBINIT DD statement was found, TSSRCF1 calls the program TSSMCF1 to perform the following steps:

   - analyze the MSDB checkpoint data sets referenced in the control region step
   - perform any necessary MSDB recovery processing
   - determine, if required, the suitable restart command

TSSRCF1 passes the RDS data set information it has gathered to TSSMCF1.

When it has completed its processing, TSSMCF1 passes back a return code. This is used by TSSRCF1 as an end-of-step return code to control the execution of the optional MSDB-related data set back-up steps in the IMS system job-stream, or started task procedure following RCF step and prior to the IMS in the JCL for the control region step.

11. If checkpoint and shutdown-type information are not available from the RDS and there are no MSDBs defined in the IMS system (for example, no MSDBINIT statement was found), RCF asks the MTO to specify the nature of the previous IMS system shutdown and the desired restart command.

12. If a cold start of the IMS system is being performed or forced recovery mode was specified (for example, TRCF=F), RCF optionally invokes the BMC Fast Path Recovery Utility (FRU) product to perform DEDB database recovery and acquire information about full-function databases requiring backout.

13. If a cold start of the IMS system is being performed or forced recovery mode was specified (for example, TRCF=F), and the Fast Path Recovery Utility (FRU) program TSSAFR1 identified full-function databases that required recovery, RCF prepares and submits job streams to recover them using the IMS Batch Backout utility (DFSBBOO00).

IMSLOG DD allocation is limited to OLDS datasets.
14. If the type of IMS restart being done is a cold start or a warm start with the MSDBLOAD keyword specified, and MSDB Maintenance mode was specified (for example, TRCF=M), TSSRCF1 allows the MTO to execute MSDB maintenance job streams.

15. If an automatic restart is not being done (for example, AUTO=N was specified or was set by RCF processing), TSSRCF1 builds an MVS ENQ block containing the restart command to be passed via the MVS/XA MPF facility to the IMS control region.

TSSMCF1

The TSSMCF1 component performs the following steps:

1. Calls the utility subroutine TSSUJLU to gather information about the MSDB checkpoint data sets referenced by this IMS system

   It then dynamically allocates and reads them to determine their current contents and usability. In an IMS-XRF environment, the newer pair of MSDB checkpoint data sets are selected by TSSMCF1 (for example, MSDBCP1 and 2, or MSDBCP3 and 4).

2. Uses this information along with the data passed by TSSRCF1 about the RDS data set (type of previous IMS system shutdown, checkpoint values from the BCPT record, etc.) to index into an internal Recovery Action Script Table

   This table is a series of two-part entries. The first part of each entry is a key that corresponds to one of the possible IMS system resource status conditions. The second part contains a series of one-byte Action Routine identifier flags that represent the list (script) of actions required to assure MSDB validity given the conditions identified by the flags that make up the entry’s key.

   Appendix A, “MSDB recovery processing action table,” shows the layout and contents of the entries in this table and lists the TSSMCF1 Action Routines and their functions.

3. Invokes the action routines identified by the selected recovery action Script

4. Ends processing by performing one of the following tasks:

   - Performs an emergency restart of the IMS system

     If AUTO=Y was specified and the status of the RDS and MSDB checkpoint data sets is such that IMS will do a simple /ERE restart successfully, TSSMCF1 does nothing further.
An automatic restart cannot be done if AUTO=N was specified, if one or more IMS system data sets must be formatted, or if the restart checkpoint that the IMS control region will choose would compromise MSDB integrity.

In this case, TSSMCF1 invokes the internal utility TSSUPFC to ensure that the AUTO value in the control region PARM data is set to N and, with the assistance of the MTO, determines the exact Emergency Restart command specification to be used. This command is then passed back to TSSRCF1. The MSDBINIT data set is not changed.

- Restarts the IMS system by a warm start or cold start

  — TSSMCF1 performs any processing necessary to create a current MSDBINIT data set for this IMS system. If a simple warm start is being done and AUTO=Y was specified, TSSMCF1 does nothing further.

  — If the restart is a cold start (or a warm start with MSDBLOAD specified), TSSMCF1 invokes the internal utility TSSUPFC to ensure that the AUTO value in the control region PARM data is set to N. This selected command is then passed back to TSSRCF1.

### TSSMCF1 return codes

TSSMCF1 passes back to TSSRCF1 a return code value that is used to control MSDB data set back-up steps following the RCF step in the IMS job or started task JCL stream. These return codes are listed in Table 3.

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Backup MSDBC1 and MSDBC2 only</td>
</tr>
<tr>
<td>1</td>
<td>Backup MSDBC3 and MSDBC4 only&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Backup MSDBC1, MSDBC2 and MSDBINIT</td>
</tr>
<tr>
<td>3</td>
<td>Backup MSDBC3, MSDBC4 and MSDBINIT&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>Backup MSDBINIT only</td>
</tr>
<tr>
<td>10</td>
<td>Do no backups</td>
</tr>
</tbody>
</table>

<sup>a</sup> The condition codes to cause the backup of MSDBC3 AND MSDBC4 data sets are issued only when processing a restart of the active partner in an IMS-XRF complex.
**TSSRCF1 subtasks**

Fast Path Restart Control Facility attaches, as required, subtasks to execute the following MVS, IMS Utility and Fast Path Recovery Utility (FRU) programs:

- DFSULTR0—IMS Log Recovery utility
- DBFDBDR0—MS MSDB Recovery utility
- DSPURX00—MS DBRC Recovery Control utility
- SORT—OS/VS Sort/Merge Program Product
- TSSAFR1—Fast Path Recovery Utility (FRU)
- TSSAFR2—Fast Path Recovery Utility (FRU)

Subtasks ensure that RCF is isolated from, and able to intercept, any abends by these programs. This allows it to notify the MTO of the problem.

**TSSRCF1 JCL requirements**

TSSRCF1 is executed as a standard MVS job step placed prior to the IMS control region step in the IMS system job-stream, or started-task proc. An EXEC statement and DD statements that define the input and output data sets are required. A sample of an IMS control region procedure containing the TSSRCF1 step is listed in Appendix B, “Sample IMS control region procedure.”

**EXEC**

This statement must be in the following form:

```
EXEC PGM=TSSRCF1,REGION=2048K,PARM='....'
```

The specifications for PARM are discussed in “PARM field data” on page 37.

**STEPLIB DD**

Defines the concatenation of the following:

- The APF-authorized load library data set containing the RCF programs and the user-generated RCFALLOC module.

- The IMS load library data set(s) containing the IMS system definition modules (DFSPRRGx and DFSBLK0x), the IMS database recovery and DBRC software, and the DFSMDA members for the RECON and WADS data sets.
If all required data sets are in the MVS linklist and are APF-authorized, a STEPLIB DD statement is not required.

**SYSPRINT DD**

Defines the report output data set used by the IMS log recovery utility DFSULTR0 when it is invoked to close an OLDS. This data set should be specified as a SYSOUT data set.

**SYSIN DD**

Defines the control statement input data set used by the IMS log recovery utility DFSULTR0. This data set must be specified as a data set on a direct access device.

**MSDBPRT DD**

Defines the report output data set used by the IMS MSDB recovery utility DBFDBDR0 when it is invoked to recover or unload main storage databases. This data set should be specified as a SYSOUT data set.

**MSDBCTL DD**

Defines the control statement input data set used by the IMS MSDB recovery utility DBFDBDR0. This data set must be specified as a data set on a direct access device.

**xxxxDUMP DD**

*(optional)* Defines the MSDBDUMP data set (or a back-up of the MSDBDUMP data set taken after the last IMS system session completed). This data set resides on a direct access device and is opened for input only.

**NOTE**

BMC strongly recommends that you specify this DD statement.

**BKUPCP1 DD**

*(optional)* Defines the data set containing a back-up of the MSDBCP1 (or MSDBCP3) data set taken before the last IMS system session started. This data set resides on a direct access device and is opened for input only.

**NOTE**

BMC strongly recommends that you specify this DD statement.
BKUPCP2 DD

(optional) Defines the data set containing a back-up of the MSDBCP2 (or MSDBCP4) data set taken before the last IMS system session started. This data set resides on a direct access device and is opened for input only.

**NOTE**

BMC strongly recommends that you specify this DD statement.

FRUPGMLD DD

Defines the following:

- The load library containing the Fast Path Recovery Utility (FRU) programs.
- The IMS load library data set(s) containing the IMS system definition modules (DFSPRRGx and DFSBLK0x), the IMS Database Recovery and DBRC software, and the DFSMDA members for the RECON and WADS data sets.

If all required data sets are in the MVS linklist and are APF-authorized, an FRUPGMLD DD statement is not required.

IMS DD

Defines the load library containing the current DBD members for this IMS system. This data set is required to invoke the DBRC utility DSPURX00.

RCFJCL DD

(optional) Defines the optional input library data set containing the skeleton JCL for jobs to perform DEDB recovery, full-function database batch backout processing, MSDB dump recovery, and online log recovery processing. This data set must be a partitioned data set.

This DD statement is not required when $TFRU=N$ is specified or when only one DEDB recovery thread is specified in the RCFALLOC macro, and the generation of batch backout jobs is not required. (For samples of the required JCL members, refer to Appendix C, “Sample skeleton JCL procedures.”)

This DD statement is required when the JCLCOPY feature is used. For information about the JCLCOPY feature, see Chapter 4, “Operations information.”
TSSRCF1 JCL requirements

**JCLCOPY DD**

*(optional)* Defines the optional output library data set into which a copy of jobs used to perform DEDB Recovery, full-function database batch backout processing, MSDB dump recovery, and online log recovery processing will be written. This data set must be a partitioned data set. For information about the JCLCOPY feature, see Chapter 4, “Operations information.”

**INTRDR DD**

Defines the internal reader via which the DEDB recovery and batch backout jobs will be submitted for execution.

**SYSOUT DD**

Defines the report output data set used when SORT is invoked. This data set should be specified as a SYSOUT data set.

**SORTLIB DD**

Defines the load library containing the run-time software modules required by SORT.

**SYSUDUMP DD**

Defines the output data set where an MVS dump is written if several processing errors are encountered. This data set should be specified as a SYSOUT data set.

The following DD statements are dynamically allocated, as required, during RCF processing and must *not* be defined in the JCL for the TSSRCF1 job step:

- MSDBINIT
- MSDBDUMP
- MSDBCP1
- IMSRDS
- MSDBCP2
- IMSRDS2
- MSDBCP3
- DEDBxx
- MSDBCP4
- DBRCCTL
**PARM field data**

The PARM data on the EXEC statement for the RCF job step is specified as shown in the following example:

```
PARM='&TRCF,&TFRU,&RGSUF,&SOUT'
```

Table 4 lists the parameters.

### Table 4  PARM parameters (part 1 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| TRCF      | a symbolic parameter added to the IMS system procedure during RCF installation  
           | Valid values are as follows:  
           | ■ Y = do normal RCF processing.  
           | ■ N = bypass RCF processing.  
           | ■ M = perform normal RCF processing and give the MTO an opportunity to do MSDB maintenance processing.  
           | ■ F = if the previous shutdown of the IMS system was *normal*, do normal RCF processing for MSDBs and *force* Fast Path Recovery Utility (FRU) and batch backout processing based on a user-specified checkpoint-ID |
| TFRU      | a symbolic parameter added to the IMS system procedure during RCF installation  
           | Valid values are as follows:  
           | ■ Y = Fast Path Recovery Utility (FRU) can be used to perform DEDB recovery.  
           | ■ D = Fast Path Recovery Utility (FRU) can be used to perform DEDB recovery. This value is valid for Fast Path Recovery Utility version 6.1 or later. This causes the IBM DB2® notification feature of Fast Path Recovery Utility (FRU) to be specified in the control statements.  
           | ■ N = Fast Path Recovery Utility (FRU) will not be invoked automatically. |
TSSUMPF is the RCF program that actually passes the required restart command to the IMS system when an Automatic Restart is not being performed (for example, AUTO=N is specified or set by RCF). It is invoked as a WTOR exit routine by the MVS/XA Message Processing Facility (MPF) in response to the DFS810A message issued by an IMS control region when AUTO=N is in effect.

