Log Master for DB2 User Guide

Supporting products

Version 12.1.00 of Log Master for DB2
Version 12.1.00 of BMC Recovery for DB2
Version 12.1.00 of Recovery Management for DB2

December 2016
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<tbody>
<tr>
<td>BMC SOFTWARE INC</td>
<td>1 713 918 8800</td>
<td>1 713 918 8000</td>
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<tr>
<td>2103 CITYWEST BLVD</td>
<td></td>
<td>or</td>
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<tr>
<td>HOUSTON TX 77042-2827 USA</td>
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<td>1 800 841 2031</td>
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Before contacting BMC
Have the following information available so that Customer Support can begin working on your issue immediately:

■ Product information
  — Product name
  — Product version (release number)
  — License number and password (trial or permanent)
■ Operating system and environment information
  — Machine type
  — Operating system type, version, and service pack or other maintenance level such as PUT or PTF
  — System hardware configuration
  — Serial numbers
  — Related software (database, application, and communication) including type, version, and service pack or maintenance level
■ Sequence of events leading to the problem
■ Commands and options that you used
■ Messages received (and the time and date that you received them)
  — Product error messages
  — Messages from the operating system
  — Messages from related software
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- In the United States and Canada, call 1 800 537 1813. Outside the United States and Canada, contact your local support center for assistance.
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About this book

This book contains detailed information about the associated product or products. This preface explains the special conventions that the book uses, and how to access related publications.

If applicable, the preface also summarizes the major changes included in the latest release of the product.

Related publications

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  - BMC Mainframe YouTube channel (https://www.youtube.com/user/BMCSoftwareMainframe)


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Tip
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Conventions

This document 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: 
  \texttt{testsys/instance/fileName}
- Menu sequences use a symbol to convey the sequence. For example, \texttt{Actions => Create Test} instructs you to choose the \texttt{Create Test} command from the \texttt{Actions} menu.

Summary of changes

This topic summarizes product changes and enhancements by version number and release date.

Version 12.1.00 December 2016

This release of Log Master includes the following product enhancements and changes:

Support for IBM DB2 Version 12

Log Master version 12.1.00 supports IBM DB2 Version 12, including the following new features.

Relative page numbers

You can now create or alter range-partitioned table spaces to support relative page numbers (RPNs) for increased size and flexibility. Without this feature, partition
information is still embedded in the page number, resulting in an absolute page number. With this feature, the partition information is separate from the page number, so the resulting page number reflects the relative page number for the partition. For reporting purposes, the partition number of an RPN space appears separately.

In logical log output, both the table space information record (DTSI) in the control file and the data change record (LLDF) in the data file include a new PAGENUMFMT field. This field indicates whether the space utilizes absolute (A) or relative (R) page numbers.

This release removes the following fields, which were unused, from the DTSI:

- UNTRANVCATNAMEFLAG
- UNIVCATNAMELEN
- UNIVCATNAME

Continuous delivery

DB2 Version 12 supports a continuous delivery model at the code, catalog, and function levels. Each level specification includes version, release, and modification components in vvrmmm format. The level information of the host subsystem appears in the BMC097078I message.

Example

| BMC097078I 001 SUCCESSFUL CONNECT TO DLK2(RELEASE 121500 OF DB2) USING PLAN ALPB1210 |
| CATALOG LEVEL(V1R1M500) | CURRENT FUNCTION LEVEL (V12R1M500) |
| HIGHEST ACTIVATED FUNCTION LEVEL (V12R1M500) |

For earlier versions, BMC097078I continues to appear as it did before this release.

Example

| BMC097078I 001 SUCCESSFUL CONNECT TO DIZ2 (RELEASE 1010(NFM ) OF DB2) USING PLAN ALPB1210 |

In logical log output, the type record (XTYP) in the control file includes new FUNCTIONLEVEL, CODELEVEL, and CATALOGLEVEL fields. For DB2 Version 12, you should use these fields instead of the legacy FUNCTIONLEVEL, DB2VERSION, and DB2CATALOGMODE fields. The DB2VERSION field is set to a constant Z99 value to indicate that you should use the new fields.
LOB compression

This release supports decompression of LOB data that has been compressed with IBM zEnterprise Data Compression (zEDC) hardware. If zEDC hardware decompression fails, Log Master attempts decompression via software emulation.

DDL syntax

This release supports new DB2 Version 12 data definition language (DDL) syntax.

This release also adds the following changes to support the new catalog activity type TRANSFER:

- TRANSFER keyword in the catalog activity definition syntax used in the WHERE clause of the LOGSCAN statement
- TRANSFERCOUNT column in the repository history table (ALPDDLF), indicating the number of TRANSFER OWNERSHIP DDL statements in the file
- TRANSFEROWNERSHIP column in the Filter Line table
- Transfer to the list of catalog activity values in the user interface for filter generation

Key store data moved above the bar

Starting with this release, key store data spills to above-the-bar (ATB) storage (that is, above the 2-gigabyte address) instead of to DASD, improving Log Master performance.

This release deprecates the following installation options:

- KSALLOCU
- KSSPACE
- KSSTOR
- KSDACLS
- KSMGMT
- KSCLUST
- KSDATA
- KSVOLS
- QBLRBUF

This release also deprecates the following options in the STOREOPTS statement syntax:
Compression dictionaries moved above the bar

In earlier releases, Log Master loaded compression dictionaries below the bar (that is, below the 2-gigabyte address), where the amount of available memory was limited. The default amount of memory was 50 MB. You could override this amount by using the DICTSPC installation option.

In this release, Log Master loads compression dictionaries above the bar (that is, above the 2-gigabyte address) and deprecates DICTSPC. By default, an unlimited amount of memory is available for storing compression dictionaries. However, you can use the DICTIONARYSPACE option in the OPTION statement if you want to specify a limit.

Note
If you already have jobs that use OPTION DICTIONARYSPACE to limit the space for compression dictionaries, BMC recommends removing that option. Doing so allows Log Master to allocate the maximum amount of memory needed for log processing.

QUIESCEAGING installation option

This release adds the QUIESCEAGING installation option. This option enables you to exclude members of a data sharing subsystem from processing if they have been quiesced.

IBM DB2 Version 12 DDL syntax

This release adds the following to support DB2 Version 12 DDL syntax:

- The new catalog activity type TRANSFER in filters. The TRANSFER keyword is added to the catalog activity definition syntax used in the WHERE clause of the LOGSCAN statement.
The TRANSFERCOUNT column to the repository history table (ALPDDLF) indicating the number of TRANSFER OWNERSHIP DDL statements in the file.

The TRANSFEROWNERSHIP column to the Filter Line Table.

Catalog Activity Value panel (ALPW180) to select a new type of catalog activity.

Catalog Activity Values panel (ALPW181) to select a new activity type.

**USEUTILITYDELETES installation option**

This release adds the USEUTILITYDELETES installation option.

This option specifies whether Log Master should use the delete record logged by the DSNUTILB utility when invoked by any of these:

- DB2 LOAD
- REPAIR utilities
- EXEC SQL statement

**Access to the SYSLGRNX table**

Starting with this release, Log Master no longer has indirect access to the SYSIBM.SYSLGRNX table. If you are using IBM DB2 Version 11 or later, Log Master can access the SYSLGRNX table directly because SYSLGRNX is defined in the DB2 catalog.

In DB2 Version 10, however, the SYSLGRNX table was delivered by IBM APAR PM35190 and subsequently updated by IBM APAR PM55333. Therefore, if you are using a DB2 Version 10 subsystem, you must ensure that CATMAINT has been executed for both PM35190 and PM55333 to define the SYSLGRNX table in the DB2 catalog.

**Drop recovery of table spaces and tables dropped in separate units of recovery (URs)**

Log Master now supports drop recovery of tables, table spaces, and databases dropped in separate URs.

**Dynamic allocation of outcopy output data sets for drop recovery**

Instead of specifying a ddname for outcopy, you use dynamic allocation of outcopy output data sets to perform drop recovery of databases and table spaces.
This release updates the following panels accordingly:

- Dropped Object Names Maintenance
- NGT Recover Outcopy Specification
- Generate Automated Drop Recovery

**DB2 spanned LOAD format**

Log Master LOAD now supports large object (LOB) or XML data in spanned record output for UNLOAD PLUS for DB2 and Log Master formats. Log Master can generate LOAD spanned output files for LOADPLUS for DB2 and IBM DB2 LOAD.

**New panel for selecting report ordering options**

For defining standard default reports, this release moves the report ordering options from the Report Output panel (ALPP054) to a new panel, the Report Order By Options panel (ALPW249). You access the new panel by entering E in the new **Edit Order By** field on the Report Output panel.

See “Defining a default report” on page 137.

**New SYSTEM ID column in load-related log records**

For load data files and control file output, this release adds a SYSTEM ID informational column in the log record information.

This column is useful if you need to process data in character format (as opposed to the Log Master internal binary format. For example, you might need this information when migrating data to another platform or to a data warehouse as part of an extract, transform, and load (ETL) process.

**LARGE data set type**

This release adds data set type LARGE to the DSNTYPE allocation parameter for the LOGSCAN statement.

**Version 11.2.00 May 2015**

This release of Log Master includes the following product enhancements and changes:

End of support for DB2 V9
Starting with this release, Log Master does not support IBM DB2 Version 9. Earlier releases will continue to support Version 9. In addition, Log Master supports DB2 Version 10 only in new-function mode.

New reports and report enhancements

- Enhancements to quiet-point reporting
  This release offers enhancements to quiet-point reporting through new batch syntax:

  — You can define a log mark to be updated with the quiet point RBA/LRSN. Subsequently, you can use the log mark instead of the RBA/LRSN value in product syntax.

  Note
  Log Master stores information about log marks in the Log Master repository.

  — With the NOQUIETPOINTRC option, you can specify a return code (RC) with which Log Master will terminate if no quiet points are found. NOQUIETPOINTRC also lets you control the severity code (I, W, E, S, or U) of the message that is displayed when no quiet points are found (BMC097547). For more information, see the Log Master for DB2 Reference Manual.

- Ability to set time intervals for control breaks
  You can now select a time interval to control how frequently Log Master reports information related to transaction volume (for example, logged time, commit time, and URID time). You can specify any interval from 1 second to 24 hours.

- Ability to see WHERE clauses in report output
  You can now include the LOGSCAN filter in report output and specify where you want the filter to be displayed (for example, in the report header or the page header).

- Ability to see a changed-column indicator in Detail reports
  You now have the option of seeing a changed-column indicator in Detail reports that use horizontal format (similar to vertical format).

  Note
  By default, "*" defines vertical format and a blank defines horizontal format, but you can change these definitions.

- New report showing the column update frequency
  This new summary report can help you determine whether placing an index on columns could be detrimental when the table is updated. The column detail includes the:

  — Column name
— Column number
— Column type
— Indexed column
— Frequency with which the column has been updated
— Total number of column updates

■ Ability to report Database Exception (DBE) records and status changes
Log Master can now report on the Database Exception (DBE) records that are logged by DB2 utilities such as REORG and REPAIR. This information can be especially useful in recovery situations.
This enhancement also includes a new LLOG option that can report status changes in logical log output. For more information, see the Log Master for DB2 Reference Manual.

■ Support for MIGRATE and UNDO COMMAND output
You can now include the COMMAND output in the same LOGSCAN statement as DDL, CATALOG ACTIVITY, or REPOS UPDATE (but not with other forms of output, such as SQL or LOAD). The commands generated include:
— FREE PLAN
— FREE PACKAGE
— BIND PLAN
— BIND PACKAGE
— REBIND PLAN
— REBIND PACKAGE
You can apply the following filters:

<table>
<thead>
<tr>
<th>Filter</th>
<th>Selects log records based on a specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSPLAN</td>
<td>Plan name</td>
</tr>
<tr>
<td>SYSPACKAGE</td>
<td>Package collection ID and package name</td>
</tr>
<tr>
<td>SYSPACKAGE LOCATION</td>
<td>Package location</td>
</tr>
<tr>
<td>SYSPACKAGE COLLECTION</td>
<td>Package collection ID</td>
</tr>
<tr>
<td>SYSPACKAGE NAME</td>
<td>Package name</td>
</tr>
<tr>
<td>SYSPACKAGE VERSION</td>
<td>Package version</td>
</tr>
</tbody>
</table>

■ New symbolic variables for use with LOAD SEPARATE DATASET YES
This release provides the following new symbolic variables:
— &DBNAME
— &TSNAME
— &DBID
— &PSID
Ability to delimit column names and keywords in the control file

You can use the following new LOAD CONTROL FILE options to control how Log Master delimits column names and keywords in the control file:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONLY</td>
<td>Delimits keywords and column names that require delimiters</td>
</tr>
<tr>
<td>NONE</td>
<td>Does not delimit any keywords or column names</td>
</tr>
<tr>
<td>ALL</td>
<td>Delimits all keywords and column names</td>
</tr>
</tbody>
</table>

For more information, see the *Log Master for DB2 Reference Manual*.

New CSV format options

This release offers new syntax for controlling how LOAD Comma Separated Value (CSV) data is formatted. The new syntax options are as follows:

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELIMIT[CONTROL]COLUMN NAME {ONLY</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td>You can specify up to eight characters. The default is a double quotation mark (&quot;),</td>
</tr>
<tr>
<td></td>
<td>You can specify leading and trailing delimiters, and the delimiters can be represented in hexadecimal.</td>
</tr>
</tbody>
</table>
### Syntax

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
</table>
| ENCLOSED[BY]delimiter[AND delimiter] | — The **ENCLOSEDBY** option specifies the delimiters used to enclose your string/text fields data. The default is a double quotation mark ("). If the **AND** option is provided, the delimiter is used only to enclose the left side of data; otherwise, it is used to enclose both sides of your data (left and right).

— The **AND delimiter** option specifies the delimiter used to enclose the right side of your string/text data. The default is a double quotation mark ("). If you do not specify a value for this option, the value specified for the **ENCLOSEDBY** option will be used.

**Note:** You must ensure that the multiple-character delimiter that you specify is not contained in your column data. |
| TERMINATED[BY] delimiter | Specifies which character (or characters) to use to delimit field data. You can specify up to eight characters. The default is a comma (,). The delimiters can be represented in hexadecimal. |
| DECIMAL POINT {char | COMMA | PERIOD} | Specifies which character to use for decimal points. You can specify one character. The default is a period (.). **Note:** You can also specify the keyword COMMA or PERIOD. |
| TRANSLATE char1 TO char2 | Defines translation rules. If char1 is found in a column string, Log Master will replace it with char2. The characters can be represented in hexadecimal. |

For more information, see the *Log Master for DB2 Reference Manual*.

**Enhancements involving compression dictionaries**

Log Master now uses incremental copies to obtain compression dictionaries and also accounts for compression dictionaries rebuilt because of LOAD or REORG utilities running during Log Master execution.

**REPAIR VERSIONS option for automated drop recovery**
Log Master now supports automated drop recovery of versioned table spaces or tables.

If you need to recover a versioned table space or table, Log Master now includes the UPDATE VERSIONS option which instructs RECOVER+ to update versions, and generate REPAIR VERSIONS or CATALOG commands in a new REPAIR output. For more information, see the Log Master for DB2 Reference Manual.

**Version 11.1.00 June 2013**

This release fixes known problems and includes the following enhancements:

**DB2 support**

Log Master supports the following versions of DB2:

- Version 10
- Version 9

DB2 Version 8 is no longer supported. Most references to DB2 Version 8 have been removed from this book.

**Logical log changes**

Changes have been made to the logical log to support extended RBAs and LRSNs, as well as extended timestamps. For more information, see the Log Master for DB2 Reference Manual. However, Log Master allows for processing of earlier versions (back to version 7.3.00) of the logical log with normalization performed as needed to work with the new format.

**Reuse of Log Master repository tables**

Log Master now supports the ability to point to existing Log Master tables when installing a new version of the product in order to avoid unload or load of the tables. The Updated Version field has been added to the following panels, and if the panels are shown in this book, they have been updated:

- Filter Browser
- Filter Information
- Free Form Filter Maintenance
- Log Mark Information
- Ongoing Record History Information
- Overtime Object Information
- Structured Filter Maintenance
Template Information
Template Maintenance
Work ID Information
Work ID Maintenance

This field is empty if the records were created prior to Log Master version 11.1.

LOGTAPES for DASD log files and new TAPES installation option

LOGTAPES is ignored if DB2 log files to be read are DASD files, or the number of actual tape units is not greater than the LOGTAPES value in a subsystem with mixed tapes/DASD log files. For this new behavior, the TAPES installation option is added in order to find what devices are tapes. (For a description of the TAPES installation option, see the Log Master for DB2 Reference Manual.)

Support for automated drop recovery of clone tables

If a table space or table to be recovered has a clone table, Log Master now generates syntax that instructs RECOVER PLUS to use image copies to recover the clone table.

Data set names, symbolic variables, and the new DSNSYMPRE installation option

The DSNSYMPRE installation option allows you to control if Log Master forces the prefix for &TABNAME and &WORKID in input and output data set names. With DSNSYMPRE=YES, the default, Log Master always adds the prefix. With DSNSYMPRE=NO, Log Master adds the prefix only if the first character of the node is not an alphabetic or a national character. (For a description of the DSNSYMPRE installation option, see the Log Master for DB2 Reference Manual.)

This enhancement:
- Removes the requirement for &TABOWN for SEPARATE DATASETS
- Updates the actions that Log Master performs to create a valid data set name

For more information, see the Log Master for DB2 Reference Manual.

Support user-selection of image copy resources

Log Master adds the following installation options:

- LOCCPSEL=(FC, LP, LB)
- REMCPSEL=(RP, RB, FC)

These installation options allow you to select the order in which Log Master uses image copy resources for both completion processing and compression dictionary access for data decompression at local and remote sites.
To override the value of these installation options at runtime, Log Master adds the OPTIONS RESOURCE SELECTION COPIES syntax.

For more information, see the Log Master for DB2 Reference Manual.

Provide a USELOGS override

Log Master adds LOGS to the OPTIONS command, RESOURCE SELECTION syntax to enable you to override the USELOGS installation option.

For more information, see the Log Master for DB2 Reference Manual.

Support for graphic data in predicate values

Log Master supports UX for Unicode graphic data and GX for EBCDIC graphic data in predicate values, as well as a string for Unicode graphic data.

For more information, see the Log Master for DB2 Reference Manual.

Support for versioned rows with inline LOBs

Log Master now supports versioned rows with inline LOBs. Log Master no longer issues error message BMC397064E (removed)

Support for REUSABLE striped data sets

Log Master now allows use of REUSABLE striped data sets. Restrictions no longer apply. Log Master no longer issues error message BMC097197 (removed).

BMCXCOPY analysis for automated drop recovery

Log Master now supports an automated drop recovery of a table space using the following copies registered in BMCXCOPY:

- Encrypted copies
- Snapshot copies
- Standard copies

Cabinet copies are not supported.

Mass delete and exchange records in load outputs

Log Master now includes the mass delete and exchange records in load outputs. For more information, see the Log Master for DB2 Reference Manual.

Quiesce records for COPY YES indexes
When you request the Quiet Point report and you request an insert of a quiesce record in SYSIBM.SYSCOPY at the same time that you generate the Quiet Point report, Log Master now inserts index quiesce records into SYSIBM.SYSCOPY for COPY YES indexes along with the table space. Log Master includes information about the indexes in the Quiet Point report.

Enhanced messages for DB2 log processing

Log Master adds messages that provide the information necessary to determine the progress of log processing. See messages BMC397070 and BMC397071 in the BMC Documentation Center.

Support for optional column names in SQL INSERT

Log Master now provides an option to omit the column name list clause for INSERT statements in SQL output. The field **Exclude INSERT COLUMN NAMES** (Y=Yes, N=No) has been added to the SQL Options panel.

Enhanced report templates

Log Master now provides sample report templates for Summary, Audit, and Detail reports with control breaks on Table Name and Create Timestamp.

For more information, see the Log Master for DB2 Reference Manual.

Documentation changes

This release includes the following documentation changes:

- All messages are now available in the BMC Documentation Center, which is accessible from the BMC Support Central site (http://www.bmc.com/support). A separate messages manual is no longer available.

- Installation and configuration information is now located in the following books:
  - Installation System User Guide
  - BMC Products and Solutions for DB2 Configuration Guide

Version 10.1.00 April 2011

This release fixes known problems and includes the following enhancements:

DB2 Version 10 support

High-speed Apply Engine supports all DB2 Version 10 features. Log Master supports the following DB2 Version 10 features:
- New active log data sets command
- Auto-compression (compress on INSERT)
- Catalog changes and restructuring
  The following new keywords and interface options support this feature: MASK and PERMISSION.
- DEFINE NO LOB and XML spaces
- New DBA privileges
  The section on DB2 authority in the *Log Master for DB2 Reference Manual* now includes DBADM.
- Hash access
  Log Master supports the use of the hash index as a primary key or a unique key index.
- IBM FlashCopy image copies
- INDEX INCLUDE columns
  Log Master supports non-indexed columns added to a unique index. The products use INCLUDE columns for analysis, but only unique key columns when generating SQL.
- Inline LOBs
- Skip level migration
  Log Master supports migrating to DB2 Version 10 from DB2 Version 8, which introduces several new migration modes:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM8</td>
<td>Conversion mode from DB2 Version 8</td>
</tr>
<tr>
<td>CM8*</td>
<td>Conversion mode* from DB2 Version 8</td>
</tr>
<tr>
<td>CM9</td>
<td>Conversion mode from DB2 Version 9</td>
</tr>
<tr>
<td>CM9*</td>
<td>Conversion mode* from DB2 Version 9</td>
</tr>
<tr>
<td>ENFM8</td>
<td>Enabling-new-function mode from DB2 Version 8</td>
</tr>
<tr>
<td>ENFM8*</td>
<td>Enabling-new-function mode* from DB2 Version 8</td>
</tr>
<tr>
<td>ENFM9</td>
<td>Enabling-new-function mode from DB2 Version 9</td>
</tr>
<tr>
<td>ENFM9*</td>
<td>Enabling-new-function mode* from DB2 Version 9</td>
</tr>
<tr>
<td>NFM</td>
<td>New-function mode</td>
</tr>
<tr>
<td>Mode</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>a</td>
<td>Before using BMC products in this mode, you must run the IBM job DSNTIJEN to successful completion. DSNTIJEN converts DB2 to enabling-new-function mode from DB2 Version 8 or 9.1. Successful completion of DSNTIJEN completes catalog migration. BMC does not support DB2 catalogs that are not completely migrated.</td>
</tr>
</tbody>
</table>

- Greater timestamp precision (extends microseconds to 12 places, but 6 remains the default)
- TIMESTAMP WITH TIME ZONE data type
- Extended Address Volumes (EAVs)
- Last/currently committed data
  Log Master supports logging changes that are associated with this feature.
- Temporal tables
  - The following new keywords and interface options support this feature: INCLUDE HISTORY, IGNOREFIELDS, PERIODOVERRIDE.
  - New record types in the following Repository tables support this feature: Data change record (LLDF) and Old objects table (ALPOLDO).
  Similar to the behavior of DB2, the Log Master Repository does not maintain the versioning relationship between a system-maintained table and its associated history table. Therefore, for overtime processing, your filter must include both the base table and the history table.

- Segmented MEMBER CLUSTER for universal table spaces (UTSs)
- Online reorganization changes
- Online schema changes
- Checking the integrity of XML documents

**LOB completion processing enhancements**

Log Master provides enhanced LOB completion processing, which provides the following benefits:

- Log Master can generate SQL with LOB column data for delete actions and update actions.
- The High-speed Apply Engine can apply logical log input when the value of the SQLType parameter is Undo, and can include LOB column data for delete actions and update actions.
- Log Master automatically includes LOB catalog objects in MIGRATE and UNDO DDL, automated drop recovery, logical logs with INCLUDE DDL, and combined SQL output.

- Log Master provides undo detail for objects that are specified with the LOGGED parameter.

- Log Master ensures full DDL generation of objects with DDL text that is stored in DB2 catalog LOB columns. These objects include VIEWs, TRIGGERs, native STORED PROCEDUREs, materialized query tables (MQT), pending DDL, and SQL functions.

**XBM zIIP redirection support**

Log Master provides the option to offload eligible processing to an IBM System z Integrated Information Processor (zIIP). To enable and use zIIP processing, you must have an installed and authorized version of the EXTENDED BUFFER MANAGER (XBM) product or the SNAPSHOT UPGRADE FEATURE (SUF) technology.