TSSUMPF uses the MVS/XA GQSCAN facility to look for the ENQ block that TSSRCF1 created to contain the IMS restart command text. If the ENQ is found, TSSUMPF formats a parameter block containing the restart command and uses an MVS/XA MGCR SVC to reply to the outstanding WTOR associated with the DFS810A message. If TSSUMPF is unable to find the required ENQ, it returns to the MPF routine that called it and the DFS810A message appears on the MVS console without change—the MTO must then reply to the outstanding WTOR.

Should an error occur during the execution of TSSUMPF, it will be automatically deactivated by MPF and will not be called again until the appropriate MPF command is issued to reactivate it. TSSUMPF can also be manually deactivated at any time by issuing an MPF command.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGSUF</td>
<td>symbolic parameter defined in the standard IMS control region procedure, PROCLIB, or control blocks</td>
</tr>
<tr>
<td></td>
<td>Use this parameter to obtain the required values for AUTO, SUF, and IMSID when the values are not specified in the IMS control region procedure. This parameter is used to reference the DFSPBxxx member in the IMS PROCLIB data set for previous IMS releases.</td>
</tr>
<tr>
<td>SOUT</td>
<td>symbolic parameter defined in the standard IMS control region procedure, PROCLIB, or control blocks</td>
</tr>
<tr>
<td></td>
<td>RCF uses this parameter when allocating SYSPRINT files for the IMS utility and Fast Path Recovery Utility (FRU) programs invoked during database recovery processing. In an XRF environment, the RSENAME value for the IMS-XRF Complex is extracted from the appropriate DFSHSBxx member of the PROCLIB data set referenced by the IMS control region job step. The RCF uses it in place of IMSID when extracting log data set information from RECON data sets, invoking DFSULTR0, and performing DEDB Recovery or Batch Backout processing.</td>
</tr>
</tbody>
</table>

TSSUMPF is the RCF program that actually passes the required restart command to the IMS system when an Automatic Restart is not being performed (for example, AUTO=N is specified or set by RCF). It is invoked as a WTOR exit routine by the MVS/XA Message Processing Facility (MPF) in response to the DFS810A message issued by an IMS control region when AUTO=N is in effect.

TSSUMPF uses the MVS/XA GQSCAN facility to look for the ENQ block that TSSRCF1 created to contain the IMS restart command text. If the ENQ is found, TSSUMPF formats a parameter block containing the restart command and uses an MVS/XA MGCR SVC to reply to the outstanding WTOR associated with the DFS810A message. If TSSUMPF is unable to find the required ENQ, it returns to the MPF routine that called it and the DFS810A message appears on the MVS console without change—the MTO must then reply to the outstanding WTOR.

Should an error occur during the execution of TSSUMPF, it will be automatically deactivated by MPF and will not be called again until the appropriate MPF command is issued to reactivate it. TSSUMPF can also be manually deactivated at any time by issuing an MPF command.
The ENQ created by TSSRCF1 has a scope of SYSTEM. The ENQ is associated with a TCB in the initiator structure of the address space in which the IMS job stream or started task is executing. The 8-byte Qname value is the job or started task name of the IMS system for which the restart command is intended. The Rname component of the ENQ contains the IMS restart command text. It is prefixed by the characters RCF, a RCF-internal version identifier byte, the ASID of the IMS job address space, and the address of the TCB within that address space on whose behalf the ENQ was created.

This methodology ensures that the correct restart command is used in situations where multiple IMS systems are being run on the same CEC and that the restart command from a previous execution of this particular IMS system is not inadvertently reused. As a further precaution against an incorrect restart command being used, TSSRCF1 automatically deletes any existing RCF-created ENQs for this IMS system that are associated with the current address space prior to commencing any other RCF processing, regardless of the setting of the TRCF parameter.

Further information about the message processing facility can be found in the following IBM manuals:

- **IMS SPL: User Exits**
- **MVS SPL: Initialization and Tuning**
- **MVS SPL: System Modifications**

**TSSRCF2**

TSSRCF2 allows RCF to keep track of any jobs submitted to perform Phase 2 DEDB recovery processing or full function database batch backout processing. (Phase 2 DEDB recovery jobs perform SORT and TSSAFR2 processing when DEDB recovery using the Fast Path Recovery Utility (FRU) is required and multiple DEDBxx files are created by TSSAFR1.)

TSSRCF2 is executed as the last job step in the submitted JCL streams. It notifies TSSRCF1 of the successful completion of the recovery processing by POSTing a pseudo-ECB that is located in CSA storage acquired by TSSRCF1. Each job submitted has one pseudo-ECB associated with it. When the MTO indicates to RCF that all recovery jobs have completed, TSSRCF1 verifies that all jobs have in fact completed successfully by examining these pseudo-ECBs. If any recovery jobs have not completed, TSSRCF2 informs the MTO. This provides an opportunity to wait for these remaining jobs to complete or to override the checking and continue with RCF processing.

The address of the pseudo-ECB is passed to TSSRCF2 via the PARM field of its EXEC statement. The PARM field contains an 8-byte value that is the display character equivalent of the hexadecimal address of the pseudo-ECB.
TSSRCF2 JCL requirements

TSSRCF2 is executed as a standard MVS job step placed last in the job stream submitted by TSSRCF1 using the skeleton JCL provided for DEDB Recovery Phase 2 and Batch Backout jobs. An EXEC statement and a STEPLIB DD statement are required. (Samples of the skeleton JCL streams are listed in Appendix C, “Sample skeleton JCL procedures.”)

EXEC

This statement must be in the following form:

```
EXEC PGM=TSSRCF2,PARM='&RCF2PRM',COND=(4,EQ,FRU2)
```

STEPLIB DD

Defines the APF-authorized load library containing the RCF programs.

RCFALLOC

Fast Path Restart Control Facility dynamically allocates/creates any data sets required for MSDB and DEDB recovery processing. These include the MSDBCPx and MSDBINIT data sets referenced by the IMS system and data sets for the Fast Path Recovery Utility (FRU). The RCFALLOC macro is used to create a nonexecutable load module that contains the required data set allocation parameters and information required by RCF.

Prior to the first invocation of RCF, the user installation must assemble and link-edit a module generated using the RCFALLOC macro into the RCF load library. An example of the JCL required to generate an RCFALLOC module is shown in Figure 2.

Figure 2 Example of RCFALLOC generation JCL (part 1 of 2)

<table>
<thead>
<tr>
<th>RCFALLOC JOB</th>
</tr>
</thead>
<tbody>
<tr>
<td>/*</td>
</tr>
<tr>
<td>//ASM EXEC PGM=IEV90,REGION=512K,</td>
</tr>
<tr>
<td>// PARM='XREF,LIST,RENT,NCAL'</td>
</tr>
<tr>
<td>//SYSPRINT DD SYSOUT=A</td>
</tr>
<tr>
<td>//SYSLIB DD DSN=BMC.RCF.FPSMAC,DISP=SHR</td>
</tr>
<tr>
<td>//SYSUT1 DD UNIT=SYSDA,SPACE=(CYL,(1,1))</td>
</tr>
<tr>
<td>//SYSUT2 DD UNIT=SYSDA,SPACE=(1700,(100,50))</td>
</tr>
<tr>
<td>//SYSUT3 DD UNIT=SYSDA,SPACE=(1700,(100,50))</td>
</tr>
<tr>
<td>//SYSLIN DD DSN=&amp;OBJSET,UNIT=SYSDA</td>
</tr>
<tr>
<td>// SPACE=(80,(100,50),RLSE)</td>
</tr>
<tr>
<td>//SYSIN DD *,DCB=BLKSIZE=80</td>
</tr>
</tbody>
</table>
The RCFALLOC macro is coded as a standard MVS macro. The format and structure of the required control statements is similar to that used with the IMS DFSMDA macro. An example of the statements required is shown in Figure 3 on page 46.

**TYPE=INITIAL statement**

This statement indicates the start of a parameter list build operation and is mandatory. It must be the first statement specified, and only one `TYPE=INITIAL` statement is allowed. No other parameters are valid on the `TYPE=INITIAL` statement. The format is:

```
RCFALLOC TYPE=INITIAL
```

**TYPE=MSDBCPx statement**

These statements specify the parameters used for the dynamic allocation of the MSDB checkpoint data sets. One specification for each statement type is mandatory. Only one pair of `SPPRI` and `TYPE` needs to be specified for all MSDBCPx/INIT statements. If more than one pair is specified, RCFALLOC will attempt to select the largest value. This is done because all MSDB checkpoint data sets should be the same size. If different device types are being used, specification in blocks will provide optimal space utilization. The format is:

```
RCFALLOC TYPE=aaaaaaa,
   VOL1=bbbbbb,
   VOL2=bbbbbb,
   SPPRI=cc.
```
Table 5 lists the parameters.

**Table 5  MSDBC\(\text{P}x\) statement parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>specifies MSDBC(P)1 or MSDBC(P)2</td>
</tr>
<tr>
<td></td>
<td>Specifications for MSDBC(P)3 and MSDBC(P)4 are also required when supporting an IMS-XRF Complex.</td>
</tr>
<tr>
<td>VOL1</td>
<td>specifies the volume serial number of the direct access device on which to allocate the indicated data set if RCF finds that the data set must be deleted and reallocated during MSDB recovery processing</td>
</tr>
<tr>
<td>VOL2</td>
<td>specifies the volume serial number of an alternate direct access device on which to allocate the indicated data set if the attempt using the VOL1 value is unsuccessful</td>
</tr>
<tr>
<td></td>
<td>This parameter is mandatory and must specify a different VSN than the VOL1 parameter.</td>
</tr>
<tr>
<td>SPPRI</td>
<td>specifies the SPACE parameter primary quantity value to be used when allocating the indicated data set</td>
</tr>
<tr>
<td></td>
<td>The default is 10.</td>
</tr>
<tr>
<td>SPTYPE</td>
<td>specifies the SPACE parameter allocation unit value to be used when allocating the indicated data set</td>
</tr>
<tr>
<td></td>
<td>This parameter must be specified as one of the following:</td>
</tr>
<tr>
<td></td>
<td>- CYL (cylinders) (default)</td>
</tr>
<tr>
<td></td>
<td>- TRK (tracks)</td>
</tr>
<tr>
<td></td>
<td>- BLK (blocks)</td>
</tr>
<tr>
<td>DEVT</td>
<td>specifies the device type of the direct access devices indicated by the VOL1 and VOL2 parameters</td>
</tr>
<tr>
<td></td>
<td>The default is the MVS-provided value SYSALLDA.</td>
</tr>
</tbody>
</table>

**TYPE=MSDBINIT statement**

This statement specifies the parameters for the dynamic allocation of an MSDBINIT data set. A specification for this statement type is mandatory.

The format is:

```plaintext
RCFALLOC TYPE=MSDBINIT,
MSDBIDEV=aaaaaa,
MSDBTDSN=bbb...bbb,
```
Table 6 lists the parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSDBIDEV</td>
<td>specifies the device type of the direct access device on which RCF can allocate a new MSDBINIT data set, if necessary. The new data set will be allocated on the DASD volume on which the MSDBINIT data set referenced by the IMS control region step resides. The specified value must be valid for that DASD volume. The default is the MVS-provided value SYSALLDA.</td>
</tr>
<tr>
<td>MSDBTDSN</td>
<td>specifies a model data set name for the data sets used if the RCF option to allow the MTO to perform MSDB maintenance is used (for example, TRCF=M is specified), and the MSDBINIT data set referenced by the IMS control region step is a Generation Data Group (GDG) member. Two data sets are used. The first is created by RCF to contain a copy of the current, recovered MSDBINIT and has a data set name composed of the value specified for the MSDBTDSN parameter with .CURR appended. The other data set is to be created by the MSDB maintenance processing and must have a data set name composed of the MSDBTDSN value with .NEW appended. When the MSDB maintenance processing is completed, RCF copies the contents of the .NEW data set into a new generation of the MSDBINIT GDG. For example, if MSDBTDSN=IMS01.MSDBMTCE is specified, the file created by RCF will be IMS01.MSDBMTCE.CURR, and the file that RCF expects to receive back from the MSDB maintenance processing will be named IMS01.MSDBMTCE.NEW. The model data set name value must be 33 characters or less. This parameter must be specified if GDGs are used for the MSDBINIT data set and TRCF=M will be used.</td>
</tr>
<tr>
<td>MSDBTDEV</td>
<td>specifies the device type of the direct access device on which RCF can allocate the temporary data sets used for MSDB maintenance, if necessary. The default is the MVS-provided value SYSALLDA.</td>
</tr>
<tr>
<td>MSDBTVOL</td>
<td>specifies the volume serial number of the direct access device on which RCF can allocate the temporary data sets used during MSDB maintenance processing. If the allocation attempt using this volume fails (it is offline or non-existent, or there are any objections raised by an installation-supplied DADSM exit), the allocation will be done using the unit type and volume serial number of the DASD device on which the MSDBINIT data set is situated. There is no default.</td>
</tr>
</tbody>
</table>
Fast Path Restart Control Facility Reference Manual

Table 6  MSDBINIT statement parameters (part 2 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPPRI</td>
<td>specifies the SPACE parameter primary quantity value to be used when allocating any temporary MSDBINIT data sets. The default is 10. This value is the same value used for the MSDBCPx data sets. The MSDBINIT is not as large as the MSDBCPx data set, so any temporary MSDBINIT data sets will release any unused space. The SPACE parameters specified here are also used to recreate the MSDBINIT data set if the MTO is performing MSDB maintenance (for example, TRCF=M is specified) and the MSDB is a GDG. If the MSDBINIT is going to increase significantly in size, RCFALLOC should be changed and assembled before performing the maintenance.</td>
</tr>
<tr>
<td>SPTYPE</td>
<td>Specifies the SPACE parameter allocation unit value to be used when allocating the indicated data set. This parameter must be specified as one of the following: - CYL (cylinders) (default) - TRK (tracks) - BLK (blocks)</td>
</tr>
</tbody>
</table>

Table 7 lists the parameters.

Table 7  FRU statement parameters (part 1 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPPRI</td>
<td>specifies the SPACE parameter primary quantity value to be used when allocating the Fast Path Recovery Utility (FRU) data sets. The default is 10.</td>
</tr>
<tr>
<td>SPSEC</td>
<td>specifies the SPACE parameter secondary quantity value to be used when allocating the Fast Path Recovery Utility (FRU) data sets. The default is 0.</td>
</tr>
</tbody>
</table>
Table 7  FRU statement parameters (part 2 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| SPTYPE    | Specifies the SPACE parameter allocation unit value to be used when allocating the Fast Path Recovery Utility (FRU) data sets. This parameter must be specified using one of the following values:  
  - CYL (cylinders)  
  - TRK (tracks)  
  - BLK (blocks)  
  The default is CYL. |
| DEVT      | Specifies the device type of the direct access devices on which to allocate the Fast Path Recovery Utility (FRU) data sets. The default is the MVS-provided value SYSALLDA. |
| #DEDB     | Specifies the number of recovery threads to be used when invoking the Fast Path Recovery Utility (FRU) (the number of DEDBxx data sets to be created by TSSAFR1, and the number of Phase 2 DEDB recovery streams to be used). If #DEDB=1 is specified, RCF will directly invoke the SORT, TSSAFR2 and DSPURX00 programs. If the value is greater than 1, RCF will submit job streams using the RCFFRU member from the data set associated with the RCFJCL DD statement in the TSSRCF1 job step to do the SORT/TSSAFR2/DBRC processing. The default value is 1. The maximum value is 10. |
| DEDBDSN   | Specifies the model for the data set names to be used when allocating the data sets used by the Fast Path Recovery Utility (FRU). The data set names for the Fast Path Recovery Utility (FRU) data sets are composed of the DEDBDSN value with a suffix as follows:  
  - DEDBxx - DEDB data extracted by TSSAFR1. The value of xx is 01 through the value specified for #DEDB.  
  - DEDBxxS - Sorted DEDB data read by TSSAFR2. The value of xx is 01 through the value specified for #DEDB.  
  - DBRCFR1 - DBRC control statements created by TSSAFR1.  
  - DBRCFR2 - Required. DBRC control statements created by TSSAFR2.  
  A model data set name value is mandatory. It must be 33 characters or less. |

**TYPE=FINAL statement**

Mandatory. This statement indicates the end of a parameter list build operation. Must be the last RCFALLOC statement specified. Only one **TYPE=FINAL** statement is allowed. No other parameters are valid on this statement.
RCFALLOC macro control statements

The format is:

```
RCFALLOC TYPE=FINAL
```

**Figure 3** Example of RCFALLOC statements

<table>
<thead>
<tr>
<th>RCFALLOC</th>
<th>TYPE=INITIAL</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=MSDBCP1.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL1=aaaaaa.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL2=bbbbbb.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPPRI=cc.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPTYPE=eee.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>DEVT=ffffffff</td>
<td>X</td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=MSDBCP2.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL1=gggggg.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL2=hhhhhh.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPPRI=i.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPTYPE=kkk.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>DEVT=11111111</td>
<td>X</td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=MSDBCP3.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL1=aaaaaa.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL2=bbbbbb.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPPRI=cc.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPTYPE=eee.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>DEVT=ffffffff</td>
<td>X</td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=MSDBCP4.,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL1=gggggg.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>VOL2=hhhhhh.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPPRI=i.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPTYPE=kkk.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>DEVT=11111111</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=MSDBINIT,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>MSDBIDEV=mmmmmmmm,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>MSDBTDSN=nnn...nnn,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>MSDBTDEV=00000000,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>MSDBTVOL=pppppp,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPPRI=xx,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPTYPE=yy</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=FRU,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPPRI=qq.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPSEC=rr.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>SPTYPE=sss.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>DEVT=tttttttt,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>#DEDB=uu,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>DEDBDSN=vvv...vvv</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCFALLOC</td>
<td>TYPE=FINAL,</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>END</td>
<td>X</td>
</tr>
</tbody>
</table>
This chapter describes the Fast Path Restart Control Facility (RCF) execution options and the skeleton JCL members RCF uses for database recovery processing. This chapter also includes some suggested problem resolution guidelines.

**Bypass processing**

If the MTO specifies TRCF=N when restarting the IMS system, no RCF processing will be done. For example:

```
S proname,TRCF=N
```
This feature is designed to permit the user to bypass RCF processing during start-up of some systems, and to permit IMS system start-ups in circumstances where the services of the RCF are not desired. Examples of a situation where RCF would be bypassed include:

- The first start-up of a new IMS system
- Upgrading to a new release of IMS
- The start-up of IMS surveillance systems in XRF environments.

When TRCF=N is specified:

1. RCF issues checks for and attempts to delete any RCF-created ENQs for this IMS system.

2. RCF issues an RCF0005I WTO message and immediately terminates normally with a return code 10. No database integrity or system resource status checking is done. No backups of MSDB-related data sets will be done.

3. The MTO is entirely responsible for ensuring RDS data set usability and that the following:
   - Database integrity is maintained.
   - The correct IMS restart will be performed.

**NOTE**

After RCF has been used with an IMS system, BMC recommends that you specify TRCF=N as the only method to bypass RCF processing. Do not perform an AUTO=N restart with the RCF steps removed from the IMS procedure.

**MSDBINIT data sets—GDGs vs. non-GDGs**

If the MSDBINIT data set is a member of a generation data group (GDG), RCF processing will create a new generation whenever AUTO=N is used to start the IMS system. An additional generation is created when the RCF MSDB maintenance option is used (for example, TRCF=M).

**NOTE**

BMC strongly recommends that a minimum of 10 cycles of the MSDBINIT GDG be retained.
If MSDBINIT is a member of a GDG, the back-up step in the IMS procedure for this data set should be omitted. If the MSDBINIT data set is not a GDG, the back-up step should be retained. RCF will set a return code to drive the back-up step whenever the MSDBINIT data set is changed.

**Back-up data sets for MSDBCPx**

BMC Software recommends that you use back-up data sets for the MSDB checkpoint data sets. These back-up data sets should be DASD resident and can be GDG members. RCF automatically sets a return-code to drive steps to back-up the MSDBCPx data sets.

RCF processing can use these data sets as a source of MSDB data when an MSDB Checkpoint data set must be reallocated and restored. Using back-up data sets avoids operator intervention and the potential requirement for manual restoration of MSDBCPx data sets.

For more information about these data sets, see “TSSRCF1 JCL requirements” on page 33 and Appendix B, “Sample IMS control region procedure.”

BMC also strongly recommends the use of the optional xxxxDUMP DD statement.

**MSDB maintenance procedures**

The following two methods can be used to perform MSDB maintenance in an RCF environment:

- conventional MSDB maintenance
- window MSDB maintenance

**Conventional MSDB maintenance**

When MSDB maintenance is desired, perform the following steps:

1. Schedule a normal shutdown of the IMS system.
2. Execute the maintenance jobs.
3. Restart the system with AUTO=N specified (non-automatic restart).
4. Perform a warm start with the MSDBLOAD keyword specified or a cold start.

**NOTE**

Processing performed by RCF can alter the contents of the MSDBINIT data set referenced by the IMS Control Region. Therefore, TRCF=N must also be specified when performing the restart of the IMS system immediately following the MSDB maintenance to bypass RCF processing.

---

**Window MSDB maintenance**

Specifying TRCF=M when restarting the IMS system indicates to the RCF that the MTO wants to perform MSDB Maintenance processing after the RCF has ensured that the MSDBINIT data set contains current data. For example:

```
S proname,TRCF=M
```

The MSDB Maintenance Window feature of RCF gives the user a method of doing MSDB Maintenance while still using the full integrity assurance services of RCF. Figure 4 on page 51 illustrates this MSDB maintenance window.
When TRCF=M is specified:

1. If AUTO=Y is specified, RCF changes it to AUTO=N.
2. All normal RCF processing is performed.
3. If an IMS Emergency Restart is required, the MSDB Maintenance request is denied.
4. If an IMS warm start is being done, RCF determines if the MSDBLOAD keyword is present in the restart command, which will be passed to the Control Region during system initialization.

If not, RCF will ask the MTO for permission to add the keyword to the restart command text via an RCF2601W message. If the operator denies permission, the MSDB Maintenance request is rejected.

5. If the MSDBINIT data set referenced in the IMS Control Region is a member of a GDG, RCF allocates an OS/VS sequential data set and copies into it the current MSDBINIT data.