Note the following XBM or SUF requirements:

- The minimum version of XBM or SUF is 5.6.00 with PTF BPE0313.
- To enable DB2 Version 10 support, XBM and SUF require PTF BPE0311.

The ZIIP command on the OPTIONS statement and the ZIIP installation option enable this functionality.

For more information about the XBM component that enables the use of zIIPs, see the *EXTENDED BUFFER MANAGER and SNAPSHOT UPGRADE FEATURE User Guide*.

**Report enhancements**

Log Master provides the following enhancements to reports:

- A report template support is available for the Drop Recovery report.
- The Catalog Activity report indicates DDL pending changes.
- Reports now display URID ELAPSED TIME, where applicable.

**Automated drop recovery enhancements**

Log Master provides the following enhancements to automated drop recovery:

- A report template for the Drop Recovery report.
- An optional step in the generated JCL runs the RUNSTATS utility for recovered objects.
Other enhancements and changes

This release includes the following additional enhancements and changes:

- You can direct all types of output to the dd name that you specify (in addition to a file or SYSOUT).

- Log Master output SQL no longer includes DELETE statements that are logged by a utility. This change eliminates failed DELETE attempts or erroneous DELETES when duplicate rows exist. For more information, see the section about special considerations for output files and SQL in the Log Master for DB2 Reference Manual.
Overview of Log Master for DB2

This chapter provides an overview of the Log Master for DB2 product, describing the product's basic features, architecture, and operational and installation considerations. A task roadmap lists the specific tasks that you can perform and points to step-by-step instructions for completing them.

Features and functions

The Log Master for DB2 product enables you to access and use the DB2 log for purposes beyond restart and recovery. With Log Master, you can easily retrieve information stored in DB2 log records to support data migration and audit tasks. Special product features provide innovative solutions to the complex problems associated with logical backout and recovery of application transactions.

Log Master features help you:

- Perform recovery tasks:
  - Identify and analyze problem transactions
  - Automate the recovery of dropped objects
  - Generate data definition language (DDL) statements or objects
  - Analyze quiet points

- Migrate data between databases, systems, and platforms

- Perform auditing tasks:
  - Audit log information
  - Create logical log files
  - Get performance and statistical information
  - Analyze Data Capture Changes (DCC) impact
  - Support DB2 table-level security

- View DB2 subsystem log status

- Support DB2 data sharing environments
Note

Log Master cannot report on table types for which:

- Activity is not logged, such as global temporary tables (GTT) and objects defined with LOG NO
- Schema is not stored in the DB2 catalog, such as declared temporary tables (DTT) and the directory

Log Master recovery tasks

Log Master provides functionality that enables you to perform transaction-level recoveries (undo and redo transactions), recover dropped objects, and discover quiet points for point-in-time recovery.

Identification and analysis of problem transactions

By analyzing activity reflected in the DB2 log, Log Master identifies problem transactions and generates SQL statements to back them out.

Good transactions (including those that apply to the same rows as the problem transactions) are not affected. Your database tables remain online throughout the backout process. For more information, see “Backing out problem transactions” on page 155.

Automated dropped objects recovery

An automated drop recovery work ID creates several forms of output that enable Log Master, working with a recover utility, to recover DB2 objects that have been dropped from the DB2 catalog.

Log Master can also create JCL to execute the different types of output in the right order to accomplish the recovery. For more information, see “Recovering dropped objects” on page 175.

Generation of DDL statements or objects

Log Master enables you to generate data definition language (DDL) files for migration or to reverse unwanted changes (UNDO DDL). You can process DB2 catalog log records within the log scan step and specify DDL as output. For more information about generating DDL, see “DDL output files” on page 94.
Optionally, you can include DDL objects in an output logical log file. DDL objects represent the DDL activity selected by your filter, but are not the same as the DDL statements that Log Master generates. A DDL object can represent multiple DDL statements, and a DDL statement can represent multiple insert, update, or delete actions against tables in the DB2 catalog. The DDL objects in a logical log file can be interpreted as input by Log Master or by the High-speed Apply Engine that is distributed with Log Master.

**Analysis of quiet points**

Log Master can analyze the log for a given time frame to determine log ranges during which no transactions were in process for a set of table spaces. Use this information to select start and end points as you recover from problem transactions (possibly with a conventional recovery and REDO SQL).

Optionally, you can specify a minimum duration to exclude shorter quiet ranges from the report. When you specify a duration, Log Master suppresses any quiet ranges that are shorter than the time value you specify. Use the option to exclude quiet ranges that represent only momentary pauses between parts of an overall "logical" transaction. By excluding shorter ranges, you can concentrate on times when there is truly no activity for your table spaces. For more information, “Quiet Point report” on page 363.

**Data migration with Log Master**

Because Log Master migrates only changed data, migration is faster and uses fewer resources than other common migration tools.

You can migrate database changes to other platforms by using the versions of the High-speed Apply Engine that run on mainframe DB2 subsystems, or on distributed systems (UNIX or Windows) against target databases on Oracle or IBM DB2 for Linux, UNIX, and Windows (LUW). For more information, see “Migrating data changes” on page 209.

**Log Master and tasks associated with auditing**

Manually achieving a meaningful audit is tedious and difficult. Because DB2 records every change to your data in the log, a solution is to use the log as an information source. With Log Master, you can search the DB2 log, retrieve information, and print a report quickly and easily.

The Log Master online interface guides you through steps for specifying search criteria to select specific log records. Easily constructed filters enable you to narrow searches to specific users, tables, plans, or even column or value changes.
Audits of log information

Log Master generates reports by using a comprehensive reporting facility. You can select from a list of convenient standard default report formats with a choice of presentation, such as by user, job name, plan name, and so on.

All forms of Log Master output (including reports) include log data from transactions that are completed within the time frame that you specify. In this context, completed means either committed or aborted. Log Master also provides reports for situations when you need information about transactions that are not complete at the end of a time frame. For more information, see “Auditing data changes” on page 125.

Creating logical log files

Log Master provides a unique form of output called a logical log file that can help you use DB2 log data.

The format of the logical log is published and includes easy-to-use fields designed for use by application programs. You can create logical logs as the only output of a Log Master job, or in addition to generated SQL and reports.

Use the logical logs as input to application programs, input to report generators, or as permanent records of activity for audit requirements. You can even use logical logs as input to Log Master, saving the time needed to scan the DB2 log subsequent times for the same records. From a logical log, you can generate the same reports and other forms of output as you can from the DB2 log. Optionally, you can direct Log Master to include DDL objects in your logical log files. For more information, see “Logical log output files” on page 92.

Getting performance and statistical information

Log Master performance and statistical features:
■ Display statistics about log activity
■ Produce reports about commit, rollback, and image copy frequency

For more information, see “Reference of default Log Master reports” on page 321.

Analysis of data capture changes (DCC)

You can analyze the impact of creating or altering your DB2 tables to use either the data capture changes (DCC) or the data capture none (DCN) attribute.

The Data Capture Changes report displays what was actually found in the log with either of the attributes, and in addition, presents what DB2 would have logged had
the data capture attribute been set to its alternate value. For more information, see “Data Capture Changes report” on page 341.

**Support for DB2 table-level security**

Log Master can honor DB2 table-level security for all Log Master jobs.

You can use installation options to enable this type of security in your environment. For more information, see “Controlled access to the DB2 log” on page 35.

**Additional benefits**

You can take advantage of the following additional features and capabilities when working with Log Master.

**DB2 subsystem display features**

Use the DB2 subsystem display features to view:

- Active and archive log file information
- Each ARCHIVE LOG command issued
- The list of checkpoint queue records

**Support for DB2 data sharing environments**

Log Master supports data sharing environments.

In a data sharing environment, DB2 tracks log records by log record sequence number (LRSN). In non-data sharing environments, DB2 uses the relative byte address (RBA) to track the log record.

Log Master displays both the RBA and the LRSN values for a log record. Because you can specify either an RBA or an LRSN when you search for log records, you can search for records that were created before or after you implemented data sharing. Under data sharing, DB2 interprets the addresses of log records as LRSNs. If the value of an LRSN indicates that the log record occurred before you implemented data sharing, Log Master interprets the address as an RBA when it processes the record.

**Controlled access to the DB2 log**

In addition to your security measures that ensure the integrity of the DB2 subsystem, you might want to control access to the DB2 log. DB2 log records contain the same
information that is stored in your database. This information might include sensitive data, or data that must be protected from competitors.

The following Log Master features can help:

- You can use installation options (also known as DOPTs) to direct Log Master to honor DB2 security at the table level for all Log Master jobs. If your environment enables this type of security, and the user ID of a job does not have the authorization required to access a given table, Log Master suppresses log records relating to the table in the job’s output. Depending on how you set the installation options, the job might not receive any notification that records have been suppressed.

  Log Master honors DB2 security settings. Log Master honors either native DB2 security or external security (the DSNX@XAC exit provided by IBM RACF, CA Technologies CA-ACF2 for DB2 or CA-Top Secret for DB2, or other security packages).

- You can conduct multiple scans of the DB2 log and create multiple logical logs. You can then secure each logical log separately to provide access only to authorized personnel.

### Scenario for reducing outages during schema restructuring

Log Master can help keep your information available as much as possible when you must change the schema of large DB2 objects (for example, when you re-partition data, change a column’s format, or change the order of columns). Use Log Master to help reduce this type of outage or control the timing of the outage.

For example, assume that a major table in a production database contains several million rows. A column in this table contains date information, and must change from a CHAR(10) field to a DATE field. This type of change requires that you drop and re-create the table. By using Log Master, a DB2 Load utility, and a DB2 Unload utility, you can complete the following process:

1. Create a new table in a new table space with the required schema changes.

2. Unload data from the existing table.

3. Load data into the new table.
4 Use Log Master to capture changes to the existing table that have occurred since the unload action.
   Log Master captures all of the insert, update, and delete actions against the existing table that take place after you unload the data.

5 Use Log Master to apply the database changes to the new table as SQL statements. During the capture and apply actions, the existing table is still available.

6 Capture and apply any changes since the start of the previous capture action.
   Repeat the capture and apply process as needed until the time period is short enough to be within the time that you need to stop a table space, rename two tables, perform some administrative actions, and start a table space. You can also keep this process going until you reach the best point in your processing cycle to tolerate the outage.

7 Put the original table space into read-only mode.

8 Capture and apply the last set of changes with Log Master.

9 Reconcile data to ensure that correct data exists in the new table.

10 Rename two tables and perform administrative actions:
   - Rename the existing table (keeping it for backup purposes).
   - Drop any views on the existing table.
   - Rename the new table to use the production name.
   - Drop and re-create any foreign keys defined on the production table (and resolve check pending status).
   - Re-create any views on the production table.
   - Rebind required application plans, packages, or collections.

11 Put the new table space into update mode.

12 Update existing maintenance procedures so that DB2 utilities use the new table space and index names.

Use BMC Software tools to simplify major schema changes to extremely large tables, reduce the outage to a few minutes, and better control when the outage occurs.
Log Master architecture

The following figure shows how Log Master components interact during processing:

- You initiate Log Master actions through the online interface.

- By specifying time frames and filters, you can scan the data that is available in active and archive logs, and generate a logical log. You can also save the logical log file.

- Log Master can generate a variety of reports and other types of output, including SQL statements and load files.

  **Note**
  As you choose actions through the online interface, Log Master specifies certain reports and output by default. You can change these defaults or specify additional reports and output.

- The High-speed Apply Engine that is distributed with Log Master handles SQL that Log Master or any other SQL generator produces. High-speed Apply can also apply logical log files that Log Master generates.

- Load files that Log Master generates can be processed by the IBM Load utility or the BMC LOADPLUS for DB2 product.
Log Master (including the High-speed Apply Engine) is also a component of the BMC Recovery Management for DB2 solution. The BMC Recovery Management for DB2 solution integrates the features of Log Master and the following BMC products:

- RECOVERY MANAGER for DB2
- BMC Next Generation Technology Recover for DB2 for z/OS
- BMC Next Generation Technology Copy for DB2 for z/OS
- SNAPSHOT UPGRADE FEATURE

Customers who acquire this solution benefit from the features of these individual products and from additional features that are available only with the solution. For more information about the solution-only features, see the Recovery Management for DB2 User Guide.
Operational considerations and installation information


Task roadmap

The following table lists specific tasks that you can complete with Log Master, and indicates where to find instructions for completing each task.

Table 1: Roadmap of Log Master tasks

<table>
<thead>
<tr>
<th>What do you want to do?</th>
<th>Related tasks</th>
<th>Where to find instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn about the Log Master interface</td>
<td>Start the interface</td>
<td>“Using the online interface” on page 43</td>
</tr>
<tr>
<td>Enable display of long object names</td>
<td>“Displaying long DB2 object names” on page 44</td>
<td></td>
</tr>
<tr>
<td>Display Unicode characters</td>
<td>“Displaying Unicode characters” on page 46</td>
<td></td>
</tr>
<tr>
<td>Create or edit a work ID</td>
<td>Create or access a work ID, edit its options, or add steps to it</td>
<td>“Creating and managing work IDs” on page 53</td>
</tr>
<tr>
<td>Identify and undo problem transactions</td>
<td>Analyze the log to identify problem transactions</td>
<td>“Analysis of problem transactions” on page 157</td>
</tr>
<tr>
<td></td>
<td>Check for anomalies before backing out problem transactions</td>
<td>“Performing backout integrity checking” on page 169</td>
</tr>
<tr>
<td></td>
<td>Back out problem transactions</td>
<td>“Using UNDO SQL” on page 159</td>
</tr>
<tr>
<td></td>
<td>Reapply valid transactions after a recovery (that is, restore the table spaces to a current state that does not include problem transactions)</td>
<td>“Using REDO SQL” on page 162</td>
</tr>
<tr>
<td>Migrate DB2 data changes</td>
<td>Migrate changes to another platform without requiring an outage</td>
<td>“Using Log Master for data migration” on page 211</td>
</tr>
<tr>
<td>Automate recovery of dropped objects</td>
<td>Create a work ID for drop recovery, generate the JCL, and submit the job</td>
<td>“Recovering dropped objects” on page 175</td>
</tr>
<tr>
<td>What do you want to do?</td>
<td>Related tasks</td>
<td>Where to find instructions</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Convert log records into a logical log data file and readable control file</td>
<td>Not applicable</td>
<td>“Defining an output logical log file” on page 117</td>
</tr>
<tr>
<td>Use the DB2 log for general analysis and planning</td>
<td>Analyze quiet points</td>
<td>“Quiet Point report” on page 363</td>
</tr>
<tr>
<td></td>
<td>Analyze the impact of creating or altering DB2 tables that are defined with data capture changes (DCC)</td>
<td>“Data Capture Changes report” on page 341</td>
</tr>
</tbody>
</table>
Getting started with Log Master

This chapter explains how to use the online interface, provides an overview of work IDs, and explains how to create and edit work IDs.

Using the online interface

The Log Master for DB2 online interface helps you perform the common tasks of dealing with problem transactions, migrating data, and auditing database activity. For example, the interface guides you through setting up a search for log records by using filters and time frames. Required steps are presented with explanatory Help screens that you access by pressing F1. Log Master selects default outputs, depending on the task that you are performing.

Log Master CLIST

At installation, one of the installation jobs places a CLIST named ALPISPF in the library named HLQ.DBCLIB, or copies ALPISPF to the library that is specified during installation. (HLQ represents a qualifier that your environment assigns during installation.)

To run the Log Master online interface

1. Execute ALPISPF in one of the following ways:

   Note
   
   *clistLibName* is the name of the data set where ALPISPF exists, and *ssid* is the identifier of the DB2 subsystem where Log Master will run.

   To execute from Interactive System Productivity Facility (ISPF) Option 6, enter one of the following TSO commands, depending on whether you want to pass the DB2 subsystem ID (SSID):

   ```
   EX 'clistLibName (ALPISPF)'
   EX 'clistLibName(ALPISPF)' 'SSID (ssid)'
   ```
To execute from an ISPF panel, add an option to the panel that executes ALPISPF. For example, if you use LM as the option name, enter one of the following lines in the panel definition, depending on whether you want to pass the SSID:

```
LM, 'CMD(EX "clistLibName (ALPISPF)")'
LM, 'CMD(EX "clistLibName(ALPISPF)" SSID(ssid) )'
```

Figure 2 on page 44 shows the initial panel of the interface.

**Figure 2: Log Master for DB2 Main Menu**

<table>
<thead>
<tr>
<th>Option</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Analyze Problem Transactions</td>
<td>30. Previously Created Outputs</td>
</tr>
<tr>
<td>1. Generate UNDO SQL</td>
<td>31. DB2 System Log Information</td>
</tr>
<tr>
<td>2. Generate REDO SQL</td>
<td>32. LRSN/Timestamp Conversion Panel</td>
</tr>
<tr>
<td>3. Generate MIGRATE SQL</td>
<td>40. Online Interface Options</td>
</tr>
<tr>
<td>4. Generate MIGRATE DDL</td>
<td>41. Product Options</td>
</tr>
<tr>
<td>5. Create Log Reports</td>
<td>42. Output Defaults</td>
</tr>
<tr>
<td>6. Create Logical Log Files</td>
<td>43. Automated Drop Recovery Defaults</td>
</tr>
<tr>
<td>7. Create Audit Report</td>
<td>44. Alternate Index Names Defaults</td>
</tr>
<tr>
<td>8. Generate Automated Drop Recovery</td>
<td>45. SQL Execution Codes Defaults</td>
</tr>
<tr>
<td>9. Generate High-speed Apply JCL</td>
<td>46. Display Default Options</td>
</tr>
<tr>
<td>10. Create Catalog Activity Report</td>
<td>47. Display PTF Maintenance Applied</td>
</tr>
<tr>
<td>11. Generate REPOS UPDATE JCL</td>
<td></td>
</tr>
<tr>
<td>12. Generate REPOS DELETE JCL</td>
<td></td>
</tr>
</tbody>
</table>

Repository Options:
- 20. Create or Edit Work IDs
- 21. Create or Edit Filters
- 22. Create or Edit Templates
- 23. Create or Delete Log Marks
- 24. Delete/Display Repository Tables

Enter X to exit

### Displaying long DB2 object names

Log Master accommodates the maximum length of DB2 object names available in DB2 Version 8.1 and later.

To provide this support without extensive changes to existing online interface panels, Log Master supports "zoomable" fields and an accompanying function key (F4) for the zoom function.

When an existing object name is longer than the field used to view or edit it, Log Master displays a truncated name in the field. By default, Log Master indicates a truncated name by displaying the >> characters at the end of the field. For example, in Figure 3 on page 44, Log Master displays a table and column name that are longer than the allotted panel fields.

**Figure 3: Column Name Value panel (long DB2 object names)**
The >> characters and their position at the end of a field are product default values. Use the TRCHARS and TRPOS installation options to control the content and position of the character string that indicates truncated names.

If at least one field on a panel or pop-up supports the zoom function, Log Master displays the F4= Zoom prompt in the PFSHOW key list on the panel.

**Before you begin**

Determine whether the current DB2 subsystem supports the name lengths that you enter through the online interface.

**To display long names with the zoom function**

1. Position the cursor within a zoomable field, and then press F4.

   Log Master displays a pop-up or a full-size ISPF panel where you can view or edit the object name.

2. If the original field is editable, enter or change the name through the pop-up or panel.

   If you view or edit an existing object name that is longer than 64 characters, Log Master displays the full-size panel, where you can use the maximum currently usable name length for the object.

   If you view or edit an existing object name that is 64 characters or less in length, or if you are entering a new object name, Log Master displays the pop-up shown in Figure 4 on page 45.

**Figure 4: DB2 long object name pop-up**

```
Table Name Value
Command ===> 
Table Name .. .:
SUM_OF_1ST_QUARTER_FINANCIAL_DATA_AND_QUARTERLY_ESTIMATES_TABLE
_ Expand to maximum size
```

3. *(optional)* To expand the pop-up to a full-size panel, type Y in the **Expand to maximum size** field, and then press Enter.
4 For editable fields on the pop-up or the full-size panel, press F3 or press F12 as follows:

- To save your object name and return to the previous panel, press F3.
- To return without saving the object name, press F12.

Displaying Unicode characters

Log Master supports Unicode characters in DB2 object names and column data as described in this section.

For more information about how Log Master handles Unicode characters in output files, see the chapter about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

In input from the online interface, Log Master accepts EBCDIC characters and translates them to Unicode when the context requires it; for example, in Unicode DB2 object names, or in Unicode column data.

In output to the online interface, Log Master displays Unicode in one of the following ways:

- Translates Unicode characters to EBCDIC whenever possible
  For untranslatable characters, Log Master displays a substitute character as defined by the applicable CCSID conversion information; for example, x'3F', which appears as a space on most output devices.
- Displays Unicode characters in the format used to previously enter them (the hexadecimal representation of the UTF-8 values for all characters in the string, as described in this section).

To enter Unicode object names or column data through the online interface

1 Enter the equivalent EBCDIC characters.

For untranslatable Unicode characters, enter the hexadecimal representation of the UTF-8 values for all characters in the string. Log Master provides support for this capability in selected online interface fields.
Example

Assume that you have the following column value, where * represents an untranslatable character:

```
ACCOUNT- *
```

To enter this column value through the online interface, specify the following hexadecimal values:

```
X'4143434F554E542DE4B883'
```

In this example, 'E4B883' is an untranslatable character. After you enter a Unicode constant or Unicode object name in the hexadecimal UTF-8 format, the Log Master online interface displays this format on all panels (shown in Figure 5 on page 47.)

Figure 5: Column Name Value panel (Unicode character entry)

---

Overview of work IDs

A work ID is an entity defined within Log Master that groups together the specifications of one Log Master job. Work IDs define the input source, time frame, filter (or WHERE clause), the various types of job output, and other items.

Work IDs help you to identify and track the activities that you perform with Log Master. When you select certain action items from a panel, Log Master assigns a default work ID and displays it through the interface. After you perform a task, and choose to exit the task dialog, Log Master prompts you to save your selections under a work ID.

Log Master requires work IDs for all jobs created by using the online interface. If you create a job using JCL and the batch interface, the work ID is not required unless your job includes an ongoing log scan.

Example

Assume that you need to create a job to print a report of all accounting transactions that took place in January. You can save each selection that you make through the online interface for this task in a work ID. Later, you can edit the work ID to change how you search for transactions, to add another report to the list of generated output, or to revise the time frame, perhaps searching for a different month.
Note
Internally, Log Master keeps track of all job steps and actions by using a combination of a job’s user ID and work ID. BMC strongly recommends that you define different jobs with a unique combination of user ID and work ID, particularly if you run multiple jobs concurrently, or if you define any jobs as ongoing processes.

Work ID names

A work ID has a two-part name in the format owner.workIDName (with the period as a required separator):

- owner is a one- to eight-character identifier. If you do not supply an owner when you create a work ID, Log Master uses your TSO prefix or your TSO user ID (if you have no prefix).

- workIDName is a one- to 18-character name that must comply with the following restrictions:
  - The first character must be alphabetic or a national character (such as $, #, or @).
  - Additional characters can be alphabetic, numeric, or national.
  - You cannot create a work ID name that begins with $$WORKID.

The default workIDName is $$WORKIDnnnn, where nnnn is a sequence number (for example, USER14.$$WORKID0001). The default work ID name is reserved for use by Log Master.

Work ID contents

You can name, save, and edit a work ID, and you can assign security to it. The contents of the work ID reflect the steps defined for a particular task. A work ID can contain the following types of steps, as introduced in this section:

- Log scan
- Log mark
- Execute SQL
- Automated drop recovery
- High-speed Apply JCL generation
- Repository maintenance

You can add steps to a work ID in any order. Log Master processes multiple log scan steps simultaneously, but always processes any execute SQL steps last.
Log scan step

Most tasks require that you scan the log for certain types of transactions, and then generate reports and output.

Log Master stores this type of activity in the work ID as part of the log scan step. A work ID typically contains only a single log scan step unless you create or modify it by using the Create or Edit Work IDs option.

The log scan step can include time frame, filter, report, output file, and optional log mark specifications. The log scan step includes all of the information that Log Master needs to perform a log scan, and generate reports and other output. You can also use the log scan step to update the Old Objects Table in the Repository.

Your work ID can contain a single log scan step or multiple log scan steps. The choices listed under the Actions category on the Main Menu guide you through the steps for creating a work ID with a single step.