The data set name of the sequential data set is composed of the value specified for the MSDBTDSN parameter in the user-generated RCFALLOC module suffixed by .CURR. RCF notifies the MTO of this action via an RCF2611I message.

This strategy is required because RCF has previously created a new generation of the MSDBINIT data set, and MVS processing of GDG index catalog entries will not release the resultant ENQ until RCF step ends. (The MSDB Maintenance job would not be able to execute if it referenced the true MSDBINIT data set.)

If the MSDBINIT data set is not a GDG, the copy operation is not performed since the MSBD Maintenance job can access the MSDBINIT data set directly. You should backup the MSDBINIT data set in the MSDB Maintenance window prior to performing any maintenance and then use this data set as input to the MSDB maintenance. This procedure enables you to create a new MSDBINIT data set under its previous name. You should verify that MSDB maintenance was applied correctly before passing an updated MSDBINIT data set back to RCF.

6. RCF issues an RCF2610I WTOR message requesting the MTO to execute the MSDB Maintenance jobs.

When that processing is successfully completed, the MTO must reply to the WTOR to cause RCF to continue.

7. If the MSDBINIT data set is a member of a GDG, RCF expects that the MSDB Maintenance jobs will place the new MSDBINIT data in a data set identified by the MSDBTDSN parameter specified in the user-generated RCFALLOC module suffixed by characters .NEW.

RCF now attempts to allocate this data set. If successful, RCF allocates another generation of the MSDBINIT data set and copies into it the new MSDB data. Finally, RCF deletes both sequential data sets and notifies the MTO of this processing via an RCF2611I message.
8. **NOTE**

Since the .NEW MSDB data set will be deleted after RCF attempts to copy the file to a new generation of the MSDBINIT data set, you should back up the .NEW MSDB data set prior to responding to the RCF2610I message that appears. This backup ensures that, should problems occur, you have a data set to create an updated generation of the MSDBINIT data set. You can then restart IMS using the conventional MSDB maintenance procedure provided by RCF.

8. RCF continues with its normal processing.

The output from the MSDB maintenance utility includes an IEBUPDTE-format control deck written to the MSDBPUN DD statement. These statements are used for updating or replacing the DBFMSDBx member in the PROCLIB referenced by the IMS control region. The member name suffix is controlled by the value specified on the PROC statement in the control statements provided to DBFDBMA0.

Typically, this value is incremented by one character each time MSDB maintenance is done.

**NOTE**

RCF does not allow the MTO to change the setting of the control region **MSDB** parameter.

BMC suggests the following:

- The IMS procedure be set to always specify a fixed value (for example, MSDB=0 to use the IMS PROCLIB member DBFMSDB0).

- Do not use a specification of PROC=0 (or whatever fixed value is chosen) in DBFDBMA0 input decks.

- The output from the IEBUPDTE done during MSBD Maintenance either can be kept in a separate data set or directed to the IMS PROCLIB, as desired.

- Prior to the MTO replying to the RCF WTOR to indicate that MSDB Maintenance has been completed, copy the newly created/updated member into the IMS PROCLIB as the permanent DBFMSDBx member.
Forced recovery processing

If the MTO specifies TRCF=F when restarting the IMS system, RCF processing will be performed in Forced Recovery mode. For example:

```
$ procname,TRCF=F
```

Forced recovery processing provides an automated, integrity-assured facility for recovering databases following an Emergency Restart during which database allocation errors have occurred. These errors might have been caused by hardware failures (such as, an inoperative DASD controller or HDA) or by MVS problems (such as, a path to the DASD unit containing the affected databases has been varied offline). In either case, the restart completes successfully, but the databases that could not be allocated are marked as needing recovery processing and cannot be used by the IMS system. Recovery or Batch Backout processing of these databases is required before they can be /STA-rted and made available to the IMS system.

The typical procedure when this situation occurs is to shutdown the IMS system, correct the cause(s) of the allocation failures, set up and submit the required database recovery job streams and restart the IMS system.

Forced Recovery mode processing in RCF is a viable alternative for this scenario. To use it, simply perform the following:

- Shutdown the IMS system (/CHE FREEZE).
- Correct the causes of the allocation failures.
- Restart the IMS system with TRCF=F.

1. When the MTO specifies TRCF=F, RCF issues a prompting message to verify the request for Forced Recovery processing.

2. RCF checks to ensure that the previous shutdown of the IMS system was normal and that AUTO=N has been specified.

   If the previous shutdown of the IMS system was not normal or the RDS is unusable, RCF processing mode is reset to the normal TRCF=Y setting. When AUTO=Y is detected, the MTO is prompted for permission to change it to AUTO=N. If this is allowed, the change is made and Forced Recovery processing continues; if not, the processing mode reverts to TRCF=Y.
3. RCF prompts the MTO to specify the checkpoint-ID to be used for database recovery processing.

   The value specified in the MTOs response must be a valid system checkpoint from the IMS system session prior to the /ERE attempt. This can be obtained from the DFS994I messages on the IMS system Hardcopy Log. It must be a valid checkpoint for this IMS system, and must be prior to the Current and Fast Path checkpoint-IDs in the RDS data set.

4. Analysis of, and any required actions relating to, MSDB integrity are performed in the normal fashion.

5. If Forced Recovery mode is still in effect, the BMC Fast Path Recovery Utility (FRU) product is invoked using the checkpoint information specified by the MTO.

   The utility performs DEDB recovery and gathers information needed for creating and submitting any required Batch Backout job streams.

6. The MTO is prompted to enter the IMS restart command to be passed to the Control Region.

   The permissible responses are either a warm start or a cold start.

**Manual restart**

If the MTO specifies TFRU=N when restarting the IMS system, Fast Path Recovery Utility (FRU) will not be invoked to perform DEDB database recoveries. Also, the information required to determine which (if any) full-function databases require Batch Backout processing will not be available. For example:

```
S procnam,TFRU=N
```

This feature allows RCF to be used in user installations that do not have the Fast Path Recovery Utility product installed or that use an alternative procedure for database recoveries.

If TFRU=N is specified and RCF determines that DEDB processing is required, the MTO will be informed via an RCF2500W WTO message and given the opportunity to either perform the recoveries or terminate the IMS system start-up.
Automatic restart

If TFRU=Y is specified in the PARM data for RCF job step, Fast Path Recovery Utility (FRU) will be invoked to perform any required DEDB database recoveries.

If an IMS cold start is being done and the previous shutdown was abnormal, RCF will automatically invoke Fast Path Recovery Utility. In both recovery modes:

1. TSSAFR1 and the DBRC utility DSPURX00 are invoked directly as subtasks.
2. A return code from TSSAFR1 of 4 or 12 indicates that batch backouts are required.
3. Any required batch backout jobs are submitted, using the RCFBBO member from the data set specified on the RCFJCL DD statement.

The number of recovery threads (for example, DEDB data output files created by TSSAFR1) is based on the value specified for the #DEDB parameter in the user-generated RCFALLOC module. A value greater than 1 implies multi-thread DEDB recovery.

Fast Path Recovery Utility processing can be performed using the following methods:

- single-thread DEDB recovery
- multi-thread DEDB recovery

Single-thread DEDB recovery

Note the following items when single-thread DEDB recovery is used:

- The #DEDB parameter in the RCFALLOC module is 1.

- TSSAFR1 has created a single DEDB recovery data output file. RCF directly invokes subtasks to perform the SORT, TSSAFR2 and DBRC steps of Fast Path Recovery Utility processing. RCF notifies the MTO of this processing via RCF25xx messages.

- If DEDB recovery problems are encountered, RCF informs the MTO and pauses to allow manual recovery execution.
Multi-thread DEDB recovery

Note the following items when multi-thread DEDB recovery is used:

- The #DEDB parameter in the RCFALLOC module is greater than 1.

- TSSAFR1 has created multiple DEDB data output files. In this mode, the RCFJCL DD statement is required. RCF uses the RCFFRU member from this data set to submit multiple jobs to perform the SORT, TSSAFR2 and DBRC steps of Fast Path Recovery Utility processing. Refer to Chapter C, “Sample skeleton JCL procedures.”

- RCF builds an internal table entry for each job. When all jobs have been submitted, RCF issues a WTOR message and pauses until the MTO replies to indicate that the jobs have completed. RCF verifies that all recovery threads completed successfully. If a recovery thread has not completed, RCF informs the MTO and pauses to allow manual intervention. The MTO can override this condition and force RCF processing to continue.

- If any job submission errors are encountered, RCF pauses to allow the MTO to perform the processing manually.

Problem resolution guidelines

RCF directly invokes several IMS utilities, as required, to perform processing needed during recovery processing:

- DFSULTR0, the IMS log recovery utility
- DBFDBDR0, the IMS MSDB recovery utility
- DSPURX00, the IMS DBRC recovery control utility

If an error is encountered that prevents further processing (such as, failure of DFSULTR0 or DBFDBDR0), the RCF informs the MTO and terminates abnormally. The MTO should use IOF, SDSF or an equivalent to examine the report generated by the failing utility. After corrective action is taken, the IMS system can be restarted.

DSPURX00 errors cause RCF to issue an RCF2512 message and pause to allow the MTO to review the DSPURX00 messages via SDSF. The MTO must reply to the WTOR to allow RCF to continue processing.

**NOTE**

BMC strongly recommends that either all or none of the databases in an IMS system be registered with DBRC.
Obtaining a copy of submitted job JCL

The JCLCOPY feature provides the ability to obtain a copy of the JCL for all submitted jobs (for Fast Path Recovery Utility) and full-function database Batch Backout) and other possible error situations (such as, MSDB Maintenance, Log Recovery). The JCL can be used in error recovery situations.

The JCL is saved in a partitioned data set referred to by the ddname JCLCOPY. If the JCLCOPY DD statement is not present or does not refer to a partitioned data set, this feature is disabled. The base source members are copied from members of the partitioned data set referred to by the RCFJCL DD. The names of members created in the JCLCOPY library are identified in message RCF4035I. A list of source members and the output members are provided in Table 8.

Table 8 Source members and output member

<table>
<thead>
<tr>
<th>Source member</th>
<th>Output member</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCFBBBO</td>
<td>psbname</td>
<td>One member is stored for each PSB to be backed out. The psbname is used for the output member name.</td>
</tr>
<tr>
<td>RCFFRU</td>
<td>FRU2JCLn</td>
<td>One member is stored for each FRU2 job submitted. ‘n’ is a value from A to Z or 0 to 9.</td>
</tr>
<tr>
<td>RCFULTR0</td>
<td>DFSULTR0</td>
<td>If a log recovery is required, a new member is written reflecting the log being closed.</td>
</tr>
<tr>
<td>RCFDBDR0</td>
<td>DBFDBDR0</td>
<td>If the MSDBINIT is being recovered or unloaded, a new member is written reflecting the OLDS or SLDSs used.</td>
</tr>
</tbody>
</table>
Maintenance

This chapter describes the procedures to follow when applying maintenance to the Fast Path Restart Control Facility (RCF) product.

The following sections are discussed in this chapter:

Introduction .................................................. 59
TSSRRA30 maintenance procedure .................. 59
Fast Path Restart Control Facility performance .... 60

Introduction

Use the TSSRRA30 maintenance procedure (see “TSSRRA30 maintenance procedure”) when you are upgrading to a new IMS program update tape (PUT) level. TSSRRA30 is sensitive to changes in the IMS Parms in the DFSPBxxx member.

For information about easier installation and better performance of the Fast Path Restart Control Facility product, see “Fast Path Restart Control Facility performance” on page 60.

TSSRRA30 maintenance procedure

After IMS maintenance has been applied, TSSRRA30 should be linked to pick up any IMS DFSRRA30 changes.

NOTE

You must execute this step each time you apply IMS maintenance to DFSRRA30. If you are running multiple release levels of IMS, you must link-edit TSSRRA30 for each release level, and keep them in separate libraries.
To apply TSSRRA30 maintenance

1. Link-edit the TSSRRA30 module with the current DFSRRA30 module in the IMS RESLIB.

2. Edit the TSSRA3LK sample JCL member that is provided in sample library FPSSAMP (if you selected separate libraries for the installation) or sample library IMSAMP (if you selected merged libraries for the installation).

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

   B. Modify the SYSLIB DD data set name BMC.RCF.IMLIB/FPSLIB load library to reflect the name you assigned.

   C. Modify the RESLIB DD data set name IMSVS.RESLIB to your IMS name.

   D. Modify the SYSLMOD DD data set name to reflect the output load library name that will be concatenated before IMS RESLIB.

3. Submit the TSSRA3LK job to perform the link of TSSRRA30. When the job is completed, ensure the condition code for the LKED step is zero.

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

Fast Path Restart Control Facility performance

Consider the following points for easier installation and better performance of the Fast Path Restart Control Facility:

- If you plan to use Fast Path Restart Control Facility to support multiple IMS systems, BMC suggests that you do the following:

  — Maintain the executable RCF modules in a single (central) APF-authorized data set that is referenced on the STEPLIB DD statement of the RCF job step in all the IMS procedures.
— Maintain the RCFALLOC load module for each specific IMS system in a separate, small (one track) data set that is included in the RCF job step STEPLIB concatenation of the procedure for that IMS system. The data set must be APF-authorized.

Alternately, you can use an existing IMS system-specific, APF-authorized data set to contain that system’s RCFALLOC module (for example, MATRIX, the data set containing DFSMDA modules).

This ensures that all the IMS systems are using the current version of RCF and avoids complex maintenance problems if fixes become necessary.

- If Fast Path Restart Control Facility is supporting multiple IMS systems, you must create a JCL library for each system that contains the RCFBBO, RCFDBDR0, RCFULTR0, and RCFFRU skeleton JCL members. After creating these libraries, tailor the data set names, and perform other actions as necessary.
MSDB recovery processing action table

The TSSMCF1 program component of the Fast Path Restart Control Facility (RCF) uses an internal action table to determine the appropriate processing required to assure MSDB integrity. Selection of the required table entry is based on the status of the MSDB checkpoint data sets, the IMS RDS, the nature of the previous IMS system shutdown and the current setting of the IMS procedure AUTO parameter.

Entries in the table are 12 bytes in length, and use the following format:

ABCDEFFFFFFF

Table 9 describes the values for the table entry.

Table 9    Table entry values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>MSDBCP1 status</td>
</tr>
<tr>
<td>B</td>
<td>MSDBCP2 status</td>
</tr>
<tr>
<td>C</td>
<td>RDS status</td>
</tr>
<tr>
<td>D</td>
<td>AUTO= parm value</td>
</tr>
<tr>
<td>E</td>
<td>Shutdown status</td>
</tr>
<tr>
<td>F</td>
<td>Action routine ID</td>
</tr>
</tbody>
</table>

Possible settings for MSDBCP1/2 and RDS status are listed in Table 10.

Table 10    Possible MSDBCP1/2 and RDS status settings (part 1 of 2)

<table>
<thead>
<tr>
<th>MSDBCP1</th>
<th>MSDBCP2</th>
<th>RDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOT ALLOC</td>
<td>NOT ALLOC</td>
<td>NOT ALLOC</td>
</tr>
<tr>
<td>OPEN ERROR</td>
<td>OPEN ERROR</td>
<td>OPEN ERROR</td>
</tr>
</tbody>
</table>
Possible settings for AUTO and shutdown status are listed in Table 11.

Table 11  Possible AUTO and shutdown status settings

<table>
<thead>
<tr>
<th>AUTO</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>NORMAL</td>
</tr>
<tr>
<td>NO</td>
<td>ABEND</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>UNKNOWN (?)</td>
</tr>
</tbody>
</table>

The TSSMCF1 action table is presented in Table 12.

Table 12  TSSMCF1 action table (part 1 of 3)

<table>
<thead>
<tr>
<th>MSDBCP1</th>
<th>MSDBCP2</th>
<th>RDS</th>
<th>AUTO</th>
<th>Shutdown</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN ERROR</td>
<td>OPEN ERROR</td>
<td>I/O ERROR</td>
<td>1</td>
<td>1</td>
<td>3,6,7,B</td>
</tr>
<tr>
<td>I/O ERROR</td>
<td>I/O ERROR</td>
<td>I/O ERROR</td>
<td>1</td>
<td>1</td>
<td>3,6,7,9,B</td>
</tr>
<tr>
<td>UNUSABLE</td>
<td>UNUSABLE</td>
<td>NOT A BCPT</td>
<td>2</td>
<td>2</td>
<td>3,6,7,B</td>
</tr>
<tr>
<td>EMPTY</td>
<td>EMPTY</td>
<td>EMPTY</td>
<td>2</td>
<td>2</td>
<td>3,6,7,9,B</td>
</tr>
<tr>
<td>UNKNOWN CHKPT</td>
<td>UNKNOWN CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>3</td>
<td>3</td>
<td>3,G</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>3</td>
<td>3</td>
<td>3,A</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>OLDEST CHKPT</td>
<td>OLDEST CHKPT</td>
<td>3</td>
<td>3</td>
<td>3,A</td>
</tr>
</tbody>
</table>

Table 10  Possible MSDBCP1/2 and RDS status settings (part 2 of 2)
<table>
<thead>
<tr>
<th>MSDBCP1</th>
<th>MSDBCP2</th>
<th>RDS</th>
<th>AUTO</th>
<th>Shutdown</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPTY</td>
<td>CURRENT CHKPT</td>
<td>CHKPT</td>
<td>NO</td>
<td>NORMAL</td>
<td>3,5,7</td>
</tr>
<tr>
<td>EMPTY</td>
<td>CURRENT CHKPT</td>
<td>CHKPT</td>
<td>NO</td>
<td>ABEND</td>
<td>3,6,7</td>
</tr>
<tr>
<td>EMPTY</td>
<td>CURRENT CHKPT</td>
<td>CHKPT</td>
<td>YES</td>
<td>NORMAL</td>
<td>3,5,7</td>
</tr>
<tr>
<td>EMPTY</td>
<td>CURRENT CHKPT</td>
<td>CHKPT</td>
<td>YES</td>
<td>ABEND</td>
<td>3,8</td>
</tr>
<tr>
<td>CHKPT</td>
<td>EMPTY</td>
<td>EMPTY</td>
<td>NO</td>
<td>?</td>
<td>4,6,7,B</td>
</tr>
<tr>
<td>CHKPT</td>
<td>EMPTY</td>
<td>EMPTY</td>
<td>YES</td>
<td>?</td>
<td>4,6,7,9,B</td>
</tr>
<tr>
<td>CHKPT</td>
<td>NOT A BCPT</td>
<td>NO</td>
<td>?</td>
<td>?</td>
<td>4,6,7,B</td>
</tr>
<tr>
<td>CHKPT</td>
<td>NOT A BCPT</td>
<td>YES</td>
<td>?</td>
<td>?</td>
<td>4,6,7,9,B</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>EMPTY</td>
<td>CHKPT</td>
<td>NO</td>
<td>NORMAL</td>
<td>4,G</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>EMPTY</td>
<td>CHKPT</td>
<td>NO</td>
<td>ABEND</td>
<td>4,A</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>EMPTY</td>
<td>CHKPT</td>
<td>YES</td>
<td>NORMAL</td>
<td>4,9,G</td>
</tr>
<tr>
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<td>EMPTY</td>
<td>CHKPT</td>
<td>YES</td>
<td>ABEND</td>
<td>4,A</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>EMPTY</td>
<td>CHKPT</td>
<td>NO</td>
<td>NORMAL</td>
<td>4,5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>EMPTY</td>
<td>CHKPT</td>
<td>NO</td>
<td>ABEND</td>
<td>4,6,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
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<td>CHKPT</td>
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<td>NORMAL</td>
<td>4,5,7</td>
</tr>
<tr>
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<td>ABEND</td>
<td>4,8</td>
</tr>
<tr>
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<td>6,7,B</td>
</tr>
<tr>
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<td>CHKPT</td>
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<td>?</td>
<td>6,7,9,B</td>
</tr>
<tr>
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<td>?</td>
<td>6,7,9,B</td>
</tr>
<tr>
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<td>CHKPT</td>
<td>NOT A BCPT</td>
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<td>6,7,9,B</td>
</tr>
<tr>
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<td>OLDEST CHKPT</td>
<td>CHKPT</td>
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<td>NORMAL</td>
<td>G</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>OLDEST CHKPT</td>
<td>CHKPT</td>
<td>NO</td>
<td>ABEND</td>
<td>A</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>OLDEST CHKPT</td>
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<tr>
<td>OLDEST CHKPT</td>
<td>OLDEST CHKPT</td>
<td>CHKPT</td>
<td>YES</td>
<td>ABEND</td>
<td>A</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
<td>CURRENT CHKPT</td>
<td>CHKPT</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
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<td>CHKPT</td>
<td>NO</td>
<td>ABEND</td>
<td>6,7</td>
</tr>
<tr>
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<td>CHKPT</td>
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<td>NORMAL</td>
<td>5,7</td>
</tr>
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<td>ABEND</td>
<td>8</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>OLDEST CHKPT</td>
<td>CHKPT</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>OLDEST CHKPT</td>
<td>CHKPT</td>
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</tr>
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<tr>
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<td>ABEND</td>
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</tr>
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<td>OTHER RDS ERROR</td>
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<td>ABEND</td>
<td>6,7,B</td>
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<td>OTHER RDS ERROR</td>
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<td>ABEND</td>
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</tr>
<tr>
<td>OLDEST CHKPT</td>
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<td>ABEND</td>
<td>4,6,7,9,B</td>
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</tr>
<tr>
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<td>OTHER RDS ERROR</td>
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</tr>
<tr>
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<td>ABEND</td>
<td>3,6,7,B</td>
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</tr>
<tr>
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<td>ABEND</td>
<td>4,6,7,B</td>
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<tr>
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<td>6,7,9,B</td>
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</tr>
<tr>
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<td>6,7,9,B</td>
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</tr>
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<td>6,7,9,B</td>
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<td>ABEND</td>
<td>6,7,9,B</td>
<td></td>
</tr>
<tr>
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<td>ABEND</td>
<td>6,7,9,B</td>
<td></td>
</tr>
<tr>
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<td>OTHER RDS ERROR</td>
<td>YES</td>
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<td>6,7,9,B</td>
<td></td>
</tr>
</tbody>
</table>
### Table 12  TSSMCF1 action table (part 3 of 3)

<table>
<thead>
<tr>
<th>MSDBCP1</th>
<th>MSDBCP2</th>
<th>RDS</th>
<th>AUTO</th>
<th>Shutdown</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPTY</td>
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</tr>
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<td>4,0</td>
</tr>
<tr>
<td>OLDEST CHKPT</td>
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<td>6,7,9</td>
</tr>
<tr>
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<td>OLDEST CHKPT</td>
<td>OTHER RDS ERROR</td>
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<td>NORMAL</td>
<td>3,9</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>EMPTY</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7,9</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>OLDEST CHKPT</td>
<td>OTHER RDS ERROR</td>
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<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
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<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>NORMAL</td>
<td>5,7</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>OLDEST CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>ABEND</td>
<td>6,7,9</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>OLDEST CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>ABEND</td>
<td>6,7,9</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
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<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>ABEND</td>
<td>6,7,9</td>
</tr>
<tr>
<td>CURRENT CHKPT</td>
<td>CURRENT CHKPT</td>
<td>OTHER RDS ERROR</td>
<td>NO</td>
<td>ABEND</td>
<td>6,7,9</td>
</tr>
</tbody>
</table>