You can also add a log scan step so that you simultaneously read the log with two different log scans, and generate two different streams of output. Work IDs that contain multiple log scan steps must use the same input source. For example, you cannot scan a logical log file and use the bootstrap data set (BSDS) to locate DB2 logs at the same time.

Example

Figure 6 on page 49 shows the contents of the ABC.PAYROLL work ID. In this example, the work ID contains a single log scan step and uses the BSDS to obtain log files containing log records from 4:00 P.M. on November 18 to the present. The example uses a filter and specifies Summary and Audit reports as output.

Figure 6: Work ID Maintenance panel

Be aware of the following points as you add log scan steps to a work ID:
The Work ID Maintenance panel does not automatically generate reports and outputs. You can generate default reports and output automatically by using the task dialogs that are listed under the Actions category on the Main Menu.

When you generate a Catalog Activity report or an output DDL file, or update the Repository, Log Master cannot generate other forms of output in the same log scan, such as other reports or SQL. To generate any other forms of output that you need in the same work ID, add an additional, separate log scan step in your work ID.

Log Master processes log scan steps simultaneously. For example, you can add two log scan steps to a work ID that simultaneously scan two different portions of the DB2 log, and generate two different streams of output.

Log scan parameters enable you to process DB2 catalog records, or to perform overtime processing tasks.

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for adding a log scan step to a work ID</td>
<td>“Adding a log scan step to a work ID” on page 57</td>
</tr>
<tr>
<td>Information about and step-by-step instructions for defining a log scan step</td>
<td>“Defining a log scan” on page 69</td>
</tr>
</tbody>
</table>

Log mark step

Use log marks to identify a point in the DB2 log for reference. You can create log marks as part of a log scan step, or in a separate log mark step, and then save them as part of a work ID.

You can also create, delete, or view information about a log mark directly from the online interface by using the Create or Delete Log Marks choice on the Log Master Main Menu.

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for adding a log mark step to a work ID</td>
<td>“Adding a log mark step to a work ID” on page 59</td>
</tr>
<tr>
<td>Information about log marks and step-by-step instructions for defining a log mark step</td>
<td>■ “Log mark definitions” on page 95  ■ “Defining a log mark in a log scan step” on page 122</td>
</tr>
</tbody>
</table>
Execute SQL step

You can open a new work ID or modify an existing work ID to add an execute SQL step that executes previously generated SQL.

This step enables you to use the High-speed Apply Engine to execute and monitor a set of SQL statements as part of your Log Master job or job step. After you add an execute SQL step, you can generate the JCL to run the work ID.

Be aware of the following points as you add an execute SQL step to your work ID:

- In many cases, you must add an execute SQL step to a new work ID to execute SQL that you generated under a different work ID.
- Before you select an SQL data set to execute, review its status and study its statistics. For example, you can examine the type of SQL and the number of database changes that the data set contains before you attempt to execute it.

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for adding an execute SQL step to a work ID</td>
<td>“Adding an execute SQL or DDL step to a work ID” on page 60</td>
</tr>
<tr>
<td>Information about generating and executing SQL statements</td>
<td>“SQL output files” on page 87</td>
</tr>
<tr>
<td>SQL code handling</td>
<td>“Executing SQL” on page 227</td>
</tr>
</tbody>
</table>

Automated drop recovery step

The Log Master automated drop recovery feature works with the BMC NGT Recover product or DSN1COPY to recover dropped DB2 objects, such as tables or table spaces.

You can specify different types of output for this step, depending on the type of recovery operation that you want to perform. If you execute the generated outputs in sequence, you can recover dropped objects with a minimum of time and investigation.

**Note**

A work ID that contains an automated drop recovery step cannot contain other steps.

For more information about the topics in this section, see the following references:
**High-speed Apply JCL generation step**

You can use the Log Master online interface panels to specify configuration parameters for the High-speed Apply Engine, then generate JCL for a separate job that runs High-speed Apply using your parameters.

As you learn more about High-speed Apply, you can edit the JCL to define more parameters and use more High-speed Apply features.

---

**Note**

A work ID that contains a High-speed Apply JCL generation step cannot contain other steps.

---

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for adding an execute SQL step to a work ID</td>
<td>“Adding a High-speed Apply JCL generation step to a work ID” on page 64</td>
</tr>
<tr>
<td>Information about defining a work ID for generated High-speed Apply JCL</td>
<td>“Examples using generated High-speed Apply JCL” on page 232</td>
</tr>
</tbody>
</table>

---

**Repository maintenance step**

Log Master uses the Repository to support many types of processing, including overtime processing, which affects the Old Objects table (ALPOLDO), and ongoing processing, which affects the Open Unit of Recovery table (ALPURID).

A Repository maintenance step generates a Log Master job that performs one of the following actions:

- Updates the ALPOLDO table with object structure definitions or compression dictionaries
- Deletes information from the ALPOLDO table, the ALPURID table, or both tables when the information is no longer required
When you create a Repository maintenance step by using the Log Master online interface, the generated JCL actually contains specialized LOGSCAN statements.

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for adding a Repository maintenance step to a work ID</td>
<td>“Adding a Repository maintenance step to a work ID” on page 66</td>
</tr>
<tr>
<td>Tables in the Repository</td>
<td>Chapter about the Log Master Repository in the Log Master for DB2 Reference Manual</td>
</tr>
</tbody>
</table>

**Work ID security**

The owner of a work ID can assign the following levels of security to the work ID to control its security level:

- **Read/Write**
  
  With this level of security, any user can read or write to the work ID. This level is the default.

- **Read Only**
  
  With this level of security, other users can view the contents of the work ID. They can modify the work ID, and then save it under a different name.

- **No Access**
  
  With this level of security, access by other users to the work ID is blocked. The work ID will not appear as a selection in any work ID list except for that of the owner.

To set the security level for work IDs that you create, from the Main Menu, select Product Options.

**Creating and managing work IDs**

Each time that you select an option from the Actions category on the Main Menu, you create a work ID. After you create a work ID, you can add steps to the work ID, or specify run time options for the work ID.

The procedures in this section provide basic instructions for creating and editing work IDs, and provide references to more information.
Creating and accessing a work ID

These procedures explain how to create and save a new work ID, and how to open an existing work ID.

Before you begin

Ensure that you understand the concepts presented in “Overview of work IDs” on page 47.

To create and save an empty work ID

1. In the Repository Options category on the Main Menu, select Create or Edit Work IDs and press Enter.

Log Master displays the Work ID File Menu (Figure 7 on page 54).

Figure 7: Work ID File Menu

2. Select New.
Log Master displays the Step Type panel (Figure 8 on page 55).

**Figure 8: Step Type panel**

<table>
<thead>
<tr>
<th>Step Type</th>
<th>1. Log Scan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Log Mark</td>
</tr>
<tr>
<td></td>
<td>3. Execute SQL</td>
</tr>
<tr>
<td></td>
<td>4. Automated Drop Recovery</td>
</tr>
<tr>
<td></td>
<td>5. High-speed Apply JCL Generation</td>
</tr>
<tr>
<td></td>
<td>6. Repository Maintenance</td>
</tr>
</tbody>
</table>

F1=Help F3=Exit F12=Cancel

3 Press **F3** twice to return to the Work ID File Menu (Figure 7 on page 54).

4 Select **Save As**.

Log Master displays the Work ID Name Entry panel.

5 Accept the default work ID name, security settings, and date format, or enter a new values, and then press **F3**.

Log Master displays the Work ID File Menu (Figure 7 on page 54).

For a list of editing tasks that you can perform to continue defining the work ID, see Table 2 on page 55.

**Table 2: Tasks for editing a work ID**

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify run time options for a work ID</td>
<td>“Editing work ID run time options” on page 56</td>
</tr>
<tr>
<td>Add a step to the work ID</td>
<td>■ “Adding a log scan step to a work ID” on page 57</td>
</tr>
<tr>
<td></td>
<td>■ “Adding a log mark step to a work ID” on page 59</td>
</tr>
<tr>
<td></td>
<td>■ “Adding an execute SQL or DDL step to a work ID” on page 60</td>
</tr>
<tr>
<td></td>
<td>■ “Adding an automated drop recovery step to a work ID” on page 63</td>
</tr>
<tr>
<td></td>
<td>■ “Adding a High-speed Apply JCL generation step to a work ID” on page 64</td>
</tr>
<tr>
<td></td>
<td>■ “Adding a Repository maintenance step to a work ID” on page 66</td>
</tr>
</tbody>
</table>
### To open an existing work ID

1. From the Repository Options category on the Main Menu, select **Create or Edit Work IDs** and press **Enter**.

   Log Master displays **Figure 7 on page 54**.

2. Select **Open** and press **Enter**.

   Log Master displays the Open Work ID panel.

3. In the **Work ID Name** field, type the name of the work ID, or type a partial name and a wildcard, and then press **Enter**.

   Valid wildcards are ?, %, and *. For more information about using wildcards, press **F1** to access the online Help.

4. To select a work ID from the list, type **S** in the **ACT** field next to the ID and press **Enter**.

   Log Master displays the Work ID Maintenance panel. (For an example, see **Figure 6 on page 49**.)

5. Add a new log scan step, or edit an existing step:
   - To add a log scan step, type **I** in the **ACT** field and press **Enter**.
     Log Master displays the Step Type panel (**Figure 8 on page 55**).
   - To edit a log scan step, type **E** in the **ACT** field and press **Enter**.
     Log Master displays the Log Scan Options panel. (For an example, see **Figure 10 on page 58**.)

### Editing work ID run time options

This procedure explains how to specify run time options that apply only to the selected work ID. (To specify the default values for any new work IDs that you create, from the Options and Defaults category on the Main Menu, select **Product Options**.)
To edit work ID run time options

1. Open the work ID that you want to edit and access the Work ID Maintenance panel. (See Figure 6 on page 49.)

   For instructions, see “Creating and accessing a work ID” on page 54.

2. In the Work ID Batch Options field, type E and press Enter.

   Log Master displays the Work ID Run Time Options panel (Figure 9 on page 57).

   **Figure 9: Work ID Run Time Options panel**

   ```
   Work ID Run Time Options
   Filter Relational Operator . . . . . . . . . . A (A=And, O=Or)
   Execution Mode . . . . . . . . . . . . . . . . . . . . . . C (C=Current, O=Overtime)
   Attempt Completion (OverTime Mode Only) . N (Y=Yes, N=No, ‘ ’=Default)
   Modify SQL Execution Codes . . . . . . . . . . . . . . (E=Edit, ‘ ’=Default)
   Alternate Index Names . . . . . . . . . . . . . . . . . . . . (E=Enter values)
   Process Through Point-In-Time Recoveries . . . . . . . . (Y=Yes, N=No, ‘ ’=Default)
   Specify Image Copies . . . . . . . . . . . . . . . . . . . . . (E=Enter values)
   Use SYSLOGRX to exclude member logs. . . . . . . . . . . (Y=Yes, N=No, ‘ ’=Default)
   End scan at lowest LRSN of all members . . . . . . . . . . (Y=Yes, N=No, ‘ ’=Default)
   Sort Options . . . . . . . . . . . . . . . . . . . . . . . . . . . . . (E=Enter values)
   KEEPDICTIONARY Used in All Utilities . . . . . . . . . . . (Y=Yes, N=No, ‘ ’=Default)
   Keystore SMS Management Class . . . . . . . . . . . . .
   Keystore SMS Storage Class . . . . . . . . . . . . . . . .
   Keystore SMS Data Class . . . . . . . . . . . . . . . . . .
   LOB Option . . . . . . . . . . . . . . . . . . . . . . . . . . . . (E=Edit)
   XML Option . . . . . . . . . . . . . . . . . . . . . . . . . . . . (E=Edit)
   ```

3. Specify run time options for the work ID.

   For more information about the run time options on the panel, press F1 to access the online Help.

4. To save the run time options, press F3 twice to return to the Work ID File Menu, and then select Save.

Adding a log scan step to a work ID

Normally, you create a log scan step when you create a work ID. This procedure explains how to insert the additional steps in a work ID if you require multiple log scan steps.
Before you begin

Ensure that you understand the concepts presented in these sections:

- “Overview of work IDs” on page 47
- “Log scan step” on page 49

To add a log scan step to a work ID

1 Open the work ID that you want to edit and access the Step Type panel.

   You can view the panel and instructions in “Creating and accessing a work ID” on page 54.

2 On the Step Type panel, select Log Scan and press Enter.

   Log Master displays the Log Scan Options panel (Figure 10 on page 58).

   **Figure 10: Log Scan Options panel**

<table>
<thead>
<tr>
<th>Log Scan Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options . . . . .</td>
</tr>
<tr>
<td>1. Specify Log Filter Associations</td>
</tr>
<tr>
<td>2. Specify Time Frame and/or Input Source</td>
</tr>
<tr>
<td>3. Define Report and File Outputs</td>
</tr>
<tr>
<td>4. Define Log Mark</td>
</tr>
<tr>
<td>5. Define Log Scan Parameters</td>
</tr>
<tr>
<td>F1=Help F3=Exit F12=Cancel</td>
</tr>
</tbody>
</table>

3 Select an option to specify a filter, a time frame, report and file outputs, or a log mark, as needed.
Log Master displays a panel specific to the option that you select. To create a valid LOGSCAN statement, you must specify at least a time frame and output (such as a report, an SQL output file), or a log mark. For more information about the log scan options, press F1 to access the online Help, and see “Defining a log scan” on page 69.

4 To process DB2 catalog records, or to update the Old Objects Table in the Repository, select Define Log Scan Parameters.

For more information about using this option, see “Processing objects over time” on page 257.

5 When you finish defining the log scan step, press F3 twice to open the Work ID File Menu (you can view the panel in “Creating and accessing a work ID” on page 54), and save the work ID.

### Adding a log mark step to a work ID

This procedure explains how to add a separate log mark step to an existing work ID.

Ensure that you understand the concepts presented in the following sections:

- “Overview of work IDs” on page 47
- “Log mark step” on page 50
- “Log mark definitions” on page 95

Before you begin
To add a log mark step to a work ID

1 Open the work ID that you want to edit, and access the Step Type panel.

You can find the Step Type panel and instructions in “Creating and accessing a work ID” on page 54.

2 Select Log Mark and press Enter.

Log Master displays the Log Mark Step Maintenance panel (Figure 11 on page 60). For more information about the options on this panel, press F1 to access the online Help.

Figure 11: Log Mark Step Maintenance panel

<table>
<thead>
<tr>
<th>Command ==&gt;&gt;</th>
<th>Log Mark Step Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark Name</td>
<td>Description</td>
</tr>
<tr>
<td>Quiesce with Mark</td>
<td>N (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Quiesce Tablespace</td>
<td>N (Y=Yes Valid for DB2 V6 and above, N=No)</td>
</tr>
<tr>
<td>Tablespace List for Quiesce</td>
<td>Type one or more action codes. Then press Enter.</td>
</tr>
<tr>
<td>ACT DATABASE TABLESPACE</td>
<td></td>
</tr>
<tr>
<td>******** End Of List ********</td>
<td></td>
</tr>
</tbody>
</table>

3 In the Mark Name field, type a log mark name and, optionally, a description.

4 To generate a quiesce point at the same time that you create a log mark, type Y in the Quiesce with Mark field and press Enter.

5 In the Tablespace List for Quiesce fields, enter a qualified name for each table space that you want to include in the quiesce.

This action directs Log Master to use the DB2 QUIESCE utility to generate a quiesce point for the specified table spaces. Log Master associates the RBA/LRSN of the quiesce point with the log mark name.

6 Press F3 twice to return to the Work ID File Menu and save the work ID.

Adding an execute SQL or DDL step to a work ID

This procedure explains how to add an execute SQL or execute DDL step to an existing work ID.

For more information about executing SQL, see “Executing SQL” on page 227.
Before you begin

Ensure that you understand the concepts presented in the following sections:

- “Overview of work IDs” on page 47
- “Execute SQL step” on page 51

To add an execute SQL/DDL step to a work ID

1. Open the work ID that you want to edit and access the Step Type panel.
   For more information, see “Creating and accessing a work ID” on page 54.

2. Select **Execute SQL** and press **Enter**.
   Log Master displays the EXEC SQL Options Menu.

3. *(optional)* Enter values for the application plan that Log Master uses to execute your SQL file:
a Select **Specify EXEC SQL Options**.

b Enter the optional values.

c Press **F3** to return to the EXEC SQL Options Menu panel.

4 Select **Specify SQL Dataset**.

Log Master displays the Execute SQL/DDL Dataset Name Entry panel (Figure 12 on page 62).

**Figure 12: Execute SQL/DDL Dataset Name Entry panel**

![Execute SQL/DDL Dataset Name Entry panel](image)

5 Select one of the options, depending on whether you know the name of the data set that you want to use:

- If you know the name of the SQL or DDL data set that you want to use:

  1. Type either **2** or **4** in the **Options** field.

  2. On the line below the options, type the name of the data set or a wildcard pattern and press **Enter**.

     In the **Proposed Dataset** field, Log Master displays the data set name that you entered.

- To search for an SQL or DDL data set:

  1. Type **1** or **4** in the **Options** field and press **Enter**.

  2. On the search criteria panel, type your search criteria and press **Enter**.

     Log Master displays a list of the data sets that meet your specifications.

  3. Beside the data set that you want to use, type **S** and press **F3**.

     Log Master displays the Execute SQL Dataset Name Entry panel with the data set that you selected in the **Proposed SQL Dataset** field.
6 Press F3 to return to the Work ID File Menu and save the work ID.

Adding an automated drop recovery step to a work ID

This procedure explains how to add an automated drop recovery step to an existing work ID.

A work ID that contains an automated drop recovery step cannot contain other steps. The automated drop recovery step performs a log scan as part of its normal operation. You do not need to define a log scan step to perform automated drop recovery. For more information about automated drop recovery, see “Recovering dropped objects” on page 175.

Before you begin

Ensure that you understand the concepts presented in the following sections:

- “Overview of work IDs” on page 47
- “Automated drop recovery step” on page 51

To add an automated drop recovery step to a work ID

1 Open the work ID that you want to edit, and access the Step Type panel.

   For more information, see “Creating and accessing a work ID” on page 54.

2 Select Automated Drop Recovery and press Enter.
Log Master displays the Generate Automated Drop Recovery panel. For descriptions of the options on this panel, press F1 to access the online Help.

3 Modify the values for the options on the panel to define your automated drop recovery action.

4 Press F3 until you return to the Work ID File Menu, and save the work ID.

Adding a High-speed Apply JCL generation step to a work ID

This procedure explains how to specify a limited subset of configuration parameters for the High-speed Apply Engine, and then generate High-speed Apply JCL.

A work ID that contains a High-speed Apply JCL generation step cannot contain other steps.

Before you begin

Ensure that you understand the concepts presented in the following sections:

- “Overview of work IDs” on page 47
- “High-speed Apply JCL generation step” on page 52
To add a High-speed Apply JCL generation step to a work ID

1 Open the work ID that you want to edit and access the Step Type panel.

   For more information, see “Creating and accessing a work ID” on page 54.

2 Select **High-speed Apply JCL Generation** and press **Enter**.

   Log Master displays the High-speed Apply JCL Generation panel. For descriptions of the options on this panel, press **F1** to access the online Help.

3 Modify the values for the options on the panel.

4 Specify High-speed Apply configuration parameters for conflict rules (responses to SQL codes):

   a Press **F8** to advance to the **Edit Conflict Rules** field.

   b Type **E** in the field and press **Enter**.

      Log Master displays the High-speed Apply Conflict Specification panel.

   c Specify AnyConflict parameters and press **F3**.

      Log Master displays the High-speed Apply JCL Generation panel.

5 Specify High-speed Apply configuration parameters for object mapping:

   a Press **F8** to advance to the **Edit Object Mapping Rules** field.

   b Type **E** in the field, specify values in any additional required fields, and press **Enter**.

      Log Master displays the High-speed Apply Object Mapping Specification panel.

   c Specify ObjectMap parameters and press **F3**.

      Log Master displays the High-speed Apply JCL Generation panel.

6 Press **F3** until you return to the Work ID File Menu and save the work ID.
Adding a Repository maintenance step to a work ID

This procedure explains how to add a Repository maintenance step to an existing work ID.

Before you begin

Ensure that you understand the concepts presented in the following sections:

- “Overview of work IDs” on page 47
- “Repository maintenance step” on page 52

To add a Repository maintenance step to a work ID

1. Open the work ID that you want to edit, and access the Step Type panel.
   
   For more information, see “Creating and accessing a work ID” on page 54.

2. Select Repository Maintenance and press Enter.
   
   Log Master displays the Repository Maintenance Parameters panel. For descriptions of the options on this panel, press F1 to access the online Help.

3. Modify the values for the options on the panel.
4 Press **F3** until you return to the Work ID File Menu and save the work ID.

**Creating a batch job from a work ID**

This procedure explains how to create a batch job from the information in a work ID.

![Diagram of the process](image)

**Before you begin**

Ensure that you understand the concepts presented “Overview of work IDs” on page 47.

**To create a batch job from a work ID**

1. Open the work ID that you want to edit, and access the Work ID Maintenance panel.
   
   For more information, see “Creating and accessing a work ID” on page 54.

2. Press **F3**.

   Log Master displays the Work ID File Menu.

3. From the Work ID File Menu, select **Generate JCL** and press **Enter**.

   Log Master displays the Generate JCL panel (Figure 13 on page 67). For descriptions of the options on this panel, press **F1** to access the online Help.

**Figure 13: Generate JCL panel**

```
GENJCL ============= Generate JCL ============= Scroll ==> HALF
Command ==> Generate JCL
SSID: DB2R
Work ID . . : ABC.ACCTREDO
```
Press Enter to generate JCL to a temporary dataset otherwise specify the name of the output dataset for the JCL generation (including member name if partitioned) then press Enter

Dataset Name . . . ________________________________________________________
If partitioned, replace existing member . . . Y (Y=Yes, N=No)

Job Statement Information . . .
1. _______________________________________________________________________
2. _______________________________________________________________________
3. _______________________________________________________________________
4. _______________________________________________________________________
5. _______________________________________________________________________

DB2 Steplibs . . .
1. DB2.DSNLOAD__________________________________
2. DB2.DSNEXIT__________________________________
3. _____________________________________________

BMC Steplibs . . .
1. product.libraries____________________________
2. _____________________________________________
3. _____________________________________________
4. _____________________________________________
5. _____________________________________________
6. _____________________________________________

Modify the values for the options on the panel as needed for your environment and press Enter.

Log Master displays the generated JCL for your review.

Press F3 until you return to the Work ID File Menu, and save the work ID with the generated JCL.

Submit the job to run the generated JCL.
Defining a log scan

This chapter provides an overview of log scans and explains how to define a log scan step.

Overview of log scans

A *log scan* is the process of searching an input source for log records. In Log Master, the log scan step determines how Log Master scans the DB2 log for input, and the kind of output that the job creates.

The following table describes the parts of a log scan step:

**Table 3: Parts of a log scan step**

<table>
<thead>
<tr>
<th>Part of a log scan step</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
</table>
| Time frame (required)  | Controls the range and the input source of the log scan  
Log Master uses the input source for all of the log scans in the current work ID. You must specify a time frame to create a valid log scan step. | ■ “Time frame definitions” on page 81  
■ “Defining a time frame” on page 109 |
| Filter (optional)      | Enables you to select a subset of log records within the range of a time frame  
Though not required, in practice, most log scans include a filter. | ■ “Filter definitions” on page 71  
■ “Defining a filter in a log scan step” on page 101  
■ “Adding a filter association to a log scan step” on page 103 |
Log scan example

The following example illustrates how the parts of a log scan relate to a typical work situation.

Assume that you need to audit all of the transactions that were applied to your company’s accounting database since noon yesterday. To do so, you must complete the following steps to define a log scan:

1. **Report or output file definitions (required)**
   - Enable you to define forms of output for your selected task.
   - For example, you can define an Audit report when you perform an audit on a select group of transactions. You can generate UNDO SQL to back out application transactions. Similarly, you can define MIGRATE DDL to move object structure definitions.
   - You must specify at least one form of output (a report or an output file) to create a valid log scan step.

2. **Log mark (optional)**
   - A name, defined within Log Master, that refers to a specific point in the DB2 log.
   - You can create log marks either as part of a log scan step, or as a separate log mark step.

3. **Run time options (optional)**
   - Determine several characteristics of a work ID, and apply to all steps in a work ID.
   - For example, a run time option determines whether Log Master processes DB2 catalog log records as part of the log scan steps included in the work ID.
   - Some run time options are influenced by installation options. The Log Master online interface displays a subset of the run time options when you create a work ID using some options in the Actions category of the Main Menu. To display more run time options, create or edit a work ID by selecting Create or Edit Work IDs from the Main Menu.

---

<table>
<thead>
<tr>
<th>Part of a log scan step</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report or output file definitions</td>
<td>Enable you to define forms of output for your selected task. For example, you can define an Audit report when you perform an audit on a select group of transactions. You can generate UNDO SQL to back out application transactions. Similarly, you can define MIGRATE DDL to move object structure definitions. You must specify at least one form of output (a report or an output file) to create a valid log scan step.</td>
<td>“Reports from the log scan” on page 85</td>
</tr>
<tr>
<td>Log mark</td>
<td>A name, defined within Log Master, that refers to a specific point in the DB2 log. You can create log marks either as part of a log scan step, or as a separate log mark step.</td>
<td>“Log mark definitions” on page 95</td>
</tr>
<tr>
<td>Run time options</td>
<td>Determine several characteristics of a work ID, and apply to all steps in a work ID. For example, a run time option determines whether Log Master processes DB2 catalog log records as part of the log scan steps included in the work ID. Some run time options are influenced by installation options. The Log Master online interface displays a subset of the run time options when you create a work ID using some options in the Actions category of the Main Menu. To display more run time options, create or edit a work ID by selecting Create or Edit Work IDs from the Main Menu.</td>
<td>“Editing work ID run time options” on page 56</td>
</tr>
</tbody>
</table>
1 Define a time frame and input source.

Every time frame has a start point and an end point that define the scan range of the log scan. In this case, you set the start point to noon yesterday, and the end point to the current date and time.

Define the input source as the boot strap data set (BSDS). The BSDS, which contains information about all log files for a DB2 subsystem, is Log Master’s default input source.

With this step, you have selected all log records created from noon yesterday to the present time for your entire DB2 subsystem.

2 Define a filter.

In this example, you need to audit only transactions that affect the accounting database, so your filter selects log records with a database name of ACCT.

3 Define the type of report or output file that you need; in this example, define the output to be an Audit report.

When your Log Master job is run, the resulting log scan selects all of the accounting transactions written to the log since noon yesterday, and prints them in an Audit report.

Filter definitions

A filter is a Log Master object. You can name, secure, and maintain filters as you do work IDs.

You define filters to restrict the selection of log records within the source and range of a time frame. Use filters to select records by:

- Unit of recovery (select by plans, jobs, users, and so on)
- Specific database object
- Specific column data

Log Master supports the following types of filters:

- Filters created and saved as part of a log scan step (under a work ID)
  
  To create a filter in association with a time frame, and save it under a specified work ID, select an option from 0 through 7 in the Actions category on the Main Menu. Filters created in this manner are a part of a log scan step. When filters are
saved as part of a log scan step, the filter name and security defaults to the name and security of the work ID that contains it.

When you define a log scan step with multiple filters, you can specify a filter relational operator to determine whether the filters are joined by the AND or the OR relational operand.

- Filters created and saved as a Log Master object outside of a work ID (referred to as an independent filter)

  You can add an independent filter to the log scan step of any work ID to further restrict transaction selection within the defined time frame. You can name and secure an independent filter in the same way that you name and secure a work ID.

  You can add either type of filter to the log scan step of other work IDs. The relationship of a filter to one or several work IDs is referred to as a filter association.

Filter specification interfaces

To specify a filter, you can use either the Structured interface or the Free Form interface, as described in this section.

If you create a filter by using the Structured interface, you can edit it with either the Structured or Free Form interface. However, after you edit or create a filter with the Free Form interface, you cannot edit it again with the Structured interface.

Structured interface

You can specify multiple predicates by using this interface. The Structured interface guides you through a set of linked panels that prompt you to define each part of your search criteria (called a filter predicate). To define a predicate, you must define the following items:

- Field
- Conditional operator
- Value

In following filter predicate example, the field is AUTH ID (which represents the authorization ID of a log record), the operator is the equal sign, and the value is the character string DBA1.

\[
\text{AUTH ID} = \text{DBA1}
\]

The Structured interface enables you to use the catalog search feature to define filter predicates that use a specific DB2 object or group of objects. This feature works in a similar manner to the object search features of the BMC CATALOG MANAGER for DB2 product.
When you enter C in the ACT column of the Structured Filter Maintenance panel (also available on other panels), Log Master displays the Catalog Search panel:

**Figure 14: Catalog Search panel**

![Catalog Search panel]

You can generate lists of objects, as shown in the previous figure, by typing a wildcard pattern to list objects by type that match a specified search pattern. For more information about using wildcards, press F1 to access the online Help.

The following figure shows the Tablespace List panel, which provides a list of table spaces that match the wildcard pattern afr*.*.

**Figure 15: Tablespace List panel**

![Tablespace List panel]

You can search for related object types by typing an action code and pressing Enter. For example, to list all of the tables stored in table space AFR220I.ACAREPOS, type the action code TB, and press Enter. See the following figure for an example:

**Figure 16: Table List panel**

![Table List panel]
To view the complete name of the table YEAR_END_FINANCI>>, press F4 in the TABLE column. For more information, see “Displaying long DB2 object names” on page 44.

Free Form interface

The Free Form interface enables you to specify filters with greater logical complexity than you can specify with the Structured interface. It displays a panel where you can specify filter predicates by using syntax similar to that used for SQL statements. The filter in the following figure uses the IN conditional operand. You can group Free Form filters together by using the AND or OR relational operand (see “Filter relational operators” on page 76).

Figure 17: Free Form Filter Maintenance panel (IN operand)

If you begin specifying a filter by using the Structured interface, you can type FREEFORM in the Command line and press Enter to convert the definition to a Free Form format. You can continue defining the filter by using the Free Form interface. After you have converted the definition to Free Form format, you can no longer edit it with the Structured interface.
Free Form specification rules

To specify a selectable field in the Free Form interface, use any of the following character strings to represent a selectable field:

- Unit of Recovery
- Correlation ID
- Plan Name
- Auth ID
- Connection ID
- Connection Type
- Update Type
- Database Name
- Table Space Name
- Table Name
- DBID
- PSID
- OBID
- Catalog Activity
- Catalog Object
- Member Name (only in data sharing environments)
- Member ID (only in data sharing environments)
- SSID (only in data sharing environments)
- LUW Network ID
- LUW Name
- LUW Unique Value
- Alias
- Synonym
- Object Set
- Command
- Status
- Utility
- Sysplan
- Syspackage
- Syspackage Location
- Syspackage Collid
- Syspackage Name
- Syspackage Version

You must specify column names as userID.tableName.columnName. You cannot specify the following operators:
BETWEEN

EXISTS

The Max Lines field of the Free Form Filter Maintenance panel displays the maximum number of lines that are saved for the Free Form filter interface.

Filter relational operators

As you create multiple filter predicates, Log Master relates them to each other by using a filter relational operator.

The default relational operator for the Structured interface is AND. To relate filter predicates in an OR relationship, use the O=Logical OR action code on the Structured Filter Maintenance panel.

By using the Structured interface, you can define a filter like the one shown in Figure 18 on page 76.

Figure 18: Example of filter logical OR (within predicates)

Log Master gives precedence to the AND operator. It interprets the filter shown in Figure 18 on page 76 as if you had entered the following syntax through the Free Form interface:

WHERE
AUTH ID = SUSPECT
OR
(PLAN NAME = SUSPLAN AND TABLE NAME = DB2BA.TABLE01)

To define a more complex and specific filter, use the Free Form interface to override the Log Master default operator precedence rules by entering parentheses in the filter syntax. The revised syntax could be as follows:

WHERE
(AUTH ID= SUSPECT OR PLAN NAME = SUSPLAN)
AND
TABLE NAME = DB2BA.TABLE01
Delimited table and column names in filters

Log Master fully supports delimited table names and column names in filter predicates.

Structured filters generate batch syntax in the following format for table name predicates:

<table>
<thead>
<tr>
<th>TABLE NAME</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE NAME = 'Owner'.TABLE</td>
<td>Owner delimited, Table not</td>
</tr>
<tr>
<td>TABLE NAME = OWNER.'Table'</td>
<td>Table delimited, Owner not</td>
</tr>
<tr>
<td>TABLE NAME = 'Owner'.'Table'</td>
<td>Both delimited</td>
</tr>
<tr>
<td>TABLE NAME = TABLE</td>
<td>Owner not specified, Table not delimited</td>
</tr>
</tbody>
</table>

Earlier versions of Log Master created batch syntax as

```
TABLE NAME = 'OWNER.TABLE'
```

Log Master treats this type of table name predicate ('OWNER.TABLE') as a nondelimited OWNER.TABLE, or if no period is found, as a nondelimited TABLE.

**Note**

If you have a delimited table name, you must also specify the table owner in the predicate value.

Structured filters will generate batch syntax in the following format for column name predicates:

```
"Owner"."Table"."Column" = value
OWNER.TABLE.COLUMN = value
OWNER."Table".COLUMN = value
```

Free form filtering can use any of the formats described in this section.

Log Master accepts as a delimiter either a single quote (') or a double quote character (") based on what it encounters in the first character of a delimited name. If the delimiter character is also part of the delimited name itself, you must enter the character twice so that Log Master can recognize it as a single occurrence of the delimiter character. This is the same convention used in data definition language (DDL) statements. For example, a table with a name of

```
Ralphs TABLE
```
can be specified in a filter as

\[
\text{TABLE NAME} = 'Ralph's'.\text{TABLE}
\]

or

\[
\text{TABLE NAME} = "Ralph's".\text{TABLE}
\]

Embedded spaces, periods, or any other characters are supported within delimited names, with the exception of a null byte (EBCDIC x'00').

**Filter names**

Whether Log Master automatically assigns a name to a new filter and stores the filter with your work ID depends on how you create the filter, as follows:

- When you create a filter as part of a task dialog (any of the options under the Actions category on the Main Menu), Log Master automatically assigns a name to the filter and stores the filter with your work ID. You cannot control the name of this type of filter.

- When you create a filter by using the options under the Repository Options category on the Main Menu, Log Master does not store the filter as part of a work ID.

  This type of filter is called an independent filter, and you can assign a name to it. You should carefully consider the naming conventions that you use to name independent filters, taking into consideration that you will need to easily identify independent filters.

A filter name consists of two parts, and you must separate the two parts with a period. The first part defaults to your TSO prefix or your TSO user ID; the second part must conform to the following rules:

- The name can be from one to eighteen characters long.
- The first character cannot be numeric.
- All characters after the first character must be alphanumeric or national (for example, $, #, or @).

**Filter security**

You can assign different levels of security to filters.

The owner of a filter controls its security level. The security levels available for a filter are as follows:
Read/Write
With this level of security, any user can read or write to the filter. This level is the default.

Read Only
With this level of security, other users can view the contents of the filter. They can modify the filter, and then save it under a different name.

No Access
With this level of security, access by other users to the filter is blocked. The filter will not appear as a selection in any filter list except for that of the owner.

To set the security level for the filters that you create, from the Main Menu, select Product Options.

Filter optimization and usage

Log Master supports very complex filters. To avoid poor performance, optimize your filters in the same way that database users optimize their SQL SELECT statements. Use the tips in this section to help you create more efficient filters, which can result in improved performance. Improvement depends on many factors in your environment, including the size of the filters that you define.

- When you request a range of DB2 objects, use IN or LIKE instead of GREATER THAN or LESS THAN to gain more efficient results. Similarly, when you request a set of similar objects, use IN or LIKE to define the set, rather than joining a list of objects together with the OR operator.

- If you select objects in the DB2 catalog, specify only the most distinct object. For example, to select a given table, you do not need to specify the table space or database. From most distinct to least distinct, the order is
  - Column name
  - Table name (or DBID.OBID)
  - Table space name (or DBID.PSID)
  - Database name (or DBID)

This suggestion becomes especially important when the value of either the USELGRNG keyword or the USELGRNG installation option is YES. If you include unneeded qualifiers in your filter, you can cause Log Master to read extra log files, negating the time savings that USELGRNG provides.
If you select more than one occurrence of the same type of database object, do not use the logical OR operator to join them together. Instead, use the IN or NOT IN operators to more efficiently specify a set of objects.

**Example**

Instead of a filter like the following:

```
DB2DBA.TABLE01.BRANCHCODE = 01
OR
DB2DBA.TABLE01.BRANCHCODE = 02
```

you can get better performance with a filter like this:

```
DB2DBA.TABLE01.BRANCHCODE IN (01, 02)
```

Add URID-level predicates (like authorization ID or plan name) in your filter when possible, to enable pre-filtering. Doing so enables Log Master to filter out unneeded records at an earlier point in processing, and improve overall performance.

**Example**

If you are trying to select records in a given table, you might specify a simple filter like the following:

```
TABLE NAME = DB2DBA.TABLE01
```

However, if you know the name of the application plan used to access the table, use a filter like this:

```
TABLE NAME = DB2DBA.TABLE01
AND
PLAN NAME = DSNESPCS
```

To determine the amount of pre-filtering that occurs, use the statistics displayed starting in messages BMC097583 and BMC097586.

If the DB2 catalog in your environment contains large numbers of objects (for example, some enterprise resource planning applications generate tens of thousands of objects), avoid using the NOT operator or LIKE syntax. These types of filters cause Log Master to scan the DB2 catalog. Also consider using dynamic filtering in this environment. For more information, see the FILTER METHOD keyword in the section about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

To generate DDL statements, you might need to include some additional DB2 objects to obtain the dependent effects that you need. For example, to generate MIGRATE DDL for an entire table space, you might use a filter such as the following:

```
TABLESPACE NAME = DTBS01.TBLSPC01
```

Using this filter, Log Master generates DDL statements to create the table space and the tables within it, but does not generate statements to create the indexes on the various tables. To create the table space, the tables, and the indexes, use a filter
such as the following (where the names of all tables in the table space begin with the characters SPC01):

```
TABLESPACE NAME = DTBS01.TBLSPC01
OR
TABLE NAME LIKE OWNER01.SPC01TB*
```

**Deleting filters**

You can delete filters in accordance with Log Master security provisions, and work ID associations, as follows:

- If a filter is associated with a work ID, to delete the filter, you must be the owner of the work ID, or have read/write access to the work ID.

- If the filter is not associated with a work ID, you can delete the filter if you are the owner of the filter, or if you have read/write access to the filter.

For more information about filters, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for creating a filter with the Structured interface</td>
<td>“Defining a filter in a log scan step” on page 101</td>
</tr>
<tr>
<td>Step-by-step instructions for adding an independent filter to a log scan step</td>
<td>“Adding a filter association to a log scan step” on page 103</td>
</tr>
<tr>
<td>Step-by-step instructions for deleting a filter</td>
<td>“Deleting a filter” on page 107</td>
</tr>
</tbody>
</table>

**Time frame definitions**

Time frames (also called *scan ranges, or ranges*) are primarily start and end points that determine when a log scan begins and ends.

Log Master saves the time frame definition under a work ID. When viewing the contents of the work ID, the time frame definition constitutes part of the log scan step.

As you define a time frame, you can also define the input source that Log Master uses to read log records. Log Master uses one input source for all of the log scans in a work ID. When Log Master processes a time frame, it selects all of the records within the specified range. To restrict record selection, specify a filter. For this reason, work IDs usually include both a time frame and a filter.

The type and goal of your task determine how to define a time frame. Some tasks, such as migrating changes or auditing, are performed on an ongoing basis. You can
create a time frame to accommodate the requirements of ongoing processing. For more information, see “Migrating data changes” on page 209.

**Scan range definition**

To define the start point and end point of a range, use one of the following methods:

- Specify an RBA or LRSN value (depending on your data sharing environment)
- Specify a date and time
- Specify a log mark name
  For more information, see “Log mark names” on page 96.
- Specify the current RBA/LRSN value at the start of execution
  This value is the default scan range definition.
- Specify the last archived RBA/LRSN value
  This is the RBA/LRSN of the end point of the most recently written archive log file at the start of execution. Use this option to reduce the chance of reading active log files on the current DB2 subsystem.

To set the Log Master default end point to the current RBA/LRSN value, or to set other work ID default values, select **Product Options** from the Main Menu.

**Alternate limits for time frames**

You can define an alternate limit on your time frame.

When you do so, the end point of your log scan is determined by the value of either the **Options** field, or the **Optional Limit** fields on the Modify End Point panel (displayed in “Defining a time frame” on page 109), whichever comes first.

The **Optional Limit** fields are frequently used with ongoing log scans. For example, assume that during a period of high logging activity, an ongoing job does not complete during its assigned processing window. The operating system terminates the job and no valid output is produced. If you run the ongoing job again, the same problem exists.

In this situation, define an alternate limit that includes a range of log that is short enough to be processed by Log Master during the window. You can then run the same job repeatedly (producing valid output for each run without changing SYSIN syntax multiple times), until you work your way through the period of high activity and "catch up" to normal operation.
If you enter a value in the **Rerun Run Number** field on the Modify End Point panel to execute a previous log scan again, Log Master ignores any values in the **Optional Limit** fields. If you enter a value in the **From Start of Run Number** field to use the start point of a previous log scan, be sure that the end point defined by the **Optional Limit** field is after the end point of the previous log scan. For more information about the options on the Modify End Point panel, press F1 to access the online Help.

**Note**

The limit defined by these fields defines only how much log Log Master scans. For example, if you specify 01:00:00 in the **Hours** field, Log Master does not stop running after one hour; it stops after it has scanned all log files covering a one-hour period from your start point. The same principle applies to a limit specified as a number of log files.

---

**Setting the input source**

Log Master can read log records from the input sources described in this section.

To set the input source, use the **Reset Time Frame Using Log File Selections** option on the Time Frame Specification panel (shown in “Setting the input source Log Master can read log records from the input sources described in this section.”):

- The log files listed in the BSDS, or a set of BSDSs for a data sharing group
  
  This source is the default on the Time Frame Specification panel. Log Master uses this source to locate the log records written for a subsystem or data sharing group within your time frame.

- A set of specific DB2 log files

- A set of specific Log Master logical log control files created by a previous run of Log Master

When you set the input source to DB2 log files or logical log control files, the range of the selected files sets limits on the time frame of your log scan. Log Master resets any predefined start or end point values. The start and end points of the selected input source define the new time frame. You can contract this time frame further, but you cannot extend it past either end of the input source. The content of the selected files, and the DB2 subsystem where the files were created, also determine the domain of your log scan.

**Input source: specific DB2 log files**

When you define a specific DB2 log file or set of DB2 log files as input, you must provide at least the DB2 log files that cover the period of your time frame. In some situations, you might need to specify more resources, such as additional DB2 log files or image copies. This requirement occurs for the following reasons:
When the input source is specific DB2 log files, Log Master does not access the current DB2 subsystem’s BSDS or DB2 catalog.

Unless the tables selected by your filter are defined with the Data Capture Changes (DCC) attribute, Log Master attempts to perform row completion processing. To do this, Log Master frequently requires resources other than the DB2 log files covering the period that is defined in your time frame. These resources can include additional DB2 log files from other members in a data sharing group, (for example, when activity on another member affects the table rows selected by your filter), or files that cover periods of time outside of your time frame (for example, log files covering the period between an image copy and the start point of your time frame). For more information, see “Row completion processing and your jobs” on page 281.

If the DB2 objects selected by your filter reside in compressed table spaces, Log Master might require image copies to obtain a valid compression dictionary. Define the location of the image copies by using the Specify Image Copies field on the Work ID Run Time Options panel.

You cannot define a log scan as ongoing when your input source is specific DB2 log files.

Input source: Logical log control files

Be aware of the following points when you specify the input source as logical log control files:

The data in the logical log control file might already be filtered. You can use an additional filter to further restrict the selection of transactions.

If you specify a generation data group (GDG) base as a logical log control file, Log Master includes all available generations of the file as input.

If you specify more than one logical log control file as input (directly or by specifying a GDG base), Log Master automatically runs in overtime mode. For more information about overtime mode, see “Processing objects over time” on page 257.

You cannot define a log scan as ongoing if your input source is logical log control files.
You cannot create a log mark within a log scan step if the log scan reads input from logical log files. In this situation, Log Master cannot be certain that the logical log file was created on the current DB2 subsystem.

Reports from the log scan

Log Master provides a comprehensive reporting facility.

You can select from the following report types:

- Audit
- Detail
- Summary
- Object Activity Summary
- Catalog Activity
- Commit
- Rollback
- Data Capture Analysis
- Image Copy
- Backout Integrity
- Quiet Point
- Open Transaction
- Commands
- Log Bytes
- Column Update Frequency

Reports and output files that correspond to a particular task are automatically selected when you use a task dialog to perform the following actions:

- Back out application transactions
- Migrate data changes
- Perform an audit

You can also define customized reports by using report templates. With report templates, you can:

- Control the content of the report
- Control the format of the report, by defining the content and placement of headers, footers, text constants, data elements, and other report characteristics
- Use additional report data elements or sort capabilities that are available only in customized reports
If you use application programs to extract information from Log Master reports, you can use templates to optimize the report data for your program.

The Output Options panel (Figure 19 on page 86) lists the types of reports and outputs that you can generate. The individual reports are grouped into the categories Log Information, Performance, and Miscellaneous. The File Outputs category refers to forms of output other than reports.

**Figure 19: Output Options panel**

<table>
<thead>
<tr>
<th>File Outputs</th>
<th>Performance Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SQL (Dataset, Execution)</td>
<td>12. Commit</td>
</tr>
<tr>
<td>2. Logical Log File Outputs</td>
<td>13. Rollback</td>
</tr>
<tr>
<td>4. DDL File Outputs</td>
<td>15. Data Capture Analysis</td>
</tr>
<tr>
<td>5. Command File Outputs</td>
<td>Miscellaneous Reports</td>
</tr>
</tbody>
</table>

In addition to using the default reports for a task dialog, you can change the report, or add additional reports to a log scan. You can also view or get information about previously created reports. For a description of reports and the steps necessary to create or view them, see “Auditing data changes” on page 125.

**Output file definitions**

The following is a list of output file types:

- SQL files (see “SQL output files” on page 87)
- Load files (see “Load output files” on page 91)
- Logical log files (see “Logical log output files” on page 92)
- DDL files (see “DDL output files” on page 94)
- Command files (see “Command output files” on page 94)

For any output file, you can perform the following actions:

- Direct Log Master to produce the output file in several ways, including:
— From the Main Menu, select **Create or Edit Work IDs**, and then select the **Define Report and File Outputs** option.

— From the Actions category on the Main Menu, select an option from 0 through 7 to start a task dialog and accept the default output files for that dialog.

— From the Main Menu, select **Create Log Reports**.

- View the contents of (or get information about) output files that are saved to a data set. To generate lists of SQL, load file, or logical log data sets, select **Previously Created Outputs** from the Main Menu.

- Define default data set names and default symbolic values that Log Master inserts in the names of different types of output files. If you specify the output data set name as a GDG name, Log Master does not validate the name.

You can also specify certain default values for the online interface by using a product options file (POF). For more information, see the description of the ALPOFDSN installation option in the *Log Master for DB2 Reference Manual*.

- Control which specific data columns are included with, or excluded from, the generated output file. For an example of how to use the Create Include/Exclude Column panel for the output file types, see “Example 3: Ad hoc migration of changes” on page 219.

### SQL output files

You can generate the following types of SQL output files:

- **UNDO SQL** to reverse the effects of problem transactions.

- **REDO SQL** to reapply a set of changes (usually after a database recovery), omitting the subset of changes specified by the filter and the time frame. When you generate REDO SQL, be aware of the following points:
  
  — You must define a recovery point.
  
  — Your filter must refer to at least one specific DB2 object, such as a table name or a column name. This action ensures that you define (either directly or indirectly) a set of table spaces.
  
  — You cannot execute REDO SQL in the same run that generates the REDO SQL statements.

---

**Best practice**

BMC strongly recommends that you generate REDO SQL before you perform the recovery action.
- MIGRATE SQL to move data to shadow tables, or migrate specific updates to another system for test or audit.

After the SQL output file exists and is cataloged, to view the contents of the SQL output file or to view information about the SQL output file, from the Main Menu, select Previously Created Outputs. Figure 20 on page 88 shows a sample of the information displayed for an SQL output data set.