### Table 13  TSSMCF1 action routines functional description (part 1 of 6)

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<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Rescan the ACTION Table using the updated status of the MSDBCPx and RDS data sets and settings for the AUTO and Shutdown flags to determine the functions that should be performed.</td>
</tr>
<tr>
<td>1</td>
<td>Delete and reallocate the MSDBCP1/MSDBCP3 data set. If the old MSDBCP1/MSDBCP3 data set cannot be deleted, uncatalog it and reallocate the new data set.</td>
</tr>
<tr>
<td>2</td>
<td>Delete and reallocate the MSDBCP2/MSDBCP4 data set. If the old MSDBCP2/MSDBCP4 data set cannot be deleted, uncatalog it and reallocate the new data set.</td>
</tr>
<tr>
<td>3</td>
<td>Copy into the MSDBCP1/MSDBCP3 data set the contents of the newer of the xxxxDUMP and MSDBCP2/MSDBCP4 data sets.</td>
</tr>
<tr>
<td>4</td>
<td>Copy into the MSDBCP2/MSDBCP4 data set the contents of the newer of the xxxxDUMP and MSDBCP1/MSDBCP3 data sets.</td>
</tr>
</tbody>
</table>
| 5      | 1. Allocate the MSDBINIT data set referenced in the IMS Control Region step. If the MSDBINIT data set is a member of a GDG, a new generation is created.  
2. Allocate the newer of the MSDBCP1/MSDBCP3 and MSDBCP2/MSDBCP4 data sets to the ddname MSBDUMP.  
3. Invoke the IMS MSDB recovery utility (DBFDBDR0) to perform an unload operation.  
4. If the MSDBINIT data set is a member of a GDG, call the internal utility TSSUJLU to update the MVS control blocks in the IMS Control Region step to reference this new data set. |
1. Allocate the MSDBINIT data set referenced in the IMS control region step. If the MSDBINIT data set is a member of a GDG, a new generation is created.

2. Call the internal utility TSSXRCN to obtain from the RECON data sets the list of IMS log data sets required to recover the MSDBs. Allocate the log data sets.

3. Invoke the IMS MSDB recovery utility (DBFDBDR0) to perform a RECOVER operation.

4. If the MSDBINIT data set is a member of a GDG, call the internal utility TSSUJLU to update the OS/MVS control blocks in the IMS control region step to reference the newly created data set.

5. Set the return code to be passed to TSSRCF1 to indicate back up MSDBCP1/2 and MSDBINIT (RC=2) or Back up MSDBCP3/4 and MSDBINIT (RC=3).

   If one or both of the MSDB checkpoint data sets is empty, set the return code to back up MSDBINIT only (RC=4).

6. Set the return code to be passed to TSSRCF1 to indicate back up MSDBCP1/2 only (RC = 0) or back up MSDBCP3/4 only (RC=1).

7. Invoke the internal utility TSSUPFC to set the value of the AUTO parameter in the PARM data for the IMS control region step to N.

8. Issue a WTOR message to ask the MTO to choose one of the following options:

   - Do an emergency restart of the IMS system.
     
     Invoke action routine 8.

   - Specify an IMS restart command.
     
     Invoke the internal utility TSSUICMD to analyze and parse it. If the command is an emergency restart, invoke Action Routine 8. If the command is a warm start, issue a message that it is not acceptable and reissue the WTOR. If it is a cold start, invoke Action Routines 6 and 7.

   - Quit processing.
     
     TSSMCF1 terminates with a User Abend 3565.
B Issue a WTOR message to ask the MTO to choose one of the following options:

- Do an emergency restart or a cold start with FORMAT RS specified.
  TSSMCF1 does no further processing.
- Specify an IMS restart command.
  Invoke the internal utility TSSUICMD to analyze and parse it.
  — If the command is an emergency restart or a cold start, TSSMCF1 does no further processing.
  — If the command is a warm start, issue a message that it is not acceptable and reissue the WTOR.
- Quit processing.
  TSSMCF1 terminates with a User Abend 3565.

C Issue a WTOR message to ask the MTO to choose one of the following options:

- Do a cold start with FORMAT RS specified.
  Invoke Action Routine 7.
- Do an RCF recovery of the MSDBCPx data sets.
  Invoke Action Routine E.
- Specify an IMS restart command.
  Invoke the internal utility TSSUICMD to analyze and parse it.
  — If the command is a cold start, invoke Action Routine 7.
  — If the command is an emergency restart, or a warm start, issue a message that it is not acceptable and reissue the WTOR.
- Quit processing.
  TSSMCF1 terminates with a User Abend 3565.
D | Issue a WTOR message to ask the MTO to choose one of the following options:
   |   - Do a warm start with MSDBLOAD specified.
   |       - Invoke Action Routine 7.
   |   - Do a cold start.
   |       - Invoke Action Routine 7.
   |   - Do an RCF recovery of the MSDBCPx data sets.
   |       - Invoke Action Routine E.
   |   - Specify an IMS restart command.
   |       - Invoke the internal utility TSSUICMD to analyze and parse it.
   |       - If the command is a cold start or a warm start with the MSDBLOAD keyword specified, invoke Action Routine 7.
   |       - If the command is an emergency restart, issue a message that it is not acceptable and reissue the WTOR.
   |   - Quit processing.
   |       TSSMCF1 terminates with a User Abend 3565.

E | Perform Fast Path Restart Control Facility recovery of the MSDB Checkpoint data sets as follows:
   | 1. Copy the contents of the newer of the xxxxDUMP, MSDBBBKP1 and MSDBBBKP2 data sets into both MSDB Checkpoint data sets.
   | 2. Reset the status indicators for the two data sets.
   | 3. Re-evaluate the type of processing required (for example, search the TSSMCF1 Action Table to find the appropriate entry for these new conditions).
Issue a WTOR message to ask the MTO to choose one of the following options:

- Do a cold start.
  - Invoke Action Routine 7.

- Do an RCF recovery of the MSDBCPx data sets.
  - Invoke Action Routine E.

- Specify an IMS restart command.
  - Invoke the internal utility TSSUICMD to analyze and parse it.
    - If the command is a cold start, invoke Action Routine 7.
    - If the command is an emergency restart or a warm start, issue a message that it is not acceptable and reissue the WTOR.

- Quit processing.
  - TSSMCF1 terminates with a User Abend 3565.

Issue a WTOR message to ask the MTO to choose one of the following options:

- Do a warm start with MSDBLOAD specified.
  - Invoke Action Routines 6 and 7.

- Specify an IMS restart command.
  - Invoke the internal utility TSSUICMD to analyze and parse it.
    - If the command is a cold start or a warm start with the MSDBLOAD keyword specified, invoke Action Routines 6 and 7.
    - If the command is an emergency restart, issue a message that it is not acceptable and reissue the WTOR.

- Quit processing.
  - TSSMCF1 terminates with a User Abend 3565.
Table 13  TSSMCF1 action routines functional description (part 6 of 6)

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Issue a WTOR message to ask the MTO to choose one of the following options:</td>
</tr>
<tr>
<td></td>
<td>- Do a cold start with FORMAT RS specified.</td>
</tr>
<tr>
<td></td>
<td>The IMS system will be restarted using the command shown in the message.</td>
</tr>
<tr>
<td></td>
<td>- Specify an IMS restart command.</td>
</tr>
<tr>
<td></td>
<td>Invoke the internal utility TSSUICMD to analyze and parse it.</td>
</tr>
<tr>
<td></td>
<td>- If the command is a cold start with FORMAT RS specified, the IMS system will be restarted using that command.</td>
</tr>
<tr>
<td></td>
<td>- If the FORMAT RS specification is omitted, or any other command was specified, issue a message that it is not acceptable and reissue the initial WTOR.</td>
</tr>
<tr>
<td></td>
<td>- Quit processing.</td>
</tr>
<tr>
<td></td>
<td>TSSMCF1 terminates with a User Abend 3565.</td>
</tr>
</tbody>
</table>
Sample IMS control region procedure

The JCL shown in Figure 5 illustrates the IMS control region procedure that you use with Fast Path Restart Control Facility (RCF).

Figure 5 Sample IMS control region procedure JCL (part 1 of 4)

```
// PROC RGN=2000K,SOUT=A,DPTY='(14,15)',
// .... <=== Standard IMS
// .... <=== Parameters
// ....
// TRCF=Y,TFRU=,RGSUF= <=== NEW
/**
//**********************************************************
//** RESTART CONTROL FACILITY STEP                        **
//**********************************************************
//** ******************** NOTES ********************        **
//** 1) FOLLOWING DD STATEMENTS ARE NOT ALLOWED.         **
//**     THE DATASETS USED IN THE IMS STEP WILL BE DYNAMICALLY ALLOCATED. **
//**                                                      **
//**     MSDBINIT, MSDBCP1, MSDBCP2, IMSRDS
//**     MSBDUMP, MSDBCP3, MSDBCP4, IMSRDS2
//**     DBRCCTL, DEDB??
/**
//**********************************************************
//RCFSTEP EXEC PGM=TSSRCF1,REGION=2048K
// PARM='&TRCF,&TFRU,&RGSUF,&SOUT'
//STEPLIB DD DSN=bmc.rcf.pgml,DISP=SHR
// DD DSN=IMSVS.RESLIB,DISP=SHR
/**
//**********************************************************
//** MANDATORY DD STATEMENTS FOR DFSULTRO                **
//**********************************************************
//SYSIN DD DSN=&ULTRCTL,DISP=(,PASS).
```
Figure 5    Sample IMS control region procedure JCL (part 2 of 4)

```
//             UNIT=SYSDA,SPACE=(TRK,(2,1))
//SYSPRINT DD  SYSOUT=&SOUT
//*
//***********************************************
//** MANDATORY DD STATEMENTS FOR DBFDBDR0        **
//***********************************************
//MSDBCTL  DD  DSN=&MSDBCTL,DISP=(,PASS),
//             UNIT=SYSDA,SPACE=(TRK,(2,1))
//MSDBPRT  DD  SYSOUT=&SOUT
//*
//***********************************************
//** OPTIONAL DD STATEMENTS (RECOMMENDED)        **
//***********************************************
//XXXXDUMP DD  DSN=IMSVS.MSDBDUMP,DISP=SHR
//BKUPCP1 DD  DSN=IMSVS.BKUPCP1(0),DISP=SHR
//BKUPCP2 DD  DSN=IMSVS.BKUPCP2(0),DISP=SHR
//*
//***********************************************
//** MANDATORY DD STATEMENTS FOR TFRU=Y          **
//***********************************************
//FRUPMLD DD  DSN=bmc.fruv.pgmlint,DISP=SHR
//RESLIB   DD  DSN=IMSVS.RESLIB,DISP=SHR
//*
//IMS      DD  DSN=IMSVS.DBDLIB,DISP=SHR
//*
//RCFJCL   DD  DSN=BCD.RCF.FPSAMP,DISP=SHR
//INTRDR   DD  SYSOUT=(A,INTRDR),DCB=BLKSIZE=80
//*
//SYSOUT   DD  SYSOUT=&SOUT
//SORTLIB  DD  DSN=SYS1.SORTLIB,DISP=SHR
//SORTWK01 DD  UNIT=SYSDA,SPACE=(CYL,(40,10))
//SORTWK02 DD  UNIT=SYSDA,SPACE=(CYL,(40,10))
//SORTWK03 DD  UNIT=SYSDA,SPACE=(CYL,(40,10))
//*
//***********************************************
//** OPTIONAL DD STATEMENTS for JCLCOPY           **
//***********************************************
//JCLCOPY DD DISP=SHR,DSN=your PDS data set name
//*
//***********************************************
//** BACKUP MSDBCP1 STEP                         **
//***********************************************
//BKUPCP1 EXEC PGM=IEBGENER,
//           COND=((1,EQ,RCFSTEP),(3,LE,RCFSTEP))
//SYSPRINT DD  SYSOUT=&SOUT
//SYSIN    DD  DUMMY
//SYSUT1   DD  DSN=IMSVS.MSDBCP1,DISP=SHR
//SYSUT2   DD  DSN=IMSVS.BKUPCP1(+1),DISP=(,CATLG),
//             UNIT=SYSDA,SPACE=(CYL,(3,1),RLSE),
//             DCB=(IMSVS.MSDBCP1)
Figure 5  Sample IMS control region procedure JCL (part 3 of 4)