**Figure 20: SQL Dataset Information panel**

<table>
<thead>
<tr>
<th>Dataset . . . . : DB2DBA.OM701.SQL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status . . . . : Cataloged</td>
</tr>
<tr>
<td>SQL Type . . . : MIGRATE</td>
</tr>
</tbody>
</table>

**SQL Dataset Statistics**

- Insert Count : 329700
- Update Count : 30600
- Delete Count : 29700
- Where Clause Mode: Primary Key
- Date Format : ISO

**Creation Statistics**

- Work ID/Run Num : DB2DBA.OM701LLOGSQL / 2
- Step Number : 1
- Job Name/Num : DB2DBA / 3304

SQL generation

Log Master provides an SQL generator, with exclusive features, that generates SQL statements that undo or redo specific transactions. WHERE clauses are intelligently generated based on available index information. You can control whether updates resulting from referential integrity are a part of the correction process.

When executing generated SQL, the product accommodates and automatically reports any errors (SQL codes) that it encounters. The product can report specific errors, and then bypass them to continue processing.

**Table and column name translation during SQL generation**

Log Master enables you to change the names of tables or columns during SQL generation. This feature provides a way to generate SQL for migrating changes to similar objects on other DBMS platforms, or to other DB2 systems with different naming conventions. You can choose to translate names during SQL execution or SQL generation:

- To translate names during SQL execution, use High-speed Apply configuration parameters. For an example, see “Example 1: Using the online interface to generate High-speed Apply JCL” on page 232.
To translate names during SQL generation, you must edit your JCL to add an SQLXLAT DD statement to the job or job step that generates the SQL. The DD statement defines either a data set containing translation specifications, or contains specifications "in stream" in the JCL. Specify how to translate table and column names by using the following format:

```
TABLE tbowner.tbname -> newowner.newname
COLUMN colname -> newname
```

The COLUMN lines are always associated with the preceding TABLE line. The table names may contain an asterisk (*) to indicate a match on all possibilities.

The following figure shows an example of an in stream SQXLXLAT DD statement:

**Figure 21: Sample SQLXLAT DD statement**

```
//SQLXLAT DD *
TABLE USER1.PAYROLL -> USER2.PYRLL
COLUMN ATT1 -> NEWCOL1
TABLE MYUSER.* -> NEWUSER.*
TABLE X.Y -> X.Y
COLUMN UNITCOST -> OURCOST
COLUMN SUPPLIER -> CONTRACTOR
/*
```

In this example, the product would take the following actions:

- Generate SQL with the name USER2.PYRLL instead of USER1.PAYROLL
- Convert references to column ATT1 to NEWCOL1
- Generate all of the tables owned by MYUSER using the owner name of NEWUSER
- Convert references to table X.Y columns UNITCOST and SUPPLIER to OURCOST and CONTRACTOR, respectively. However, the product would *not* translate the name of table X.Y.

**SQL output and the SQL template**

To execute SQL output with the High-speed Apply Engine that is distributed with Log Master, specify the following forms of output:

- SQL output
- SQL template

The SQL template file contains descriptions of all distinct statement types contained in the SQL output. The template file is optional:

- If you execute the generated SQL with High-speed Apply, BMC recommends that you create the template file.
If you execute the SQL with a program other than High-speed Apply, you do not need the SQL template file.

When you allocate space for these data sets, remember that the SQL output data set must accommodate the total number of SQL statements, while the SQL template data set must accommodate the total number of distinct statement types.

**SQL output data set options**

The following figure shows the SQL Output panel, which you access from the Output Options panel. Define an output SQL file by specifying values on this panel. For descriptions of the options on this panel, press F1 to access the online Help.

**Figure 22: SQL Output panel**

<table>
<thead>
<tr>
<th>Command</th>
<th>Option</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDO SQL</td>
<td>Include RI Recs</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Include DDL</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include Trigger Recs</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Include Rollback</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include XML</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Execute SQL</td>
<td>N</td>
</tr>
<tr>
<td>MIGRATE SQL</td>
<td>Include RI Recs</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include DDL</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include Trigger Recs</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Include Rollback</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include LOBS</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include XML</td>
<td>N</td>
</tr>
<tr>
<td>REDO SQL</td>
<td>Include RI Recs</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include DDL</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include Trigger Recs</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>Include Rollback</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include LOBS</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Include XML</td>
<td>N</td>
</tr>
</tbody>
</table>

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step overview of how to generate an SQL output file through the online interface</td>
<td>“Defining an output SQL file” on page 112</td>
</tr>
<tr>
<td>Description of the type of tasks that you can perform with UNDO SQL and REDO SQL output files</td>
<td>“Backing out problem transactions” on page 155</td>
</tr>
<tr>
<td>Description of the types of tasks that you can perform with MIGRATE SQL output files</td>
<td>“Migrating data changes” on page 209</td>
</tr>
</tbody>
</table>
Load output files

Log Master enables you to create load files that support a wide range of migration requirements.

Load files can be processed by DB2 Load utilities, including the IBM Load Utility or the BMC LOADPLUS for DB2 product. Each load data file has an associated load control file that contains DB2 Load utility control statements to define the load data file, including:

- Identifying the tables into which data is loaded
- Describing fields in the input (columns in the tables)
- Describing the overall format of the load data file

Although a load file that Log Master creates uses the DB2 Load utility format, the content is not the same as a load file created by a DB2 Unload utility. The load data file created by Log Master reflects activity over a period of time, and can contain multiple records that affect the same row in a table space. A load file created by a DB2 Unload utility reflects a given point in time, and contains only one load record for each row in a table space.

You access the Load Output panel (Figure 23 on page 91) from the Output Options panel. For descriptions of the options on this panel, press F1 to access the online Help.

Figure 23: Load Output panel
Creation of tables to receive load data

When Log Master creates an output load file, it adds additional columns to give context to each load record. If you intend to use a load file to migrate data, you must take one of the following actions:

- Define additional columns in the receiving table, to match the columns added by Log Master, if, on the Load Output panel, you
  - Set the Separate Unit of Recovery Info field to Y
  - Set the Include INFO Columns with Data field to U (URID only), or A (All)
- Edit the load control file to remove the definition of the additional columns
  This action causes any subsequent Load utility to ignore the additional columns as it loads the data.

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of how to use the interface to define an</td>
<td>“Defining an output load file” on page 115</td>
</tr>
<tr>
<td>output load file</td>
<td></td>
</tr>
<tr>
<td>Determining which additional columns you must</td>
<td>The chapter about Log Master for DB2 syntax in the Log Master for DB2</td>
</tr>
<tr>
<td>define when creating tables to receive load data</td>
<td>Reference Manual</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Logical log output files

When you select records from the DB2 log, Log Master creates an intermediate file that contains all of the log records that meet the filter criteria. This intermediate file is a unique form of output called a logical log file.

Several files make up a logical log, including the logical log data file and the logical log control file. Both files must be variable blocked (VB) files. You can also generate an optional XMLSTRING control file if your logical log includes data from XML columns.

A logical log file can contain input from the following sources:

- The DB2 log
- A specific set of DB2 log files
- A previously created logical log file or set of previously created files

You can save the logical log as an output file of a log scan. You can then use logical logs as input for audit or data migration tasks. To enable subsequent ad hoc use of Log Master, you might choose to create logical logs and save them. You can then use the logical logs for input, and save the time required to scan the DB2 log.

Logical logs also provide a way to create audit files of data. By creating logical log files, you can save data for months, or years. You can still access and report on the data, even if the application has changed and the original logs have been deleted from your DB2 subsystem. Log Master can include DDL objects in your logical log files that can be interpreted as input by either Log Master or the High-speed Apply Engine.

You can use logical logs as input for other programs in your environment, or in subsequent runs of Log Master. BMC publishes the format of logical log files. The formats of the logical log control file and data file do not define an order for the records that they contain. The order of columns within the logical log data file is based on logical position within the base table, regardless of physical position within the table row. The column order is based on the COLNO column in the SYSIBM.SYSCOLUMNS table of the DB2 catalog.

The following example illustrates the use of logical logs. For this example, assume that you are occasionally required to produce audits for a payroll application. Instead of having to repeatedly re-create a search to select the same records from the DB2 log, you can generate a logical log output file. The logical log output file contains all of the information that you need to generate a report for that particular month’s payroll. The content of the file exactly represents the information logged by DB2 at the time that you ran payroll.

Figure 24 on page 93 shows the Logical Log Output panel. Define an output logical log file by specifying values on this panel. For descriptions of the options on this panel, press F1 to access the online Help.

Figure 24: Logical Log Output panel

---

Overview of log scans

Chapter 3 Defining a log scan 93
For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview of how to use the interface to define and generate a logical log output file</td>
<td>“Defining an output logical log file” on page 117</td>
</tr>
<tr>
<td>Logical log files, including sorting</td>
<td>The section about logical log files in the Log Master for DB2 Reference Manual</td>
</tr>
</tbody>
</table>

**DDL output files**

Log Master enables you to generate DDL files to migrate changes (called MIGRATE DDL), or to reverse the changes (called UNDO DDL).

When you generate a DDL output file, Log Master can generate a Catalog Activity report, generate a command output file, or update the Repository. Log Master cannot include other forms of output in the same log scan, such as other reports or SQL. To generate any other forms of output that you need in the same work ID, add an additional, separate log scan step. To generate DDL, you must also set the Process DB2 Catalog Records field on the Run Time Options panel to **Y**.

You access the DDL Output panel (Figure 25 on page 94) from the Output Options panel. Define an output DDL file by specifying values on this panel. For descriptions of the options on this panel, press **F1** to access the online Help.

**Figure 25: DDL Output panel**

<table>
<thead>
<tr>
<th>Command ====&gt;</th>
<th>DDL Output</th>
<th>SSID : DHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNDO DDL</td>
<td>(E=Edit, D=Delete)</td>
<td>DSN: &amp;SYSUID..D&amp;DATE..T&amp;TIME..UNDO.DDL</td>
</tr>
<tr>
<td>MIGRATE DDL</td>
<td>(E=Edit, D=Delete)</td>
<td>DSN: &amp;SYSUID..D&amp;DATE..T&amp;TIME..MIGRATE.DDL</td>
</tr>
</tbody>
</table>

Additional Options:
- Include Comments . . . . . . . N (Y=Yes, N=No)
- Commit Frequency . . . . . . . 1 (Number of Transactions, 0=All)
- Set SQLID . . . . . . . . . (Generate SET SQLID)

**Command output files**

Log Master enables you to generate command files to migrate changes (using MIGRATE Command on the Command Output panel), or to reverse the changes (using UNDO Command).

When you generate a command output file, Log Master can generate a Catalog Activity report, generate a DDL output file, or update the Repository. Log Master cannot include other forms of output in the same log scan, such as other reports or
SQL. To generate any other forms of output that you need in the same work ID, add an additional, separate log scan step.

Figure 26 on page 95 shows the Command Output panel, which you access from the Output Options panel. Define a command output file by specifying values on this panel. For descriptions of the options on this panel, press F1 to access the online Help.

**Figure 26: Command Output panel**

<table>
<thead>
<tr>
<th>Command Output</th>
<th>SSID : DJV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command =====&gt;</td>
<td></td>
</tr>
<tr>
<td>UNDO Command</td>
<td>(E=Edit)</td>
</tr>
<tr>
<td>MIGRATE Command</td>
<td>(E=Edit)</td>
</tr>
<tr>
<td>Additional Options: Include Comments</td>
<td>N (Y=Yes, N=No)</td>
</tr>
</tbody>
</table>

**Log mark definitions**

The ability to create a log mark is a unique Log Master feature. Log marks enable you to associate a name with a point on the log. You can use a log mark to define the start point and end point for a time frame.

When you specify a log mark, you can later refer to that point by the log mark name. You do not have to know the actual RBA or LRSN. Log Master maintains log mark information internally, in a Repository table named ALPMARK.

**How Log Master records RBAs and LRSNs**

Log Master records the RBA or LRSN for the log mark in one of the following ways:

- By using the RBA or LRSN that is current at the start of the job
- By using the RBA or LRSN obtained as a result of the quiesce when the Quiesce with Mark option is selected (as described in “Quiesce with Mark option” on page 96)
- If the log mark is created as part of a log scan, by using the RBA or LRSN that is associated with the end of the log scan’s time frame
- If you create the log mark directly through the Log Master online interface, by using the RBA or LRSN that you select
Methods of defining a log mark

You can generate log marks as part of a log scan step, or as a separate log mark step within a work ID.

When you define a log mark as part of a log scan step, Log Master sets the log mark equal to the selected end point of the time frame. This type of log mark cannot be generated if the log scan obtains its input from logical log files. When you define a log mark as a separate log mark step, independent from a log scan, Log Master sets the log mark equal to the current RBA/LRSN value within DB2 when your job starts running.

Within the Log Master online interface, you can:

- Use any of the task dialogs to define a log mark, or generate a log mark as part of the work ID’s log scan step
- Add a separate log mark step to a work ID (from the Main Menu, select Create or Edit Work IDs)
- Create, delete, or view information about a log mark, independent of a work ID (from the Main Menu, select Create or Delete Log Marks)

By using this method, you can create log marks that correspond with events in the SYSIBM.SYSCOPY table of the DB2 catalog, or the start points of DB2 log files.

Quiesce with Mark option

When you create a log mark, you can set the RBA/LRSN for the log mark to the RBA or LRSN of a quiesce action that you request.

To use the Quiesce with Mark option (Log Mark Entry panel), ensure that your filter refers to at least one specific DB2 object, such as a table name or a column name. This action ensures that you define (either directly or indirectly) a set of table spaces that Log Master can pass to the DB2 QUIESCE utility. The utility generates a quiesce point for the specified table spaces.

Log mark names

A log mark name represents a given point in the DB2 log.

A log mark name:

- Can be up to 40 characters long
- Can be any combination of alphanumeric or national characters
- Can use periods to separate portions of the name
- Is not qualified by Log Master with a user ID or a TSO prefix
Can use symbolic substitutions

Within a time frame, use existing (not newly created) log marks. You cannot create and refer to a log mark within the same run of Log Master.

You can enter log marks by using a numeric value appended to the log mark name. This technique enables you to reuse the same log mark name, and refer to specific log points by the numeric suffix. The suffix can be a relative or absolute generation.

**Relative generation**

You can enter a log mark with a relative value for the numeric suffix. Use a generation suffix of zero (0) to refer to the most recent log mark. Refer to the previous generation of the log mark with the generation suffix of (-1), and so on. When you work with the product’s ongoing capabilities, it can be convenient to use relative generations with your log mark names.

*Example*

- MSTRUPDATESTART(-1)
- MSTRUPDATESTART(0)

**Absolute generation**

You can enter a log mark with an absolute value for the numeric suffix. Separate the suffix from the log mark name with a period.

*Example*

- MSTRUPDATESTART.12

**Viewing log mark information**

When you specify a log mark through the online interface, you can type a wildcard pattern and generate a list of log marks.

**To view log mark information from the Main Menu**

1. From the Main Menu, select **Create or Delete Log Marks**.

2. Select **Display Log Marks**.

3. In the **Mark Name** field, type the name of a log mark, or enter a wild card pattern (for example *.*), and press **Enter**.

Log Master displays the Display Log Marks panel.
4 Beside the log mark for which you want information, type I and press Enter.

Log Master displays the Log Mark Information panel (Figure 27 on page 98) with information about the selected log mark.

**To view log mark information within a time frame**

1 From either the Define Start Point, Define End Point, or REDO Recovery Point panel, select the option to use a log mark.

2 In the Log Mark field, enter a wild card pattern (for example *. *), and press Enter.

Log Master displays the Mark List panel.

3 Beside the log mark for which you want information, type I and press Enter.

Log Master displays the Log Mark Information panel (Figure 27 on page 98) with information about the selected log mark.

**Figure 27: Log Mark Information panel**

<table>
<thead>
<tr>
<th>Log Mark Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark Name. . . . . . . : BEGIN.OF.RANGE</td>
</tr>
<tr>
<td>Version. . . . . . . : 1</td>
</tr>
<tr>
<td>Description. . . . . : GENERATION MARK PRIOR TO TRANSACTION EXECUTION</td>
</tr>
<tr>
<td>Mark RBA /LRSN . . . . : 000C858000130</td>
</tr>
<tr>
<td>Date/Time . . . . . . : 2013-01-18 09:03:48</td>
</tr>
<tr>
<td>Quiesce At Mark. . . . : Yes</td>
</tr>
<tr>
<td>Creating Work ID . . . . : BMC001.RD001</td>
</tr>
<tr>
<td>Phase ID . . . . . . : 1</td>
</tr>
<tr>
<td>Step Number . . . . : 1</td>
</tr>
<tr>
<td>Job Name/Number . . . : AA001T1 / 8602</td>
</tr>
<tr>
<td>Updated Version . . . : V11.01.00</td>
</tr>
</tbody>
</table>

For more information about the topics in this section, see the following references:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step-by-step instructions for creating a log mark step that you can later add to a work ID</td>
<td>“Adding a log mark step to a work ID” on page 59</td>
</tr>
<tr>
<td>Using the interface to define a log mark as part of the log scan step</td>
<td>“Defining a log mark in a log scan step” on page 122</td>
</tr>
<tr>
<td>How to use log marks to define a time frame range</td>
<td>“Migrating data changes” on page 209</td>
</tr>
</tbody>
</table>
Run time options

Run time options apply to all steps in a work ID.

Log Master provides different sets of run time options based on how you create or edit your work ID. You can specify run time options in the following ways:

- From a task dialog (options from 0 through 7 under the Actions category on the Main Menu)
  Log Master provides a subset of run time options. After you start a task dialog, the product displays a panel that is specific to that task. On that panel, select Specify Run Time Options. For descriptions of the options on the panel, press F1 to access the online Help.

- By using the Create or Edit Work IDs option on the Main Menu
  Log Master provides a larger set of run time options. For more information, see “Editing work ID run time options” on page 56.

Defining a log scan step

This section provides instructions, examples, and tips for using the online interface to define a log scan step.

The following table summarizes the tasks necessary to create a log scan step, and provides references to procedures for completing each task:

Table 4: Tasks for defining a log scan step

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify log filter criteria (optional)</td>
<td>Select Specify Log Filter Criteria to specify search criteria based on a unit of recovery, a specific database object, or specific data. Filter specification is optional, but for practical purposes most log scans include a filter. You can specify filters using a Structured or Free Form interface.</td>
<td>■ “Defining a filter in a log scan step” on page 101  ■ “Adding a filter association to a log scan step” on page 103</td>
</tr>
<tr>
<td>Specify time frame, input source (required)</td>
<td>Select Specify Time Frame and/or Input Source or Input Source, or both, to specify the set of log records that constitutes the range of the log scan, and specify the input source that the product scans for log records.</td>
<td>“Defining a time frame” on page 109</td>
</tr>
<tr>
<td>Task</td>
<td>Description</td>
<td>Reference</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Define report and file outputs (required) | Select **Define Report And File Outputs** to create reports of selected transactions, or generate an SQL file, a logical log file, a load file, or a DDL file. | ■ “Defining an output SQL file” on page 112  
■ “Defining an output load file” on page 115  
■ “Defining an output logical log file” on page 117  
■ “Defining an output DDL file” on page 119  
■ “Defining an output command file” on page 120  
■ “Defining a default report” on page 137 |
| Define a log mark (optional)              | Select **Define Log Mark** to name a point on the log.                       | “Defining a log mark in a log scan step” on page 122                      |
| Specify run time options (optional)       | Select **Specify Run Time Options** to define options that apply to all steps in a work ID. | ■ “Editing work ID run time options” on page 56  
■ “Run time options” on page 99          |
| Save the work ID, or generate JCL (optional) | Select **Work ID Options, JCL Generation** to save the work ID or generate JCL.  
You can generate JCL for batch submission by selecting **Generate JCL** from the Work ID File Menu. | ■ “Creating and accessing a work ID” on page 54  
■ “Creating a batch job from a work ID” on page 67 |

### Before you begin

- Ensure that you understand the concepts presented in this section and in “Getting started with Log Master” on page 43.

- Be aware of the following points:
  - When using a task dialog to define a log scan step, as described in this section, you can define only a single log scan step and one filter association.
  - To define multiple log scan steps, or to add additional filter associations, from the Main Menu, select **Create and Edit Work IDs**, and open the work ID that you want to edit. Using this option enables you to review the log scan step for a work ID or to generate a list of other work IDs.
  - To specify default values that Log Master can use for all log scan steps that you create, select **Product Options** from the Main Menu.
Working with filters

The procedures in this section explain how to create or delete filters.

Defining a filter in a log scan step

This topic explains how to define a filter in a log scan step.

Before you begin

Ensure that you understand the concepts presented in “Filter definitions” on page 71.

To define a filter in a log scan step

1 From the Actions category on the Main Menu, select an option from 0 through 7.

Depending on the option that you choose, you might be prompted to choose whether you want a Backout Integrity report in addition to the generated SQL. Enter Y or N and press Enter to continue.

Log Master displays a task dialog panel for the action that you selected (Figure 28 on page 101).

Figure 28: Initial task dialog panel

Select an Option. Then press Enter.

Options . . . . . . . .  1. Specify Log Filter Criteria
                        2. Specify Time Frame and/or Input Source
                        3. Define Report and File Outputs
2 Select Specify Log Filter Criteria and press Enter.

Log Master displays the Selectable Fields panel (Figure 29 on page 102). For information about the options on the Selectable Fields panel, including special considerations, press F1 to access the online Help.

**Figure 29: Selectable Fields panel**

<table>
<thead>
<tr>
<th>Selectable Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field . . . 10</td>
</tr>
<tr>
<td>0. Catalog Search 12. PSID 24. Synonym Name</td>
</tr>
<tr>
<td>1. Unit of Recovery ID 13. OBID 25. Object Set Name</td>
</tr>
<tr>
<td>3. Plan Name 15. Catalog Activity 27. Status</td>
</tr>
<tr>
<td>5. Connection ID 17. DS Member Name 29. Sysplan</td>
</tr>
<tr>
<td>6. Connection Type 18. DS Member Id 30. Syspackage</td>
</tr>
<tr>
<td>7. Update Type 19. Subsystem Name 31. Syspackage Location</td>
</tr>
<tr>
<td>8. Database Name 20. LUW Network Id 32. Syspackage Collid</td>
</tr>
<tr>
<td>9. Tablespace Name 21. LUW Name 33. Syspackage Name</td>
</tr>
<tr>
<td>10. Table Name 22. LUW Unique Value 34. Syspackage Version</td>
</tr>
<tr>
<td>11. DBID 23. Alias Name</td>
</tr>
</tbody>
</table>

For Column Name please specify the following information:
- **Table Owner**: ______________________
- **Table Name**: ______________________________________
- **Column Name**: ______________________________________
- **Filter Image**: _ (A=After, B=Before, Blank = Both)

3 Select an option and press Enter.

Log Master displays the Conditional Operators panel (Figure 30 on page 102).

**Figure 30: Conditional Operators panel**

<table>
<thead>
<tr>
<th>FILTERS</th>
<th>Structured Filter Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selectable Fields</td>
<td>SID: DB2R</td>
</tr>
</tbody>
</table>

T F Selectable Field . . : Table Name

Select the Operator. Then press Enter.

**Operator . . . 1**
- 1. Equal
- 2. Not Equal
- 3. Greater Than
- 4. Greater Than or Equal * NULL
- 5. Less Than * Not NULL
- 6. Less Than or Equal * Changed
- 7. Like * Not Changed

F1=Help F12=Cancel

4 Select an operator and press Enter.
Log Master displays a value entry panel that depends on the field that you selected. This example defines a table name as the selectable field, so Log Master displays the Table Name Value panel (Figure 31 on page 103).

**Figure 31: Table Name Value panel**

<table>
<thead>
<tr>
<th>Operator . . . : Equal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter table owner and name below. If either field contains non-alphanumeric or national characters, enclose it in quotation marks. Press F3 when finished.</td>
</tr>
<tr>
<td>Owner . . . . : DB2DBA</td>
</tr>
<tr>
<td>Table Name . . . : LOCATIONTABLE</td>
</tr>
<tr>
<td>F1=Help F3=Exit F4=Zoom F12=Cancel</td>
</tr>
</tbody>
</table>

5 Type a value and press F3.

Log Master displays the Structured Filter Maintenance panel (Figure 32 on page 103). The filter shown in the example selects log records by table name.

**Figure 32: Structured Filter Maintenance panel**

| Command ===> ________________________________________________ Scroll ===> HALF |
| Work ID . . : USER2.$$WORKID0004 |
| Description : USER2 01/18/2013 14:55:03 MIGRATE |
| Updated Version:V11.01.00 |
| Type one or more action codes then press Enter: |
| I=Insert, D=Delete, E=Edit, O=Logical OR |
| ACT | SELECTABLE FIELD | OPERATOR | VALUE |
| _ | TABLE NAME | = | DB2DBA.LOCATIONTABLE |

6 To insert, delete, or edit predicates, type the appropriate action code in the ACT column and press Enter.

For more information about the available action codes, press F1 to access the online Help, or see “Action codes in the Log Master online interface” on page 317

7 When you finish specifying the filter criteria, press F3 to return to the task dialog.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “Defining a log scan step” on page 99.

**Adding a filter association to a log scan step**

You can create a filter as a separate object, independent of a work ID, and then add filter associations to a work ID. You can further restrict transaction selection by adding additional filter associations to a log scan step.
To define an independent filter

You can create a filter as a separate object, independent of a work ID, and then add filter associations to a work ID. You can further restrict transaction selection by adding additional filter associations to a log scan step.

1. From the Repository Options category on the Main Menu, select Create or Edit Filters.

   The product displays the Filter File Menu.

2. Select New and press Enter.

   The product displays the Selectable Fields panel.

3. Define a filter as explained in Step 3 on page 102 through Step 6 on page 103.

4. When you finish specifying the filter criteria, press F3 to return to the Filter File Menu.

5. Select Save As and press Enter.
The product displays the Filter Name Entry panel.

**Figure 33: Filter Name Entry panel**

6 Provide the following information for the filter and press **F3**:
- A new name (or accept the default name)
- *(optional)* A description
- Security level (or accept the default, Read/Write)

Log Master displays the Filter File Menu with a message in the upper right corner indicating that the filter was saved under the name that you specified.

7 Press **F3** to return to the Main Menu, and then add the filter to a work ID, as described in “To add a filter association to a work ID” on page 105.

**To add a filter association to a work ID**

1 Open the work ID that you want to edit, and access the Log Scan Options panel.
For instructions, see “Creating and managing work IDs” on page 53.

2 Select Specify Log Filter Associations and press Enter.

Log Master displays the Maintain Filter Associations panel.

**Figure 34: Maintain Filter Associations panel**

```
Command ===> ________________________________________________ Scroll ===> HALF
SSID: DB2R
Work ID . . : ABC.PAYROLL
Description : USER2 01/18/2013 14:11:42 MIGRATE
Maintain the Current Selected Filters list OR
Add to the list by typing a Filter Name (may be
wildcarded) then pressing Enter:
Filter Name . . ___________________________
Current Selected Filters
D=Delete from Selected List, I=Information, B=Browse
ACT FILTER NAME DESCRIPTION
_ ABC.AUTHID AUTHID EQUAL TO DBA1.
_ ABC.PAYROLL USER2 01/18/2013 14:11:42 MIGRATE
****************************** End Of List ******************************
```

3 In the Filter Name field, type the name of the filter that you want to add to the Current Selected Filters list (or type a wildcard pattern) and press Enter.

For more information about using wildcards, press F1 to access the online Help.

The example shown in Figure 34 on page 106 lists two filters. The description of filter ABC.AUTHID indicates its definition. Adding this filter to the ABC.PAYROLL work ID further restricts transaction selection within the associated time frame.

4 Press F3 twice to return to the Work ID Maintenance panel.

**Figure 35 on page 106 shows two filters for the ABC.PAYROLL work ID:**

- The filter with the same name as the work ID was created through the Migrate Data Changes task dialog at the same time that the time frame and outputs were specified.

- Filter ABC.AUTHID was created as an independent filter, and was added to the log scan step.

**Figure 35: Work ID Maintenance panel**

```
Command ===> ________________________________________________ Scroll ===> HALF
SSID : DBAN
Work ID . . : ABC.PAYROLL
Description : ABC PAYROLL SUMMARY REPORT
Updated Version: Work ID Batch Options . . _ (E=Edit)
```
5 If you have multiple filters, as shown in Figure 35 on page 106, specify the Filter Relational Operator between filters as AND or OR:

a In the Work ID Batch Options field, type E and press Enter.

b In the Filter Relational Operator field, type A or O to select an operator, and then press F3 to return to the Work ID Maintenance panel.

6 Press F3 to return to the Work ID File Menu.

7 Save the work ID, or, to save it under a new name, select Save As.

Deleting a filter

This procedure explains how to delete a filter (that you no longer need) from the Repository.

Before you begin

Ensure that you understand the security restrictions presented in “Filter security” on page 78.
To delete a filter

1 From the Repository Options category on the Main Menu, select **Delete/Display Repository Tables** and press **Enter**.

   The product displays the Delete or Display Repository Objects panel.

2 Select **Delete Filters** and press **Enter**.

   The product displays the Delete Filters panel.

**Figure 36: Delete Filters panel**

```
=================================================================
Command ==>> ____________________________________________
Scroll ==>> HALF
SSID: DBAN
Type the qualified or unqualified name of the Filter that you wish to Delete (may be wildcarded) then press Enter:
   Note: You may use the Filter Name $$ORPHAN to view Filters with no Work ID associations.
Filter Name . . . ___________________________
Filters Like: ABC.*
Type one or more action codes then press Enter
D=Delete, I=Information, B=Browse, L=Associated Work IDs
ACT FILTER NAME                  DESCRIPTION
_    ABC.FILTERONE
_    ABC.PLANNAME                 PLAN NAME FILTER
D    ABC.REGION1
_    ABC.SPUFIPLAN
****************************** End Of List ******************************
```

3 Type the filter name or wildcard pattern, and press **Enter**.

   **Note**

   To generate a list of independent filters with no work ID associations, type **$$ORPHAN**. You can also add a qualifier to this specification (for example, **ABC.$$ORPHAN**).

**Figure 36 on page 108** shows a search for filters like ABC.*. The ABC.REGION1 filter is marked for deletion. For more information about using wildcards, press **F1** to access the online Help.

4 In the **ACT** column beside the filter that you want to delete, type **D** and press **Enter**.

   Log Master displays the Delete Confirmation panel.

5 Select **Delete the Filter** and press **Enter**.
Defining a time frame

This procedure explains how to define a time frame to specify the range and source of the log scan.

Before you begin

Ensure that you understand the concepts presented in “Time frame definitions” on page 81.

To define a time frame

1. From the Actions category on the Main Menu, select an option from 0 through 7.

   Log Master displays a task dialog panel specific to your selection.

2. Select Specify Time Frame and/or Input Source and press Enter.

   Log Master displays the Time Frame Specification panel.

Figure 37: Time Frame Specification panel
3 Select Define Start Point and press Enter.

Log Master displays the Define Start Point panel.

**Figure 38: Define Start Point panel**

4 Specify a proposed start point, and then press F3 to return to the Time Frame Specification panel.

5 Select Modify End Point and press Enter.

Log Master displays the Modify End Point panel.

**Figure 39: Modify End Point panel**
6 In the **Options** field, select one of the end-point choices.

7 *(optional)* In the **Optional Limit** fields, enter values to define an alternate limit on the time frame of the log scan.

   For information about the **Optional Limit** fields, press **F1** to access the online Help.

8 Press **F3** to return to the Time Frame Specification panel.

9 *(optional)* To select an alternate input source for your log scan, select **Reset Time Frame using Log File Selections** and press **Enter**.

   Log Master displays the Log File Selection panel.

**Figure 40: Log File Selection panel**

```
<table>
<thead>
<tr>
<th>SEL</th>
<th>Log File Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEL</td>
<td>Current Source . . : Subsystem BSDS</td>
</tr>
<tr>
<td>SEL</td>
<td>Select an Option. Then press Enter.</td>
</tr>
<tr>
<td>O</td>
<td>Options . . = 1. Subsystem BSDS prescribed DB2 Log File(s)</td>
</tr>
<tr>
<td>O</td>
<td>2. Specific DB2 Log File(s)</td>
</tr>
<tr>
<td>O</td>
<td>3. Specific Logical Log File(s)</td>
</tr>
<tr>
<td>O</td>
<td>F1=Help F3=Exit F12=Cancel</td>
</tr>
<tr>
<td>O</td>
<td>OR From Start of Run Number.</td>
</tr>
<tr>
<td>O</td>
<td>(Run Sequence Number or LASTRUN)</td>
</tr>
</tbody>
</table>
```

10 *(optional)* In the **Options** field, specify the input source for the log scan, and then press **F3** until you return to the Time Frame Specification panel.

11 *(optional)* Type values in the ongoing logscan fields at the bottom of the panel.

   Depending on the task that you are performing, the Time Frame Specification panel, might contain additional fields for defining an ongoing log scan, such as **Ongoing Process, Rerun/Reprocess Options**, and **Reset/Purge Options**.

   For more information about these options, press **F1** to access the online Help.

   For more information about ongoing log scans, see the section about Log Master for DB2 syntax in the *Log Master for DB2 Reference Manual*.

12 Press **F3** until you return to the Time Frame Specification panel.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “**Defining a log scan step**” on page 99.
Defining an output SQL file

This procedure explains how to generate a REDO SQL output file. You can also use this procedure to generate UNDO or MIGRATE SQL files, skipping the indicated step that applies only to REDO SQL files.

For more information, see “Using UNDO SQL” on page 159 or “Using REDO SQL” on page 162.

Before you begin

Ensure that you understand the concepts presented in the following sections:

- “Output file definitions” on page 86
- “SQL output files” on page 87
- “Run time options” on page 99

To define an SQL file as output

1. From the Actions category on the Main Menu, select **Generate REDO SQL** and press **Enter**.

   For REDO SQL or UNDO SQL, Log Master displays a panel to confirm whether you want a Backout Integrity report in addition to the generated SQL. Choose whether to include the report, and then press **Enter**.

   Log Master displays the task dialog panel for the type of SQL that you selected.

2. Specify a filter as instructed in “Defining a filter in a log scan step” on page 101.

   To generate REDO SQL, ensure that your filter refers to at least one specific DB2 object (such as a table name or a column name). This action ensures that you define (either directly or indirectly) a set of table spaces for which Log Master generates the REDO SQL statements.

3. Specify a time frame as instructed in “Defining a time frame” on page 109.

4. **(REDO SQL file only)** To generate a REDO SQL file, you must define a REDO recovery point:

   a. On the Generate REDO SQL panel, select **Specify Run Time Options** and press **Enter**.

      Log Master displays the Run Time Options panel.
b In the **Specify REDO Recovery Point** field, type E and press Enter.

Log Master displays the REDO Recovery Point panel.

c Specify the point of recovery as a specific RBA/LRSN or a log mark.

When you select the Last Common Quiesce option, Log Master searches the SYSCOPY table until it finds a quiesce with the same RBA or LRSN for all table spaces requested. Log Master designates this RBA or LRSN as the proposed recovery point.

d Press F3 twice to return to the Generate REDO SQL panel.

5 Select **Define Report and File Outputs** and press Enter.

Log Master displays the Report and File Outputs panel (Figure 41 on page 113). The figure shows the REDO SQL defaults, which are a Backout Integrity report and a REDO SQL file.

**Figure 41: Report and File Outputs panel**

<table>
<thead>
<tr>
<th>OUTPUTS</th>
<th>Report and File Outputs</th>
<th>Scroll ====&gt; HALF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command ====&gt;</td>
<td></td>
<td>SSID : DB2A</td>
</tr>
<tr>
<td>Work ID . . : USER2.<strong>WORKID0006</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description : USER2 2013-01-18 21.42.36 REDO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enter an action code. Then press Enter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I=Insert  D=Delete  E=Edit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT TYPE</td>
<td>DESCRIPTION</td>
<td></td>
</tr>
<tr>
<td>_ Report</td>
<td>BACKOUT INTEGRITY</td>
<td></td>
</tr>
<tr>
<td>Sysout: Class(*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDNAME: BIREPORT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ SQL File</td>
<td>Terse</td>
<td></td>
</tr>
<tr>
<td>Redo File: &amp;SYSUID..D&amp;DATE..T&amp;TIME..REDO.SQL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Include Trigger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Include ROLLBACK No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>***************************************************** End of List *****************************************************</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 In the **ACT** column beside the SQL File entry, type E.

Log Master displays the SQL Output panel.

7 In the **Redo SQL** field, type E and press Enter.

Log Master displays the REDO SQL Output panel (Figure 42 on page 113).

**Figure 42: REDO SQL Output panel**

<table>
<thead>
<tr>
<th>Options</th>
<th>REDO SQL Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL Output Destination . . :</td>
<td>&amp;SYSUID..D&amp;DATE..T&amp;TIME..REDO.SQL</td>
</tr>
<tr>
<td>SQL Output Template Destination . :</td>
<td>&amp;SYSUID..D&amp;DATE..T&amp;TIME..REDO.TEMPLATE</td>
</tr>
<tr>
<td>Options . . . . . . . . . . 1. Edit SQL Output Dataset</td>
<td></td>
</tr>
</tbody>
</table>
8 Select **Edit SQL Output Dataset** and press **Enter**.

Log Master displays the Output Dataset Information panel (Figure 43 on page 114).

**Figure 43: Output Dataset Information panel**

<table>
<thead>
<tr>
<th>Redo SQL Output File</th>
<th>Dataset Name (PDS Member Allowed) . . . (Optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ABC.ACCT.REDO.SQL</td>
</tr>
<tr>
<td>Disposition. . . . . . N</td>
<td>(N=New, M=Mod, O=Old, S=Shr)</td>
</tr>
<tr>
<td>RECFM . . . . . . . . _____</td>
<td>(FB=Fixed Block, VB=Variable Block)</td>
</tr>
<tr>
<td>Unit . . . . . . . . . SYSDA</td>
<td></td>
</tr>
<tr>
<td>Allocation Type. . . . C</td>
<td>(C=Cyls, T=Trks)</td>
</tr>
<tr>
<td>Space. . . . . . . . . 15, 5</td>
<td>(Primary, Secondary)</td>
</tr>
<tr>
<td>Release. . . . . . . Y</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Max Volumes. . . . . . ___</td>
<td></td>
</tr>
<tr>
<td>Expiration Date. . . . ________</td>
<td>(yyyy/ddd or 99365, 99366, 98000, 99000)</td>
</tr>
<tr>
<td>Retention Period : . . 30__</td>
<td></td>
</tr>
<tr>
<td>Model DSCB . . . . . .</td>
<td></td>
</tr>
<tr>
<td>Data Compaction . . . _</td>
<td>(Y=Yes, N=No For TAPE Only)</td>
</tr>
<tr>
<td>Data Class . . . . . .</td>
<td>(For SMS Only)</td>
</tr>
<tr>
<td>Management Class . . . .</td>
<td>(For SMS Only)</td>
</tr>
<tr>
<td>Storage Class. . . . .</td>
<td>(For SMS Only)</td>
</tr>
<tr>
<td>Volser(s) . . . . . . .</td>
<td>. . . . . . . .</td>
</tr>
</tbody>
</table>

9 Specify the data set name and attributes as required, and then press **F3** to return to the Output Dataset Information panel.

10 *(optional)* Select **Edit SQL Template Dataset** and press **Enter**.

BMC recommends that you generate the optional SQL template data set if you use the High-speed Apply Engine to execute your generated SQL statements.

Log Master displays the Output Dataset Information panel, including a default name for the SQL template data set.

11 Specify the SQL template data set and attributes as required, and then press **F3** twice to return to the SQL Output panel.

12 *(optional)* On the SQL Output panel, change the default values for SQL output options.

13 To adjust other options, type **E** in the **SQL Options** field and press **Enter**.

Log Master displays the SQL Options panel (Figure 44 on page 115).
14 Specify options for your output SQL file as required.

For more information about these options, press F1 to access the online Help.

15 Press F3 until you return to the Report and File Outputs panel.

16 Review the selections that you made for the SQL File, and then press F3 to return to the Generate REDO SQL panel.

**Defining an output load file**

This procedure explains how to define a load file and its associated control file.

**Before you begin**

- Ensure that you understand the concepts presented in the following sections:
  - “Output file definitions” on page 86
  - “Load output files” on page 91

- Define the time frame and filters for the log scan step.

**To define a load file as output**

1 From the task dialog panel, select **Define Report and File Outputs** and press **Enter**.

Log Master displays the Report and File Outputs panel.

2 In the ACT column, type I and press **Enter**.
Log Master displays the Output Options panel.

3 Select **Load File Outputs** and press Enter.

Log Master displays the Load Output panel (Figure 45 on page 116).

**Figure 45: Load Output panel**

<table>
<thead>
<tr>
<th>Load Output</th>
<th>SSID : DJV</th>
</tr>
</thead>
<tbody>
<tr>
<td>More: +</td>
<td>(E=Edit)</td>
</tr>
<tr>
<td>Load File: &amp;SYSUID..D&amp;DATE..T&amp;TIME..LOAD.DATA</td>
<td>(E=Edit)</td>
</tr>
<tr>
<td>Load Control File: &amp;SYSUID..D&amp;DATE..T&amp;TIME..LOAD.CNTL</td>
<td>(E=Edit)</td>
</tr>
<tr>
<td>Spanned: N</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Record Format: V</td>
<td>(Y=VB, S=VBS)</td>
</tr>
<tr>
<td>Formatted of Load File Output: L</td>
<td>(L=Log Master, U=Unload Plus, C=CSV, S=Standard Format, E=EDIT CSV)</td>
</tr>
<tr>
<td>Separate Dataset per Table: N</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Generate Empty Files: N</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Expand VARCHAR columns: Y</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Include INFO Columns with Data: N</td>
<td>(A=All, U=Urid Only, N=Urid None, E=Edit, S=User Prev Specified)</td>
</tr>
<tr>
<td>Separate Unit of Recovery Info: N</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Update Record Options: S</td>
<td>(A=After Image Only, B=Before Image Only, S=Both Separately, T=Both Together)</td>
</tr>
<tr>
<td>Create Include/Exclude Columns: (E=Edit)</td>
<td></td>
</tr>
<tr>
<td>Sort: Y</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Include Rollback: N</td>
<td>(Y=Yes, O=Only, N=No)</td>
</tr>
<tr>
<td>Include XML: Y</td>
<td>(Y=Yes, N=No, T=Template, E=Edit)</td>
</tr>
<tr>
<td>Period Override: N</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>IgnoreFields: N</td>
<td>(Y=Yes, N=No)</td>
</tr>
<tr>
<td>Delimit Column Name: O</td>
<td>(O=Only, N=None, A=ALL)</td>
</tr>
</tbody>
</table>

4 In the **Load File** field, type **E** and press Enter.

Log Master displays the Output Dataset Information panel for the load file data set.

**Figure 46: Output Dataset Information panel**

<table>
<thead>
<tr>
<th>Output Dataset Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load File Dataset</td>
</tr>
<tr>
<td>Dataset Name (PDS Member Allowed): &amp;SYSUID..D&amp;DATE..T&amp;TIME..LOAD.DATA</td>
</tr>
<tr>
<td>Disposition: N</td>
</tr>
<tr>
<td>LRECL: 81-32760</td>
</tr>
<tr>
<td>Unit: SYSDA</td>
</tr>
<tr>
<td>Allocation Type: C</td>
</tr>
<tr>
<td>Space: 1</td>
</tr>
<tr>
<td>Release: Y</td>
</tr>
<tr>
<td>Max Volumes:</td>
</tr>
<tr>
<td>Expiration Date:</td>
</tr>
<tr>
<td>Retention Period:</td>
</tr>
<tr>
<td>Model DSCB:</td>
</tr>
<tr>
<td>Data Compaction:</td>
</tr>
<tr>
<td>Data Class:</td>
</tr>
<tr>
<td>Management Class:</td>
</tr>
<tr>
<td>Storage Class:</td>
</tr>
<tr>
<td>Volser(s):</td>
</tr>
</tbody>
</table>
5 Edit the default data set name and file attributes and press **F3**.

Log Master displays the Load Output panel (Figure 45 on page 116).

6 *(optional)* To edit the default data set name of the load control file, or to change data set attributes, type **E** in the Load Control File field and press **Enter**.

Log Master displays the Output Dataset Information panel for the load control data set.

7 Edit the default data set name and file attributes and press **F3**.

Log Master displays the Load Output panel.

8 Specify the remaining output load file attributes as needed.

For more information about the options on this panel, press **F1** to access the online Help.

9 Press **F3** twice to return to the first panel of the task dialog.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “Defining a log scan step” on page 99.

---

**Defining an output logical log file**

This procedure explains how to define a logical log data file and its associated logical log control file.

**Before you begin**

- Ensure that you understand the concepts presented in the following sections:
  - “Output file definitions” on page 86
  - “Logical log output files” on page 92
- Define the time frame and filters for the log scan step.
To define a logical log file as output

1. From the task dialog panel, select Define Report and File Outputs and press Enter.

   Log Master displays the Report and File Outputs panel.

2. In the ACT column, type I and press Enter.

   Log Master displays the Output Options panel.


   Log Master displays the Logical Log Output panel (Figure 47 on page 118).

   **Figure 47: Logical Log Output panel**

   ![](Logical Log Output panel.png)

   4. In the Logical Log field, type E and press Enter.

      Log Master displays the Output Dataset Information panel for the logical log data set.

   5. Edit the default data set name and file attributes (this file must be a variable blocked file) and press F3.

      Log Master displays the Logical Log Output panel.

   6. In the Logical Log Control field, type E and press Enter.

      Log Master displays the Output Dataset Information panel.

   7. Edit the default data set name and file attributes (this file must be a variable blocked file), and press F3.
Log Master displays the Logical Log Output panel.

Specify the remaining logical log output file attributes as required and press F3 twice to return to the first panel of the task dialog.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “Defining a log scan step” on page 99.

---

**Defining an output DDL file**

This procedure explains how to generate an output DDL file.

When you generate an output DDL file, Log Master can generate a Catalog Activity report, generate an output command file, or update the Repository, but it cannot generate other forms of output in the same log scan, such as other reports or SQL. To generate any other forms of output that you need in the same work ID, add a separate log scan step.

**Before you begin**

- Ensure that you understand the concepts presented in the following sections:
  - “Output file definitions” on page 86
  - “DDL output files” on page 94
  - “Run time options” on page 99

- Define the time frame and filters for the log scan step.

- To generate DDL, you must also set the Process DB2 Catalog Record run time option to Y.

**To define a DDL file as output**

1. From the task dialog panel, select Define Report and File Outputs and press Enter.

   Log Master displays the Report and File Outputs panel.

2. If the task dialog that you are using automatically generates default reports or output files, delete all default reports and output files from the log scan step by typing D in the ACT column for each one. Press Enter.

3. In the ACT column, type I and press Enter.
Log Master displays the Output Options panel.

4 Select **DDL File Outputs** and press **Enter**.

Log Master displays the DDL Output panel.

5 To define an UNDO DDL output file, type **E** in the **UNDO DDL** field and press **Enter**.

Log Master displays the Output Dataset Information panel.

6 For the UNDO DDL output file, edit the default data set name and file attributes and press **F3**.

Log Master displays the DDL Output panel.

7 To define a MIGRATE DDL output file, type **E** in the **MIGRATE DDL** field and press **Enter**.

Log Master displays the Output Dataset Information panel.

8 For the MIGRATE DDL output file, edit the default data set name and file attributes and press **F3**.

Log Master displays the DDL Output panel.

9 Finish specifying the other DDL file attributes and press **F3** twice to return to the task dialog panel.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “Defining a log scan step” on page 99.

**Defining an output command file**

This procedure describes how to generate an output command file.

When you generate an output command file, Log Master can generate a DDL output file, generate a Catalog Activity report, or update the Repository, but it cannot generate other forms of output in the same log scan, such as other reports or SQL. To generate any other forms of output that you need in the same work ID, add a separate log scan step.

**Before you begin**
Ensure that you understand the concepts presented in the following sections:
— “Output file definitions” on page 86
— “Command output files” on page 94

Define the time frame and filters for the log scan step.

**Note**

To generate command output, you must also set the Process DB2 Catalog Record run time option to Y.

**To define a command file as output**

1. From the task dialog panel, select Define Report and File Outputs and press Enter.

   Log Master displays the Report and File Outputs panel.

2. If the task dialog that you are using automatically generates default reports or output files, delete all default reports and output files from the log scan step by typing D in the ACT column for each one. Press Enter.

3. In the ACT column, type I and press Enter.

   Log Master displays the Output Options panel.


   Log Master displays the Command Output panel.

5. To define an UNDO command output file, type E in the UNDO Command field and press Enter.

   Log Master displays the Output Dataset Information panel.