```verbatim
//** BACKUP MSDBC2 STEP **
//*****************************************************************************
//BKUPCP2 EXEC       PGM=IEBGENER,
//       COND=((1,EQ,RCFSTEP),(3,LE,RCFSTEP))
//SYSPRINT DD   SYSOUT=&SOUT
//SYSIN   DD    DUMMY
//SYSUT1  DD   DSN=IMSVS.MSDBC2,DISP=SHR
//SYSUT2  DD   DSN=IMSVS.BKUPCP2(+1),DISP=(,CATLG),
//             UNIT=SYSDA,SPACE=(CYL,(3,1),RLSE),
//             DCB=(IMSVS.MSDBC2)
/*
/*
*****************************************************************************
//** BACKUP MSDBC3 STEP (IF XRF SYSTEM) **
*****************************************************************************
//BKUPCP3 EXEC       PGM=IEBGENER,
//       COND=((0,EQ,RCFSTEP),(2,EQ,RCFSTEP),(4,LE,RCFSTEP))
//SYSPRINT DD   SYSOUT=&SOUT
//SYSIN   DD    DUMMY
//SYSUT1  DD   DSN=IMSVS.MSDBC3,DISP=SHR
//SYSUT2  DD   DSN=IMSVS.BKUPCP1(+1),DISP=(,CATLG),
//             UNIT=SYSDA,SPACE=(CYL,(3,1),RLSE),
//             DCB=(IMSVS.MSDBC3)
/*
/*
*****************************************************************************
//** BACKUP MSDBC4 STEP (IF XRF SYSTEM) **
*****************************************************************************
//BKUPCP4 EXEC       PGM=IEBGENER,
//       COND=((0,EQ,RCFSTEP),(2,EQ,RCFSTEP),(4,LE,RCFSTEP))
//SYSPRINT DD   SYSOUT=&SOUT
//SYSIN   DD    DUMMY
//SYSUT1  DD   DSN=IMSVS.MSDBC4,DISP=SHR
//SYSUT2  DD   DSN=IMSVS.BKUPCP2(+1),DISP=(,CATLG),
//             UNIT=SYSDA,SPACE=(CYL,(3,1),RLSE),
//             DCB=(IMSVS.MSDBC4)
/*
*****************************************************************************
//** BACKUP MSDBINIT (IF NON-GDG) STEP **
*****************************************************************************
//BKUPINIT EXEC       PGM=IEBGENER,
//       COND=((2,GT,RCFSTEP),(4,LT,RCFSTEP))
//SYSPRINT DD   SYSOUT=&SOUT
//SYSIN   DD    DUMMY
//SYSUT1  DD   DSN=IMSVS.MSDBINIT,DISP=SHR
//SYSUT2  DD   DSN=IMSVS.BKUPINIT(+1),DISP=(,CATLG),
//             UNIT=SYSDA,SPACE=(CYL,(3,1),RLSE),
//             DCB=(IMSVS.MSDBINIT)
/*
*****************************************************************************
//** ANY OTHER INSTALLATION REQ'D STEPS **
```
```jcl
/** IMSVS CONTROL REGION STEP **

//IEFPROC EXEC PGM=DFSMVRC0,REGION=&RGN,DPRTY=&DPTY,
    PARM=(CTL,&RGSUF,
    . . . . . .)
// . . . . . .
// . . . . . .
// . . . . . .
/** . . . . (etc.) . . . .
```
Appendix C  Sample skeleton JCL procedures

The following topics are discussed in this appendix:

Skeleton members ................................................................. 77
Example 1: Sample DEDB recovery skeleton JCL .......................... 78
    RCFFRU JCL description .................................................... 80
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Skeleton members

When the automatic Fast Path Recovery Utility (FRU) invocation feature of the Fast Path Restart Control Facility (RCF) is used to perform DEDB recoveries, TSSRCF1 requires an RCFJCL DD statement in RCF job step JCL. The DD statement defines the library data set containing:

- The skeleton JCL members used by the RCF for submitting jobs to perform multi-thread Fast Path Recovery Utility (FRU) recovery of DEDBs.
- The jobs to invoke the IMS/VS batch backout utility (DFSBBO00) for processing full-function databases.
- The skeleton JCL member for the IMS log recovery utility (DFSULTR0).
- The skeleton JCL member for the IMS MSDB dump recovery utility (DBFDBDR0).
Table 14 lists the members that are used by RCF.

### Table 14 Members used by RCF

<table>
<thead>
<tr>
<th>Member</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCFFRU</td>
<td>contains a job statement and the JCL statements for the SORT, TSSAFR2, DBRC and TSSRCF2 job steps to process one Fast Path Recovery Utility DEDBxx data set created by TSSAFR1</td>
</tr>
<tr>
<td>RCFBBO</td>
<td>contains the job statement and JCL statements to perform IMS/VS batch backout processing for the full-function databases used by a PSB</td>
</tr>
<tr>
<td>RCFULTR0</td>
<td>contains the job statement and JCL statements to perform IMS Log Recovery</td>
</tr>
<tr>
<td>RCFDBDR0</td>
<td>contains the job statement and JCL statements to perform IMS MSDB Dump Recovery</td>
</tr>
</tbody>
</table>

Examples of the RCFFRU, RCFBBO, RCFULTR0, and RCFDBDR0 are shown in examples 1 through 4, respectively. The procedures must be set up as in-stream definitions, as shown in the examples, or as cataloged procedures available to jobs submitted through an MVS Internal Reader. The names of the procedures and the symbolic parameters set by RCF must be same as shown in the examples.

### Example 1: Sample DEDB recovery skeleton JCL

#### Figure 6 Sample DEDB recovery skeleton JCL (part 1 of 2)

```plaintext
//RCFFRU? JOB . . . . . . . .
//*
FLICTERNITION
//** RCFFRU SAMPLE JCL **
FLICTERNITION
//*
//RCFFRU PROC DEDBDSN='????????',DEDBXX='??',
// DEDBTYP='??',DEDBPRI='??',DEDBSEC='??',
// DEDBDEV='??',RCF2PRM='????????',SOUT='?'
//*
//SORT EXEC PGM=SORT,PARM='CORE=MAX'
FLICTERNITION
//** SORT DEDB DATA **
FLICTERNITION
//SORTLIB DD DSN=SYS1.SORTLIB,DISP=SHR
//SYSOUT DD SYSOUT=&SOUT
//SYSIN DD DSN=bmc.rcfv.cntl(RCFFRUCD),DISP=SHR
//SORTIN DD DSN=&DEDBDSN..DEDB&DEDBXX,
// DISP=(OLD,DELETE,KEEP)
//SORTOUT DD DSN=&DEDBDSN..DEDB&DEDBXX.S,
```
Figure 6  Sample DEDB recovery skeleton JCL (part 2 of 2)

```plaintext
// DISP=(NEW,CATLG,DELETE),
// UNIT=&DEDBDEV,
// SPACE=((&DEDBTyp,(&DEDBPri,&DEDBSec),RLSE)
//SORTWK01 DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//SORTWK02 DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//SORTWK03 DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//*
//TSSAFR2 EXEC PGM=TSSAFR2,REGION=1024K
//******************************************************************************
//** APPLY DEDB UPDATES **
//******************************************************************************
//STEPLIB DD DSN=bmc.fru.pgmload,DISP=SHR
//SYSPRINT DD SYSOUT=&SOUT
//REPORTS DD SYSOUT=&SOUT
//FRDDATA DD DSN=&DEDBDSN..DEDB&DEDBXX.S,
//     DISP=(OLD,DELETE,KEEP)
//DBRCCTL DD DSN=&DEDBDSN..DBRC&DEDBXX,
//     DISP=(NEW,CATLG,DELETE),
//     UNIT=&DEDBDEV,SPACE=(TRK,(10,5),RLSE)
//*
//DBRC EXEC PGM=DSPURX00,REGION=1024K,
//     COND=((2,EQ,TSSAFR2),(6,EQ,TSSAFR2),(10,EQ,TSSAFR2))
//******************************************************************************
//** OPTIONAL - UPDATE DBRC *
//******************************************************************************
//STEPLIB DD DSN=IMSVS.RESLIB,DISP=SHR
//IMS DD DSN=IMSVS.DBDLIB,DISP=SHR
//SYSPRINT DD SYSOUT=&SOUT
//SYSSIN DD DSN=&DEDBDSN..DBRC&DEDBXX,
//     DISP=(OLD,DELETE,KEEP)
//*
//TSSRCF2 EXEC PGM=TSSRCF2,COND=(8,LE,TSSAFR2),
//     PARM='&RCF2PRM'
//******************************************************************************
//** NOTIFY RCF *
//******************************************************************************
//STEPLIB DD DSN=BMC.RCF.FPSLIB,DISP=SHR
//*
//PEND
//*
```
The RCF appends the JCL statement shown in Figure 7 after the last statement read from the RCFFRU member.

**Table 15** describes the parameters used in the append JCL for RCFFRU.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDBXX</td>
<td>specifies the Fast Path Recovery Utility (FRU) data set to be used</td>
</tr>
<tr>
<td>SOUT</td>
<td>specifies the value from the RCF job step PARM data for SYSOUT data sets</td>
</tr>
<tr>
<td>RCF2PRM</td>
<td>specifies the address of the pseudo-ECB for TSSRCF2 to signal TSSRCF1 at completion of the TSSAFR2 processing, the IMS Subsys ID, the job type (F for Fast Path Recovery Utility), and the DEDBxx file ddname</td>
</tr>
</tbody>
</table>

The other DEDBxxx parameters are the values from the TYPE=FRU statement in the RCFALLOC module.

- The SORT control referenced by the SYSIN DD statement in STEP1 should be:

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

- The STEPLIB statement in Step TSSAFR2 must specify the load library containing the Fast Path Recovery Utility (FRU) programs.

- The STEPLIB statement in Step TSSRCF2 must specify the APF-authorized load library containing RCF programs.

- A job statement must be provided according to user-installation standards.

  If the jobname is specified as 1 to 7 characters suffixed with a ?, RCF will automatically create unique job streams by varying the value in the position occupied by the question mark to allow parallel job execution.

- All IMSVS.xxxxxxxx data set names must be set to specify the correct data sets for the IMS/VS system being supported by RCF.
Example 2: Sample Batch Backout skeleton JCL

NOTE
See sample JCL in FPS.SAMPLIB data set. Use RCFFRU for all IMS environments except RSR. Use RCFRURSR for RSR environments.

Example 2: Sample Batch Backout skeleton JCL

Figure 8 Sample Batch Backout skeleton JCL (part 1 of 2)