6. For the UNDO command output file, edit the default data set name and file attributes. Press F3.

   Log Master displays the Command Output panel.

7. To define a MIGRATE command output file, type E in the MIGRATE Command field and press Enter.

   Log Master displays the Output Dataset Information panel.

8. For the MIGRATE command output file, edit the default data set name and file attributes. Press F3.
Log Master displays the Command Output panel.

9 Finish specifying the other command file attributes and press **F3** twice to return to the task dialog panel.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “Defining a log scan step” on page 99.

### Defining a log mark in a log scan step

This procedure explains how to create a log mark as part of log scan step, and how to associate a log mark name with the end point of a time frame.

For instructions about how to create a separate log mark step, see “Adding a log mark step to a work ID” on page 59.

**Before you begin**

Ensure that you understand the concepts presented in the following sections:

- “Setting the input source” on page 83
- “Log mark definitions” on page 95

**To define a log mark in a log scan step**

1 From the Actions category on the Main Menu, select an option from 0 through 7.

   Depending on the option that you choose, you might be prompted to choose whether you want a Backout Integrity report in addition to the generated SQL. Type **Y** or **N**, and press **Enter** to continue.

   Log Master displays a task dialog panel for the action that you selected.

2 Select **Define Log Mark** and press **Enter**.

   Log Master displays the Log Mark Entry panel.

3 Type a log mark name and (optionally) a description.

4 To create a log mark at the same time that a quiesce is taken, type **Y** in the **Quiesce with Mark** field and press **Enter**.
When you select the **Quiesce with Mark** option, Log Master sets the RBA or LRSN for the time frame’s end point equal to the RBA or LRSN of the quiesce point. The RBA or LRSN for the quiesce point overrides any value for the end point that is specified through the interface.

For more information about using this option, see “Quiesce with Mark option” on page 96.

5 Press **F3** to return to the task dialog panel.

**Where to go from here**

For additional tasks associated with creating a log scan step, see “Defining a log scan step” on page 99.
Auditing data changes

This chapter explains how to use Log Master to perform auditing tasks.

Overview of auditing log information

Manually achieving a meaningful audit is tedious and difficult. Because DB2 records every data change in the log, a solution is to use the log as an information source. With the Log Master for DB2 product, you can search the DB2 log and save the retrieved information in a data set. Then, you can use that information to print a report quickly and easily. These auditing tasks are often performed to audit DB2 applications.

The Log Master online interface guides you through steps for specifying search criteria to select specific log records. Filters let you narrow your searches to specific users, tables, plans, or even column or value changes.

Log Master generates reports via a comprehensive reporting facility. You can select from a list of convenient standard default report formats with a choice of presentation, such as by user, job name, plan name, and so on.

Summary of default reports

The Log Master comprehensive reporting facility provides many convenient, standard default reports.

Table 5 on page 126 briefly describes each default report. You can generate report templates based on these report types. For detailed descriptions and examples, see “Reference of default Log Master reports” on page 321.
### Table 5: Default reports

<table>
<thead>
<tr>
<th>Type of report</th>
<th>Report name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log information reports: provide information about the DB2 log and information contained in the log</td>
<td>Audit</td>
<td>Lists changes made to data in the DB2 subsystem</td>
</tr>
<tr>
<td></td>
<td>Detail</td>
<td>Provides a detailed display of log records based on the criteria that you supply</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>Provides activity counts based on the criteria that you supply</td>
</tr>
<tr>
<td></td>
<td>Object Activity Summary</td>
<td>Provides a raw count of all data management activity (insert, update, delete, and exchange actions) related to the set of DB2 objects that you specify</td>
</tr>
<tr>
<td></td>
<td>Catalog Activity</td>
<td>Lists changes to the structure of DB2 objects made by data definition language (DDL) statements. This report shows which user ID or correlation ID changes the structure of your DB2 objects (for example, changes to DB2 security with GRANT or REVOKE status).</td>
</tr>
<tr>
<td></td>
<td>Column Update Frequency</td>
<td>Provides a summary report of changed columns</td>
</tr>
<tr>
<td>Performance reports: provide information to help tune a DB2 subsystem for ongoing processing and data recovery</td>
<td>Commit</td>
<td>Lists the activity counts between COMMIT actions</td>
</tr>
<tr>
<td></td>
<td>Rollback</td>
<td>Lists the activity counts for ROLLBACK actions</td>
</tr>
<tr>
<td></td>
<td>Image Copy</td>
<td>Lists activity counts between image copies</td>
</tr>
<tr>
<td></td>
<td>Data Capture Analysis</td>
<td>Analyzes the impact of creating or altering your DB2 tables that are defined with Data Capture Changes (DCC)</td>
</tr>
<tr>
<td>Miscellaneous reports: provide information about open transactions, quiet points, backout integrity, and drop recovery</td>
<td>Quiet Point</td>
<td>Lists ranges in the DB2 log where no units of recovery are active for a set of specified table spaces</td>
</tr>
<tr>
<td></td>
<td>Open Transaction</td>
<td>Lists transactions open at the end of the time frame that you specify</td>
</tr>
<tr>
<td></td>
<td>Backout Integrity</td>
<td>Provides information about recovering problem transactions</td>
</tr>
<tr>
<td></td>
<td>Commands</td>
<td>Provides information about DB2 commands issued on a subsystem</td>
</tr>
<tr>
<td></td>
<td>Log Bytes</td>
<td>Provides information about the distribution of log records in the DB2 log</td>
</tr>
<tr>
<td></td>
<td>Drop Recovery</td>
<td>Provides information about DB2 objects that you want to recover</td>
</tr>
</tbody>
</table>

For many reports, you can request report generation as part of defining a log scan step. You can generate reports from several task dialogs (options 0 through 7 under the Actions category on the Main Menu). You request a Drop Recovery report as part of an automated drop recovery work ID.
Transactions are included in a generated report based on how you define a filter and time frame. Log Master reports, like all forms of product output, include transactions that are completed within the time frame that you specify. In this context, completed means either committed or aborted. For information about transactions that are not complete at the end of a time frame, Log Master provides the Open Transaction report and the Object Activity Summary report.

**Overview of creating report templates**

You can define customized reports by using report templates.

With report templates, you can:

- Control the content of the report
- Control the format of the report by defining the content and placement of headers, footers, text constants, data elements, and other report characteristics
- Use additional report data elements or sort capabilities that are available only in customized reports

If you use application programs to extract information from Log Master reports, you can use templates to optimize the report data for your program.

**Examples of auditing changes**

This section provides examples of using Log Master to audit changes. The scenarios include auditing changes made by a specific user, auditing ongoing changes and creating an audit file, and auditing specific column data.

**Example 1: Auditing changes made by a randomly selected user**

For this example, assume that you are an auditor for a large banking institution. Banking requirements specify that you perform a monthly audit of all changes made by randomly selected users to ensure the integrity of the transactions. You must send a hardcopy report of these changes to the central auditing office.

You can specify a Log Master log scan step to create a filter that examines the AUTHID for a particular user ID, and define a time frame that spans all transactions for the month. Log Master produces the Audit report by default.
With changes to the selected authorization ID and the time frame, you can run the job whenever an auditor requests a random check. Figure 48 on page 128 shows an example of an audit process.

**Figure 48: Auditing a selected authorization ID**

The overall process for this task is as follows:

- Define a filter
- Set the time frame
- Change the default ordering of the Audit report

**To audit data changes made by a randomly selected user**

1. Complete the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Select <strong>Create Audit Report</strong> and press Enter.</td>
<td>None</td>
</tr>
</tbody>
</table>
On this panel | Take this action | Notes
--- | --- | ---
Create Audit Report | Select Specify Log Filter Criteria and press Enter. | This step creates the filter to define search criteria.
Selectable Fields | Use the Structured or Free Form filter interface to define search criteria. Define a filter that selects records based on authorization ID JCARSON. Press F3 until you return to the Create Audit Report panel. | ■ For filter values, see Figure 49 on page 129.
■ For instructions, see “Defining a filter in a log scan step” on page 101.
Create Audit Report | Select Specify Time Frame and/or Input Source and press Enter. | This step specifies the time frame for the log scan. For instructions, see “Defining a time frame” on page 109.
Time Frame Specification | Type dates and times to define the start and end points. Press F3 until you return to the Create Audit Report panel. | 
Create Audit Report | Select Define Report and File Outputs and press Enter. | Log Master displays an Audit report request by default. This step changes the default ordering of the report.
Report and File Outputs | Type E in the ACT column to view the report requests. Verify that the report destination and the report ordering options meet your requirements. Press F3 until you return to the Create Audit Report panel. | 
Create Audit Report | Select Work ID Options, JCL Generation and press Enter. | This step saves the work ID and generates the JCL. For an example, see “Creating a batch job from a work ID” on page 67.
Work ID File Menu | Select Save As. Select Generate JCL for batch submittal. | 

Figure 49: Filter for auditing log information

```
FILTERS ================ Structured Filter Maintenance ================
Command ===> ___________________________________________ Scroll ===> HALF
SSID: DB2R
Work ID . . : ABC.AUTHID
Description : AUDIT CHANGES MADE BY A RANDOMLY SELECTED USER
Updated Version: V11.01.00

Type one or more action codes. Then press Enter.
C=Catalog Search I=Insert D=Delete E=Edit O=Logical OR
ACT SELECTABLE FIELD OPERATOR VALUE
AUTH ID = JCARSON

*****************************************************************************
```

Chapter 4 Auditing data changes 129
Example 2: Auditing ongoing changes and creating an audit file

An auditor for a large insurance company requests a daily report that shows all transactions made to policy information. He wants the report sorted by authorization ID so that each person making changes to policy information can verify their daily changes before the report is delivered to him. Additionally, the auditor has asked you to save these changes in a separate file for archival purposes.

To respond to these requests, use the product’s ability to specify a work ID as an ongoing process. When Log Master runs an ongoing work ID for the first time, it uses the start point of the time frame that you define. But the next time you run the ongoing work ID, Log Master automatically adjusts the start point so that your log scan will select any transactions that were open at the end of the previous run. For more information about using ongoing processing, see “Ongoing processing” on page 210.

By combining the ongoing processing feature with the Log Master ability to define relative dates and time, you can create a single work ID that you can run daily to meet the auditor’s needs without changing or redefining the work ID.

You can specify a Log Master log scan step to create a filter to search all tables of the policy information application for updates, inserts, deletes, and exchanges. Select the changes made only by those authorized to use the application online. Exclude personnel who perform only batch transactions.

Log Master produces an Audit report by default. You can change the report ordering so that the information is grouped by authorization ID. Additionally, you can request a logical log to save the selected transactions for possible further use. It is inefficient and costly to search the entire log each time that you perform an audit. Use Log Master to create audit files in logical log format with just changes of interest for a particular purpose. Save these files for archival purposes and for further ad hoc filtering later.

Figure 50 on page 131 shows an example of the ongoing auditing process.
For this example, you will set up a process that creates a daily report of all beneficiary changes made to policy information, and save that information to a file.

The overall process for this task is as follows:

- Define a filter.
- Set the time frame.
- Change the default ordering of the Audit report.
- Run the ongoing auditing job.

Because you have defined this work ID as an ongoing process, the first time that you run the job, it starts at the start point that you designated when you defined the time frame. The next time that you run the work ID, it starts where the first run ended. The third run starts where the second run ended, and so on. This process gives you audit information in an ongoing manner.

To define an ongoing audit of data changes

1. Complete the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Select <strong>Create Audit Report</strong> and press <strong>Enter</strong>.</td>
<td>None</td>
</tr>
<tr>
<td>On this panel</td>
<td>Take this action</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Create Audit Report</td>
<td>Select <strong>Specify Log Filter Criteria</strong> and press <strong>Enter</strong>.</td>
<td>This step creates the filter to define search criteria.</td>
</tr>
</tbody>
</table>
| Selectable Fields             | Use the Structured or Free Form filter interface to define search criteria. Define a filter that selects changed records for the BENEFICIARY column in the POLICYINFO table, and changes made only by users authorized to use the online application. Press F3 until you return to the Create Audit Report panel. | ■ For filter values, see Figure 51 on page 133.  
■ For information about the interfaces, see “Filter specification interfaces” on page 72.  
■ For instructions, see “Defining a filter in a log scan step” on page 101. |
| Create Audit Report           | Select **Specify Time Frame and/or Input Source** and press **Enter**.            | This step specifies the time frame for the log scan, and designates the job as an ongoing process.                                      |
| Time Frame Specification      | In the **Ongoing Process** field, type Y. Type a date and time to define the start point, and accept the default end point value of CURRENT. Press F3 until you return to the Create Audit Report panel. | When the job is an ongoing process, Log Master automatically adjusts the range of the time frame to start where the last run ended. The first time that you run the job, it starts at the start point you designate when you define the time frame.  
For instructions, see “Defining a time frame” on page 109.  
For time frame values, see Figure 52 on page 133. |
| Create Audit Report           | Select **Define Report and File Outputs** and press **Enter**.                   | Log Master displays an Audit report request by default. This step changes the report to sort by Authorization ID, Table Name, and Unit of Recovery.  
This ordering groups all transactions made by one person. With the transactions grouped, it is easier for each person to verify their section of the report. |
| Report and File Outputs       | In the **ACT** column, type E.                                                   |                                                                                                                                         |
| Report Output                 | In the **Order By** fields, type 3, 9, and 1 and press F3.                        |                                                                                                                                         |
On this panel | Take this action | Notes
---|---|---
Report and File Outputs | In the ACT column, type I and press Enter. | This step inserts another output request that saves the logical log as an audit file. For more information, see “Logical log output files” on page 92. After you complete this step, the Report and File Outputs panel will look similar to the example in Figure 53 on page 133.
Output Options | Select Logical Log File Outputs and press Enter. | 
Logical Log Output | Beside the logical log or logical log control file, type E to change the data set name as appropriate for your environment. Press F3 until you return to the Create Audit Report panel. | 
Create Audit Report | Select Work ID Options, JCL Generation and press Enter. | This step saves the work ID and generates the JCL. For an example, see “Creating a batch job from a work ID” on page 67.
Work ID File Menu | Select Save As. Select Generate JCL for batch submittal. | 

**Figure 51: Filter selecting data by changes to a specific column**

```
FILTERS ============= Structured Filter Maintenance =========== Line 1 of 2
SSID: DB2R
Work ID . . : ABC.AUDITCHANGES
Description : POLICY INFO CHANGES - USERS ENTERING TRANSACTIONS ONLINE
Updated Version:V11.01.00

Type one or more action codes. Then press Enter.
C=Catalog Search I=Insert D=Delete E=Edit O=Logical OR

ACT SELECTABLE FIELD OPERATOR VALUE
_ CONNECTION ID = ONLINE
_ AND BENEFICIARY CHANGED

****************************************************************************** End Of List ******************************************************************************
```

**Figure 52: Example time frame definition**

```
Time Frame Specification SSID : DB2R
Start of Log Scan . . . : 2013-01-18 00.00.00.000000
End of Log Scan . . . . : CURRENT
Log File Source . . . . : Subsystem BSDS

Select an Option. Then press Enter.

Options . . . . . . . . 1. Define Start Point
2. Modify End Point
3. Reset Time Frame using Log File Selections

Ongoing Process . . . . . . . . Y (Y=Yes, N=No)
Rerun/Reprocess Options:
Rerun Run Number . . . . . . . . . . . (Run Sequence Number or LASTRUN)
OR
From End of Run Number . . . . . . . . . . . (Run Sequence Number or LASTRUN)
```

**Figure 53: Example report and file outputs for ongoing migration**

```
OUTPUTS ========= Report and File Outputs ========= DATA UPDATED
SSID: DB2R
```
Example 3: Auditing specific column data

For this example, assume that the manager of the credit card division of the bank where you work wants a daily report that verifies all changes to credit limits that set the limit to a value greater than $25,000.00.

You must produce a daily report on all column changes that meet a certain requirement, and generate the report on the day following the day that the changes were actually entered.

The overall process for this task is as follows:

- Define a filter.
  You set up a filter to select records based on the content of the LIMIT column. You need to select all records where the value of LIMIT is greater than 25,000 and the value of LIMIT has been changed.

- Set the time frame.
  You define the time frame to look at all transactions for the previous day.

- Change the default ordering of the Audit report.
  To make the Audit report (which is produced by default) more meaningful, you sort the report so that it groups all changes made by each person who entered information into the credit information table.

- Run the auditing job.
  You can run this job, with changes to the time frame, every day after midnight to produce a report of the previous day’s changes. As a result, you can provide the report to the manager of the credit card division each morning.

To audit data changes to a specific value

1. Complete the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Select Create Audit Report and press Enter.</td>
<td>None</td>
</tr>
</tbody>
</table>
On this panel | Take this action | Notes
---|---|---
Create Audit Report | Select **Specify Log Filter Criteria** and press **Enter**. | This step creates the filter to define search criteria. For filter values, see Figure 54 on page 135. For instructions, see “Defining a filter in a log scan step” on page 101.

### Selectable Fields

- **Use the Structured or Free Form filter interface to define search criteria.**
- **Define a filter that selects records where the credit limit column, LIMIT, has changed and is greater than the value 25000.**
- **Press F3 until you return to the Create Audit Report panel.**

Create Audit Report | Select **Specify Time Frame and/or Input Source** and press **Enter**. | This step specifies the time frame for the log scan, as shown in Figure 55 on page 135. For instructions, see “Defining a time frame” on page 109.

### Time Frame Specification

- **Set the time frame start and end points to look at transactions for a given day.**
- **Press F3 until you return to the Create Audit Report panel.**

Create Audit Report | Select **Define Report and File Outputs** and press **Enter**. | Log Master displays an Audit report request by default. This step changes the default ordering of the report to sort by unit of recovery and authorization ID.

#### Report and File Outputs

- **Type E in the ACT column.**

#### Report Output

- **In the Order By fields, type 1 and 3.**
- **Press F3 until you return to the Create Audit Report panel.**

Create Audit Report | Select **Work ID Options, JCL Generation** and press **Enter**. | This step saves the work ID and generates the JCL. For an example, see “Creating a batch job from a work ID” on page 67.

### Work ID File Menu

- **Select **Save As**.**
- **Select **Generate JCL** for batch submittal.**

---

**Figure 54: Filter to select credit limit**

```
FILTERS ================ Structured Filter Maintenance ============== Line 1 of 2
Command ===> [] Scroll ==>> HALF
SSID: DB2R
Work ID . . : ABC.CREDITLIMIT
Description : REPORT CHANGES TO CREDIT LIMITS WHERE THE LIMIT IS .GT. 3000
Updated Version:V11.01.00

C=Catalog Search  I=Insert  D=Delete  E=Edit  O=Logical OR
Type one or more action codes. Then press Enter.

ACT SELECTABLE FIELD OPERATOR VALUE
- LIMIT CHANGED
- AND LIMIT > 25000
End Of List
```

**Figure 55: Example time frame selecting data for one day**

```
Time Frame Specification
SSID : DB2R
```
Auditing DB2 catalog activity

You can use the following forms of Log Master output to examine changes made to the DB2 catalog in your environment. Many environments use this type of auditing to determine who makes changes to DB2 security (GRANT and REVOKE statements).

- **Catalog Activity report.** Using this report is the most convenient way to obtain information about DB2 security changes. This report can list:
  - DDL statements that change DB2 objects
  - DB2 objects that were changed
  - Date, time, and RBA/LRSN value when the changes were made
  - Authorization IDs and correlation IDs associated with the changes

For example, to generate a Catalog Activity report that lists security changes, you would define a time frame that covers your period of interest, define your output as a Catalog Activity report, and define a filter that selects only the changes that affect security. For example:

```
WHERE
CATALOG ACTIVITY IN (GRANT, REVOKE)
```

- **DDL with comments (verbose DDL).** A MIGRATE DDL file reproduces data definition language (DDL) activity that affects DB2 catalog tables. Log Master can include comments in the DDL file that provide URID-related information about each change, including the user ID, correlation ID, and plan name that made the change. This technique provides more detail than the Catalog Activity report.

For example, to audit DB2 catalog activity related to security, you can select only DDL statements that grant or revoke security. Define a time frame that covers your period of interest, define your output as a MIGRATE DDL file, and define a filter to select only grant and revoke activity in the DB2 catalog. For example:

```
WHERE
CATALOG ACTIVITY IN (GRANT, REVOKE)
```
- **Command with comments (verbose command).** A MIGRATE command file reproduces bind, free, or rebind command activity that affects DB2 plans and packages. Log Master can include comments in the command file that provide URID-related information about each change, including the user ID, correlation ID, and plan name that made the change. This technique provides more detail than the Catalog Activity report.

  For example, to audit DB2 command activity on a plan or package, you can generate only command output. Define a time frame that covers your period of interest and define your output as a MIGRATE command file.

- **Audit or Detail reports on DB2 catalog tables.** To examine DB2 catalog activity, you can generate an Audit report or a Detail report on changes to specific DB2 catalog tables. (To determine the DB2 catalog tables that relate to a given type of DB2 catalog activity, refer to IBM’s DB2 technical documentation.)

  For example, to generate an Audit or Detail report that lists security changes, define a time frame that covers your period of interest, then define your output as an Audit or Detail report. Define a filter to select the multiple catalog tables that relate to security (such as SYSIBM.SYSTABAUTH, SYSIBM.SYSCOLAUTH and so forth). Many changes to these tables relate to plan activity (BIND, REBIND, or FREE actions) and other processes that you might not be interested in. Define a filter to include all desired tables, and to exclude the unrelated activity from the report. You might need to add several filter predicates to select only the type of activity that you need. For example:

  ```sql
  WHERE
  TABLE NAME LIKE SYSIBM."SYS%AUTH" AND
  (SYSIBM.SYSCOLAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSDBAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSPACKAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSPLANAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSRESAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSROUTINEAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSSEROUTINEAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSSSEQUENCEAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSTABAUTH.GRANTEETYPE <> 'P'
  OR SYSIBM.SYSUSERAUTH.GRANTEETYPE <> 'P')
  ```

### Defining a default report

Use the procedure in this topic to define default reports, such as an Audit report or a Quiet Point report.

In this procedure, you can use the Report Output panel to specify the report’s destination, customize the report’s content, or change the default field order. The Report Output panel varies based on the type of report you are defining. The following example defines an Audit report:

---

<table>
<thead>
<tr>
<th>Command</th>
<th>Report Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPP054</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SSID : DEHJ</td>
</tr>
</tbody>
</table>

---

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Defining a default report

You can save reports in a data set or write them directly to SYSOUT. You can also specify an easily identifiable DD name to which Log Master directs report output. When generating reports, you can specify that Log Master save multiple reports to a single partitioned data set if the reports are produced from within the same log scan.

You can define a default report destination by choosing Output Dataset Defaults from the Main Menu. You can also define a model data set name to use for report data sets through this option. In addition, you can specify certain default values for the online interface by using a product options file (POF). For more information, see the description of the ALPOFDSN installation option in the Log Master for DB2 Reference Manual.

Defining overall report content

To control the content of your report, use your time frame and filter, and set values for fields on the Report Output panel. For descriptions of the options on this panel, press F1 to access the online Help.

Ordering report information

Each report type has a default ordering. When you edit a report output file, you can change the report ordering. For most reports, you can specify up to three report ordering fields. For more information, see the Report Ordering section of each report in this section.

You cannot change the ordering of a Backout Integrity report or the standard default version of a Quiet Point report. If you use a report template to customize the Quiet Point report, you can direct Log Master to sort the quiet ranges based on duration or number of open transactions. A different sorting order can change the quiet range that Log Master uses as the point to insert a quiesce record in SYSIBM.SYSCOPY.
Saving the report request

You can save report definitions as part of a log scan step under a work ID. Log Master does not limit the number of report requests that you can save in a work ID, including reports generated from report templates.

Browsing reports and viewing report information

You can view the contents of (or get information about) reports that are saved to a data set. From the Main Menu, select Previously Created Outputs to generate a list of report requests and to browse the contents of (or get information about) a report.

Before you begin

Review the following guidelines before defining reports:

- Log Master reports frequently include DB2 object names. On DB2 Version 8.1 and later versions, the object names can be long enough to affect the format of report information:
  - When an object name in a report is longer than the logical record length (LRECL) of the report, Log Master "wraps" the name and continues it on the next line of output (as shown in Figure 118 on page 322).
  - Log Master does not use a continuation character. The report contains as many lines of output as required for the complete DB2 object name.
  - The position of other data in the report can change, depending on whether object names are long enough to require additional lines. Applications that read report information must be able to tolerate changes in the position of report data (some programs or processes might require modification).