```plaintext
//RCFBBO  JOB  . . . .
//*
//**************************
//** RCFBBO SAMPLE JCL **
//**************************
//*
/YYYY RCFBBO PROC PSB='?',BBODYTM='?',
//            RCF2PRM='?',
//            SOUT='?',IMSID='?',
//            BBOLOGP='.........',
//            BBOLOGS='.........',
//            RGN=512K,BUF=8,SPIE=0,TEST=0,EXCPVR=0,RST=0,
//            LOGT=TAPE,PRLD=.,SRCH=0,CKPTID=.,MON=N,LOGA=0,
//            FMTO=.,SWAP=,DBRC=Y,IRLM=,IRLMNM=,BKO=N
//*
/YYYY BBO EXEC    PGM=DFSRRC00,REGION=&RGN,
/YYYY PARM=(DBB,DFSBB000,PSB,BUF,
/YYYY &SPIE&TEST&EXCPVR&RST,&PRLD,
/YYYY &SRCH,&CKPTID,&MON,&LOGA,&FMTO,
/YYYY &IMSID,&SWAP,&DBRC,&IRLM,&IRLMNM,&BKO)
/YYYY *********************************
/YYYY ** EXECUTE BATCH BACKOUT **
/YYYY *********************************
/YYYY STEPLIB  DD DSN=IMSVS.RESLIB,DISP=SHR
/YYYY DFSRESLIB DD DSN=IMSVS.RESLIB,DISP=SHR
/YYYY IMSACB  DD DSN=IMSVS.ACBLIB,DISP=SHR
/YYYY IMSACBA DD DSN=IMSVS.ACBLIBA,DISP=SHR
/YYYY IMSACBB DD DSN=IMSVS.ACBLIBB,DISP=SHR
/YYYY MODSTAT DD DSN=IMSVS.MODSTAT,DISP=SHR
/YYYY PROCLIB DD DSN=IMSVS.PROCLIB,DISP=SHR
/YYYY DFSVSAMP DD DSN=IMSVS.PROCLIB(DFSVSMMxx),DISP=SHR
/YYYY IEFRDER  DD DSN=BBBOLOGP.,PSB..BBBODYTM,
/YYYY DISP=(NEW,KEEP),VOL=(..99),UNIT=(LOGT..,DEFER),
/YYYY DCB=(RECFM=VB,BLKSIZ=1920,LRECL=1916)
/YYYY IEFRDER2 DD DSN=BBBOLOGS..PSB..BBBODYTM,
/YYYY DISP=(NEW,KEEP),VOL=(..99),UNIT=(LOGT..,DEFER),
/YYYY DCB=(RECFM=VB,BLKSIZ=1920,LRECL=1916)
```
RCFBBO JCL requirements

RCF appends the JCL statements shown in Figure 9 after the last statement read from the RCFBBO member.

Figure 9 Sample append JCL for RCFBBO

```
//EXEC RCFBBO,PSB=aaaaaaaa,BOBODYTM='Dyyddd.Thhmm',
//       SOUT=b,IMSID=cccccccc,
//       RCF2PRM='ddddddddddddddddddddd'
//IMSLOGR  DD DISP=SHR,DSN=...........
//IMSLOGR0 DD DISP=SHR,DSN=...........
//IMSLOGR9 DD DISP=SHR,DSN=...........
//SYSIN DD *
COLDSTART
//
```

Table 16 describes the parameters used in the append JCL for RCFBBO.

Table 16 RCFBBO parameters (part 1 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSB</td>
<td>specifies the PSB name identified by TSSAFR1 as requiring Batch Backout processing</td>
</tr>
<tr>
<td>BBODYTM</td>
<td>is the string Dyyddd.Thhmm, where yyddd is the current system date in Julian format and hhmm is the current time in 24-hour format</td>
</tr>
<tr>
<td>SOUT</td>
<td>specifies the SOUT parameter from the PARM data of RCF job step</td>
</tr>
</tbody>
</table>
IMSLOGRx DD statements are provided for up to the last ten log data sets used during previous session of the IMS/VS system. The parameters BBOLOGP and BBOLOGS in the procedure are set by the user to provide the first part of the data set name for the primary and secondary output logs, respectively. These values must not exceed 22 characters to avoid JCL errors (for example, data set names longer than the MVS maximum of 44 characters).

If a cold start is being performed, the SYSIN control statement COLDSTART is added to the JCL.

The procedure shown logs the Batch Backout changes to data sets with data set names composed of the values of the BBOLOGP and BBOLOGS parameters suffixed by the PSB name and BBODYTM values. These logs must be retained so they can be included in any subsequent recoveries of the databases involved in the backout. For example, if:

- The BBOLOGP value is IMSVS.RCF.
- The PSBs DDAPSB, LONPSB and SAVPSB require Batch Backout processing.
- The current date is 86.210 (29 July, 1986).
- The time is 4:00 PM.

Then, the primary log data set names will be:

```
IMSVS.RCF.DDAPSB.D86210.T1600
IMSVS.RCF.LONPSB.D86210.T1600
IMSVS.RCF.SAVPSB.D86210.T1600
```

Note the following items about the JCL:

- A job statement must be provided according to user-installation standards.
- IMS/VS at Releases 2.1 and later supports dynamic allocation of databases for Batch Backout.

### Table 16  RCFBBO parameters (part 2 of 2)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMSID</td>
<td>specifies the IMSID parameter from the PARM data of RCF job step. In an IMS/VS-XRF environment, the value used will be the RSENAME data found by RCF in the appropriate DFSHSBxx member of the IMS system PROCLIB data set.</td>
</tr>
<tr>
<td>RCF2PRM</td>
<td>specifies the address of the pseudo-ECB for TSSRCF2 to signal TSSRCF1 at completion of the Backout processing, the IMS Subsys ID, the job type B (for Backout) and the PSB name being processed.</td>
</tr>
</tbody>
</table>

RCFBBO JCL requirements
Example 3: Sample log recovery JCL

- The parameters other than the data set names on the IEFRDER and IEFRDER2 DD statements should be changed to conform to the installation standards, as desired.

  The IEFRDER2 DD statement and BB0LOGS symbolic parameter should be omitted if the user installation does not do dual logging.

- The DFSVSAMP DD statement must be set to reference the desired IMS/VS VSAM Buffer Pool member in the IMS/VS PROCLIB data set. If you are using the Coupling Facility in a Sysplex environment, this DD statement might be required. Specify the CFNAMES control statement and appropriate parameters. Refer to the IBM IMS System Definition Reference, for the explanation of the CFNAMES control statement.

- All IMSVS.xxxxxxxx data set name must be set to specify the correct data sets for the IMS/VS system being supported by RCF.

- The STEPLIB statement in Step TSSRCF2 must specify the APF-authorized load library containing RCF programs.

- Refer to the IBM IMS/VS Utilities Reference manual and the IMS/VS System Programming Reference manual for further information on the requirements for Batch Backout and the DBBBATCH procedure.

**NOTE**

See sample JCL in FPS.SAMPLIB data set. Use RCFBBO for all IMS environments except RSR. Use RCFBBRSR for RSR environments.

Example 3: Sample log recovery JCL

Figure 10  Sample log recovery JCL (part 1 of 2)

```
//RCFULTRO JOB . . . . .etc
/**
//++++++++++++++++++++++++++++++++++++++++++++++++++++++
/**
//**           RCFULTRO sample jcl           **
//**
//++++++++++++++++++++++++++++++++++++++++++++++++++++++
/**
//DFSULTRO PROC IMSID='????'
/**
//DFSULTRO EXEC PGM=DFSULTRO,PARM='IMSID=&IMSID.'
//STEPLIB DD DISP=SHR,DSN=IMSVS. . . .
//SYSPRINT DD SYSOUT=* 
//SYSUDUMP DD SYSOUT=* 
```
RCFULTR0 JCL requirements

RCF appends the JCL statements shown in Figure 11 after the last statement from the RCFULTR0 member.

**Figure 11  Sample append JCL for RCFULTR0**

```plaintext
//EXEC DFSULTRO,IMSID=sss
//SYSIN DD *
CLS
//DFSOLP   DD DISP=SHR,DSN=IMSVS. . . .
//DFSWADSO DD DISP=SHR,DSN=IMSVS. . . .
 . . .
//DFSWADS9 DD DISP=SHR,DSN=IMSVS. . . .
```

The IMSID parameter is used in the append JCL for RCFULTR0. The parameter specifies the IMSID parameter from the PARM data of RCF job step. In an IMS/VS-XRF environment, the value used will be the RSENAME data found by RCF in the appropriate DFSHSBxx member of the IMS system PROCLIB data set.

The JCL uses the following DD statements:

- The SYSIN DD indicates to the log recovery utility to do a log close.
- The DFSOLP DD identifies the current log to be closed.
- The DFSWADSlxx DD identifies the IMS WADS data sets defined to IMS. A job statement must be provided according to user-installation standards.

All IMSVS.xxxxxxxx data set names must be set to specify the correct data sets for the IMS system being supported by RCF. Refer to the IBM *IMS Utilities Reference* manual for further information.
Example 4: Sample MSDB dump recovery JCL

**Figure 12**  Sample MSDB dump recovery JCL

```plaintext
//RCFDBDRO JOB . . . . .etc
//*
//*******************************************************************************
//**                       RCFDBDRO sample jcl                              **
//*******************************************************************************
//DBFDBDRO PROC IMSID='????'
//*
//DBFDBDRO EXEC PGM=DBFDBDRO
//STEPLIB DD DISP=SHR,DSN=IMSVS.R???? RESLIB
//MSDBPRT DD SYSOUT=* 
//SYSUDUMP DD SYSOUT=* 
//    PEND 
//*
```

**RCFDBDRO JCL description**

RCF appends the JCL statements shown in Figure 13 after the last statement from the RCFDBDRO0 member when a recovery is being done.

**Figure 13**  Sample append JCL for RCFDBDRO0

```plaintext
/// EXEC DBFDBDRO
///SYSIN DD *
///RECOVERY DBN=ALL
///MSDBCP1 DD DISP=SHR,DSN=IMSVS. . . . 
///MSDBCP2 DD DISP=SHR,DSN=IMSVS. . . . 
///MSDBCP3 DD DISP=SHR,DSN=IMSVS. . . . 
///MSDBCP4 DD DISP=SHR,DSN=IMSVS. . . . 
///MSDBINIT DD DISP=SHR,DSN=IMSVS. . . . 
///IEFRDER DD DISP=SHR,DSN=IMSVS. . . . 
///     DD DISP=SHR,DSN=IMSVS. . . . 
```

The JCL uses the following DD statements:

- The SYSIN DD identifies the action to be performed.
- The MSDBINIT DD identifies the output MSDBINIT data set.
- The MSDBDUMP DD identifies the source MSDB checkpoint or dump data set.
The MSDBCPx DD identifies the MSDB checkpoint data sets. In an IMS-XRF environment, checkpoints 3 and 4 are present.

The IEFRDER DD statement identifies the logs to be used for recovery.

Note the following items about the JCL:

- A job statement must be provided according to user-installation standards.
- All IMSVS.xxxxxxxx data set names must be set to specify the correct data sets for the IMS system being supported by RCF.
- Refer to the IBM *IMS Utilities Reference* manual for further information.
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