- Log Master attempts to translate Unicode characters to EBCDIC in output reports. If the attempt fails, Log Master replaces the untranslatable character or characters with a substitute character as defined by the applicable CCSID conversion information (for example, x'3F').

  The substitute character is not printable. When untranslatable characters occur in column data, Log Master writes additional lines in the report to note the untranslated characters and includes hexadecimal representation of the original Unicode characters (as shown in Figure 118 on page 322 and Figure 127 on page 346).

- Most Log Master reports present only the completed transactions (committed or aborted) that are defined by your time frame and filter. If a report that you
generate does not contain the data that you expect, ensure that you have specified your time frame and filter correctly.

This procedure uses the Migrate Data Changes task dialog and provides an overview of defining a report using the online interface. All of the options described in these steps are also provided in other task dialogs (options 0 through 7 in the Actions category on the Main Menu).

To define a report

1. From the Actions category on the Main Menu, select Generate MIGRATE SQL and press Enter.

Log Master displays the Generate Migrate SQL panel.


Log Master displays the Report and File Outputs panel.

---

**Note**

When you use Create Log Reports from the Main Menu, Log Master does not define any default reports. As a result, after you select Define Report and File Outputs, Log Master immediately displays the Output Options panel. At a minimum, you must also define a time frame when you use this task dialog to define reports.

---

3. In the ACT column beside any existing output, type I and press Enter.

Log Master displays the Output Options panel.

4. Select the type of report that you want to define and press Enter.

Log Master displays the Report Format panel. This example uses a standard default report. For information about report templates, see “Creating a customized report template” on page 141.

5. Select Standard Default and press Enter.

Log Master displays the Report Output panel for the type of report that you selected (in this example, an Audit report).

6. Edit the report’s destination, the columns used for report ordering, and the columns included in the report, as necessary.

For more information about the options on this panel, press F1 to access the online Help.
Creating a customized report template

You can create a customized report template from any default report that Log Master offers.

You can control the content of the report by:

- Adding data elements and sort capabilities that are not available for standard default reports
- Removing unneeded fields or headings
- Adding text "constants" to explain or provide more details about report data

You can also control the format of the report by defining the content and placement of the following items:

- Page headers and footers
- Report headers and footers
- Items on an individual line in the report (body/detail)
- Text constants that explain or label data in the report
- Spacing between lines in a report
- Break (sort key) headers and footers (determined by the order by fields that you define to sort the data in a report)

If you use application programs to extract information from Log Master reports, using report templates enables you to optimize the report data for your program.

Considerations for report templates are as follows:

- A report template is valid only for one report type.
  
  If you define a report template for a Detail report, you cannot use that template to print a Summary report. Log Master validates the report type when it uses the template to generate a report.

- A report template reflects the report options (for example, order by fields) that were selected when the template was generated.

  To change the order by fields or other options, modify the template. You cannot specify batch syntax to use a template and specify batch syntax for order by fields of the same report.
If you save a report template in the Repository, that template can only be used on the current DB2 subsystem (SSID).

To use the same template on multiple subsystems, export the template to a data set, which you can import to additional subsystems.

When you delete a report template from the Repository, Log Master does not check work ID associations before deleting the template (as it does for filters).

If you generate a report from logical log input, and you use a report template that is stored in the Repository, Log Master requires a connection to DB2.

If the template is stored in a data set, or if you do not use a template, reports from logical log input do not require the connection.

Versions of Log Master that support report templates use at least one sort action for each type of report within a log scan.

Earlier versions of Log Master use one sort action for all reports in the same log scan (with an additional sort for Backout Integrity or Catalog Activity reports). Versions that support templates can require more resources for sort actions.

The online interface uses a default template name of userID.$$TEMPLATEnnnn, where nnnn is a sequence number (for example, USER14.$$TEMPLATE0001). The default value for the template portion of the name is reserved for use by Log Master; you cannot create a template name with a template portion that begins with $$TEMPLATE.

### Sections of a report template

Log Master groups the information in a report template into the following sections:

- Report headers and footers
- Page headers and footers
- Breaks (sort keys) that can include headers or footers
- Body/detail

Log Master provides an auto-tab feature that indents lines to distinguish break headers, break footers, or body/detail specifications based on your order by fields.

Log Master enables this feature by default, and you can turn it off. When this feature is enabled, enter column numbers for absolute positioning based on the start of the line. The auto-tab feature indent the lines properly based on your order by sequence. If you change the order of your report breaks (sort keys), you do not have to change your positioning numbers.

Figure 56 on page 143 illustrates the sections of an Audit report that is ordered by table name and unit of recovery identifier (URID).
Figure 56: Report sections in sample Audit report

Date: 2013-01-18  LOG MASTER FOR DB2 - V11.01.00  Page: 1

Audit Report, By Table Name, UrId

From: Mark DB2DBA.START.RBA(O) (x'C2B636395F36')
To: Mark DB2DBA.END.RBA(O) (x'C2B6363927DA')

Report Information:
Work ID : DB2DBA.DB2DBA#AUDIT  Run Number: 1  Subsystem: DXW
Description: DB2DBA GENERATE MONTHLY REPORTS

Table Name: DB2DBA.DB2DBA#5  DBID:OBID: (329.23)
Tablespace Name: DB2DBADB.DB2DBA#4  DBID:PSID: (329.22)

URID LRSN: x'C2B63656FA93' Data Sharing Member: DXW2
URID : x'00047A4B0563' Date : 2013-01-18 Conn Type: BA
Status : Committed  Time : 16.33.21.101 Conn ID : DB2CALL
Plan Name: ALPSQLG8  Auth ID: DB2DBA2  Corr ID : DB2DEAPR

Type: Insert At: x'00047A4B0564'  Time: 2013-01-18 16.33.21.101

Report Index: DB2DBA.DB2DBA#15  Type: Unique
RID : 00000002/01  Status: Committed
IX Value: DATA_KEY : 2292
TRANSACTION_CODE : ACCTYBL-ADJ05-29-COMP

Field Data: DATA_KEY  TRANSACTION_CODE**********  UPDNUM DESCRIPTION**
New: 2292  ACCTYBL-ADJ05-29-COMP  000021  LOAD REC #21
  SHORT DEPT_NAME: ACCT_REN_NAME**********  JOURNAL_CODE
New: ACCTSPAYABLE  EL-ASSAD, IMAD  2104--
  COMMENTS:***********************************************
New: REVISE ACCT. BALANCE FOR COMPENSATION
  UPDNUM_CHOCOUNT
New: 0

Totals For:URID: x'00047A4B0563'
Ins : 1  Del : 0  Upd : 0
Exc : 0
Ins/Tr: 0  Del/Tr: 0  Upd/Tr: 0
Tot : 1  Del/RI: 0  Upd/RI: 0

Totals For:Table Name: DB2DBA.DB2DBA#5  OBID: 23
Ins : 1  Del : 0  Upd : 0
Exc : 0
Ins/Tr: 0  Del/Tr: 0  Upd/Tr: 0
Tot : 1  Del/RI: 0  Upd/RI: 0

Report Totals:
Ins : 1  Del : 0  Upd : 0
Exc : 0
Ins/Tr: 0  Del/Tr: 0  Upd/Tr: 0
Tot : 1  Del/RI: 0  Upd/RI: 0

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Items in a report template

On each line in a template, Log Master can include filler items or the following items:

- **Constants**
  Text strings that explain or label data

- **Data elements,**
  Fields where content from your input source (DB2 log records, logical log files, and so forth) or other content are displayed
  Log Master defines names for these data elements and provides them from the following sources:
  
  — Data dictionary: data-dependent elements from your input source (for example, URID LRSN or authorization ID)
  
  — Built-ins: common elements that apply to the whole report (for example, page number, current time)
  
  — Counters: context-dependent elements where Log Master accumulates totals for use in break and report footers (for example, number of inserts, number of deletes)

  For a complete list of data elements, see HLQ.DBSAMP.ALPRDICT, where HLQ represents a qualifier assigned in your environment during installation.

- **IF expressions**
  Enable you to conditionally display output in a report based on data element values. By using an IF expression, you can:
  
  — Reduce the number of lines generated in a specified report
    For example, assume that a unit of recovery with total activity greater than 100 is an abnormality that requires investigation. The log range to be scanned contains one million units of recovery. Using a Commit report ordered by activity, you see all one million units of recovery for the log range. However, by defining an IF expression in the body of the report, you can limit the lines displayed to only the units of recovery with total activity greater than 100.
  
  — Display an alert message in a report
    For example, assume that you run a daily Commit report filtered by Correlation ID. For a correlation ID of interest, the total number of inserts must match the total number of deletes for the specified log range. If the totals do not match, then the job associated with the correlation ID requires investigation. You can define an IF expression to perform this check, and display an alert message if the totals do not match.
Considerations for IF expressions and conditional processing are as follows:

- CPU and elapsed time increase when Log Master performs conditional processing, slowing Log Master performance.

- Conditional processing of elements:
  — In break sections is less costly than in the body section
  — Occurs at report-generation time
  — In the body section of the report is performed for each input data record

For improved performance, define an IF expression:

- For a line, rather than defining identical IF expressions for each element in a line
- Around a group of lines, rather than defining identical IF expressions for each line

**Positioning items in a report template**

Use the following procedure to position a constant or a data element in a report template, using absolute or relative positioning.

**To position a constant or a data element**

1. In the report template, use one of the following methods:

   - For absolute positioning, enter a number to represent the actual column on a report line where a constant or data element starts.

   - For relative positioning, enter a number to represent the number of columns that you want to define between the end of the previous element and the start of the next element (using the order as defined on the Report Line Maintenance panel).

**Figure 57: Position of items in a report template**

<table>
<thead>
<tr>
<th>Absolute Positioning</th>
<th>Relative Positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phrase: TEXT01</td>
<td>Phrase: TEXT02</td>
</tr>
<tr>
<td>Position: A3</td>
<td>Position: R1</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T E X T 0 1</th>
<th>T E X T 0 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6</td>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
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<td>9</td>
<td>9</td>
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<tr>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
Examples of report customization tasks

This section provides examples of customizing Log Master reports. The scenarios include creating a customized report template and modifying an existing work ID to use a customized template.

Example 1: Customizing a report by using a report template

This topic shows an example of creating a new report template based on a Summary report.

The overall process for this task is as follows:

- Create a report template based on a Log Master standard default Summary report (see “To create a report template” on page 146).
  The most convenient way to create a report template is to modify a standard default report.

- Modify the template to customize the report to reduce the break header for tables from two lines to one line, and reduce the break header for units of recovery from four lines to one line (see “To customize a report template” on page 147).

- Store the template in a data set for later use (see “To preview and store the report template” on page 150).

After storing a new template, you can define or modify work IDs to generate the customized report by using the template. For an example, see “Example 2: Generating a customized report by using a report template” on page 151.

To create a report template

1. On the Main Menu panel, select Create or Edit Templates and press Enter.


3. On the Generate Template Options panel, select Summary and press Enter.

   A report template is valid for only one type of report.

This procedure uses the default report options (order by table and URID). Log Master generates a report template based on the options that you select on this panel.

On the Template Maintenance panel, an online message indicates that the template has been created.

**To customize a report template**

1. Edit the break header for tables in the report:
   a. On the Template Maintenance panel, type E in the **Break/Order By** field and press **Enter**.
   b. On the Report Break Maintenance panel, type E in the **ACT** field beside Table Name and press **Enter**.
   c. On the Report Break panel, type E in the **Header** field and press **Enter**.
   d. On the Report Section Maintenance panel, type D in the **ACT** field beside the bottom-most line on the panel. Press **Enter**.

   This step deletes the second line of the header.

2. Edit the remaining line of the break header, and add the table space name:
   a. On the Report Section Maintenance panel, type E in the **ACT** field beside the remaining line on the panel and press **Enter**.
   b. On the Report Line Maintenance panel, type D in the **ACT** field beside the bottom-most five lines on the panel. Press **Enter**.

   This step removes the DBID information from the line.
   c. On the Report Line Maintenance panel, type IC in the **ACT** field beside the bottom-most line on the panel. Press **Enter**.

   This step adds a field label (constant) for the table space name field.
   d. On the Report Element Maintenance panel, type **Tablespace Name:** in the **Phrase** field. Type A and 42 in the **Position** fields and press **F3**.

   This step specifies the text of the label, including the colon, and positions the text on the line.
   e. On the Report Line Maintenance panel, type IE in the **ACT** field beside the bottom-most line on the panel. Press **Enter**.
This step adds a data element that represents the table space name.

**f** On the Select Element panel, type T* in the **Element Name** field and press **Enter**.

This step searches for the table space name data element. The search function is case-sensitive, so you must type an uppercase T.

**g** On the Select Element panel, type S in the **ACT** field beside the Table Space Name data element. Press **Enter**.

This step selects the table space name data element (formerly on the deleted second line of the Table name break header).

**h** On the Report Element Maintenance panel, type R and 1 in the **Position** fields and press **F3**.

This step positions the field after the corresponding label.

**i** On the Report Line Maintenance panel, press **F4**.

This step launches the Log Master Template Preview feature, which you can use to verify your changes. The online display does not distinguish between constants (field labels or comments) and data elements (actual fields where content will be displayed).

**j** On the Template Preview panel, press **F3** until you return to the Report Break Maintenance panel.

To edit the break header for units of recovery in the report, complete this step:

**Note**

This step provides a guideline and is applicable to a data sharing environment; the fields differ slightly in a non-data sharing environment.

**a** On the Report Break Maintenance panel, type E in the **ACT** field beside the bottom line on the panel (UR RBA). Press **Enter**.

**b** On the Report Break panel, type E in the **Header** field and press **Enter**.

**c** On the Report Section Maintenance panel, type D in the **ACT** field beside the first, third, and fourth lines on the panel. Press **Enter**.

This step deletes three lines from the header.

**d** On the Report Section Maintenance panel, type E in the **ACT** field beside the remaining line on the panel. Press **Enter**.
e On the Report Line Maintenance panel, type D in the ACT fields beside the top three lines and the bottom two lines on the panel. Press Enter.

This step deletes all items from the remaining line except the UR Date constant and data element.

4 Reposition the constant that labels the UR Date data element:

a On the Report Line Maintenance panel, type E in the ACT field beside the top line on the panel. Press Enter.


5 Add a label (constant) for the UR Time data element:

a On the Report Line Maintenance panel, type IC in the ACT field beside the bottom line on the panel. Press Enter.

This step adds a field label (constant) for the UR Time data element.


This step provides the text of the label (be sure to type two blanks before the colon), and positions it on the line.

6 Add the UR Time data element after the label:

a On the Report Line Maintenance panel, type IE in the ACT field beside the bottom line on the panel. Press Enter.

This step adds the UR Time data element.

b On the Select Element panel, type U* in Element Name field and press Enter.

This step searches for the UR Time data element. The search function is case-sensitive, so you must type an uppercase U.

c On the Select Element panel, type S in the ACT field beside the UR Time data element. Press Enter.


This step positions the data element after the previous label, and truncates the width of the Time data element from 15 to 12 characters.
To add a label (constant) for the UR Status data element, complete the panels shown in Step 5 on page 149. Use the following values:

- In the **Phrase** field, type **Status:** as the text of the label.
- In the **Position** fields, type **A** and **49**.

To add the UR Status data element after the label, complete the panels shown in Step 6 on page 149. Use the following values:

- In the **Element Name** field, search for the UR Status element.
- In the **Position** fields, type **R** and **1**.

To add a label (constant) for the Authid data element, complete the panels shown in Step 5 on page 149. Use the following values:

- In the **Phrase** field, type **Auth ID:** as the text of the label.
- In the **Position** fields, type **A** and **71**.

To add the Authid data element after the label, complete the panels shown in Step 6 on page 149. Use the following values:

- In the **Element Name** field, search for the AuthID element.
- In the **Position** fields, type **R** and **1**.

Press **F3** until you return to the Template Maintenance panel.

**To preview and store the report template**

On the Template Maintenance panel, press **F4**.

Log Master displays the Template Preview panel. The two modified break headers are shown in the preview display. Notice that the break header for URIDs now extends past column 80. To scroll left and right, press **F10** and **F11**.

**Figure 58: Template Preview panel (entire report)**
The online preview does not display extra vertical spacing that you might have defined through the **Space before printing** field on the Report Line Maintenance panel. In a generated report, Log Master uses ANSI control characters to create this line spacing. Because most online terminals do not honor these characters, you cannot see the results of your changes in this online display for either the report section or the overall report. To see your changes, print a report using the template. Alternately, you can define a separate line that contains one filler item, defined with a blank fill character.

2 Press **F3** until you return to the Report Template File Menu.

3 To store the template in a data set for use by multiple work IDs on multiple DB2 subsystems, complete the following series of panels:
   a On the Report Template File Menu panel, select **Export to Dataset** and press **Enter**.
   b On the Export Template Dataset panel, type a data set name and press **Enter**.
      This panel supports partitioned data set (PDS) member names.
   c On the Report Template File Menu panel, press **F3**.
      Return to the Main Menu for other tasks.

### Example 2: Generating a customized report by using a report template

To use a report template, you must delete the existing report and define a new report. You cannot edit an existing report to change its format source from the standard default to a report template. This section shows an example of how to modify an existing work ID to use a customized template that is based on a Summary report. The overall process for this task is as follows:

- Open an existing work ID
Modify a log scan as follows:
— Delete an existing standard default report
— Insert a new report definition that uses a report template

Save the work ID

To use a report template in a work ID, the template must be stored in either an external data set or in the Log Master Repository. For an example of how to define a report template, see “Example 1: Customizing a report by using a report template” on page 146.

To define a work ID that uses a report template

1. Open an existing work ID and access the Work ID Maintenance panel.
   
   For instructions, see “Creating and accessing a work ID” on page 54.
   
2. To modify the log scan step in the work ID, complete the following panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work ID Maintenance</td>
<td>In the ACT field beside the log scan step that generates the standard default Summary report, type E, and then press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Log Scan Options</td>
<td>Select Define Report and File Outputs, and then press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Report and File Outputs</td>
<td>In the ACT field beside the Summary report, type D, and then press Enter.</td>
<td>To use a template, you must delete the existing report and define a new report. You cannot edit an existing report to change its format source from the standard default to a report template.</td>
</tr>
</tbody>
</table>

3. To define a new Summary report that uses your desired report template, complete the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report and File Outputs</td>
<td>Press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Output Options</td>
<td>Select Summary, and then press Enter.</td>
<td>Choose the same type of report that is defined in the template that you intend to use.</td>
</tr>
</tbody>
</table>
On this panel | Take this action | Notes
---|---|---
Report Format | Select **Template Dataset**, and then press **Enter**. | A report template can also be stored in the Log Master Repository. If so, select Template Repository and use the subsequent panels to search for and select your desired template. |
Select Template Dataset | Type the name of the data set that contains your report template, and then press **Enter**. | This panel supports partitioned data set (PDS) member names. |
Report Output | *(optional)* To change the report destination, in the **Edit Destination** field, type **E**, and follow the subsequent panels. | Change the report destination if necessary. **Important:** Do not change the other report options (for example, Include Rollback or Print Redo Information) that are defined in the report template. If you change them on the Report Output panel (or by editing the generated batch syntax), you should also make the corresponding changes in your template. |

4 To save the modified work ID, complete the following series of panels:

On this panel | Take this action | Notes
---|---|---
Report Output | Press **F3** until you return to the Work ID File Menu. | none |
Work ID File Menu | Select **Save**, and then press **Enter**. | This step redefines the existing work ID to use the report template. You can also select **Save As** to use a sequence of panels to save your modified work ID under a different name. |
Work ID File Menu | Press **F3**. | Return to the Main Menu for other tasks. |
Back out problem transactions

This chapter contains information about backing out problem transactions.

Overview of backing out transactions

Backing out application transactions can pose certain dilemmas. Problem transactions can be difficult to identify, analyze, and correct.

In addition, you might need to preserve transactions that were not in error but affected the same rows as the problem transactions. These type of problems can require complex analysis.

Table 6 on page 155 lists the Log Master solutions for handling problem transactions.

Table 6: Log Master features for handling problem transactions

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backout integrity checking</td>
<td>Backout integrity checking compares changes of interest to any subsequent updates and shows problems and potential solutions in concise reports.</td>
</tr>
<tr>
<td>SQL generation</td>
<td>The Log Master SQL generator offers features to undo or redo specific transactions. The WHERE clauses that the product generates are based on available index information. You can control whether updates resulting from referential integrity or trigger activity are a part of the correction process.</td>
</tr>
</tbody>
</table>
### Feature | Description
--- | ---
SQL processing | The High-speed Apply Engine a distributed with Log Master executes the product’s generated SQL statements. Two methods of executing SQL are available in the Log Master online interface, but these methods provide only a *subset* of High-speed Apply features. To access all features of High-speed Apply, independently code JCL and define configuration parameters to run the product. Some important High-speed Apply features include:
- Multi-threaded access to DB2
- Restart processing
- More control over responses to SQL codes
Use the Log Master online interface to enter values for a subset of High-speed Apply configuration parameters and generate High-speed Apply JCL.
The product can execute any set of SQL statements accepted by the target database (generated either by Log Master or by some other process).
For more information, see “Executing SQL” on page 227 or see the *High-speed Apply Engine Reference Manual*.

---

*a* The Log Master installation process includes the required installation of High-speed Apply. The High-speed Apply Engine honors passwords for Log Master, the BMC Recovery Management for DB2 solution, or itself.

---

**What to consider when selecting a backout strategy**

The Log Master *for DB2* product provides several features for backing out problem transactions.

Backout procedures usually include the following tasks:

- Identifying and analyzing problem transactions
- Creating UNDO SQL to back out transactions
- Creating REDO SQL to reapply transactions after a recovery

Table 7 on page 156 summarizes the factors involved in each backout procedure.

**Table 7: Selecting a backout strategy**

<table>
<thead>
<tr>
<th>Factors to consider</th>
<th>Procedure used: UNDO</th>
<th>Procedure used: REDO</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL statements</td>
<td>How many SQL statements will be generated to undo problem transactions?</td>
<td>How many SQL statements will be generated for the table spaces from the point of consistency selected to CURRENT, excluding the problem transaction?</td>
<td>“Analysis of problem transactions” on page 157</td>
</tr>
</tbody>
</table>
Factors to consider | Procedure used: UNDO | Procedure used: REDO | Reference
---|---|---|---
State of the system | Transactions can continue to access the table space during this process. | The DB2 table space must be stopped at least for REDO generation and the recovery phase of process. | ■ “Using UNDO SQL” on page 159
Recovery time | N/A | How much time will be needed to recover table spaces and indexes. | ■ “Using REDO SQL” on page 162
Execution of SQL statements | How much time will be needed to execute UNDO SQL? | How much time will be needed to execute REDO SQL? | 

You can generate both UNDO and REDO SQL at the same time, and then compare the volume of statements generated and review any anomalies, before making a decision. For more information about anomalies, see “Performing backout integrity checking” on page 169.

If you choose REDO SQL, the table space involved must be stopped during generation and remain stopped until you complete the recovery.

**Special considerations in the DB2 log**

As you plan and implement a backout action, be aware of special circumstances that can occur in the DB2 log that you might need to accommodate.

For example, when Log Master scans the DB2 log records resulting from certain load actions, it can encounter log records that cause it to generate SQL statements that, when executed, result in negative SQL codes. Similarly, if the load action includes duplicate rows in the data that is loaded, you can encounter negative SQL codes. For more information about special considerations for output files and SQL, see the section about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

**Analysis of problem transactions**

To choose an effective backout strategy, you should first analyze the problem transactions.

**Figure 59 on page 157** shows the task dialog panel for this action.

**Figure 59: Analyze Problem Transactions panel**

ANALYZE Command ➔ Analyze Problem Transactions
To perform the analysis, specify Options 1, 2, and 3. Select an Option. Then press Enter.

Options

1. Specify Log Filter Criteria
2. Specify Time Frame and/or Input Source
3. Define Report and File Outputs
4. Define Log Mark
5. Specify Run Time Options
9. Work ID Options, JCL Generation

Default outputs for the Analyze Problem Transactions option include the Backout Integrity and Summary reports. These reports provide information to help you analyze and select a backout strategy. For example, you can specify a filter and time frame to select specific sets of transactions. Log Master generates an UNDO SQL output file. A Summary report of these transactions shows how many insert, update, and delete actions that the UNDO SQL output file includes. The Backout Integrity report displays selected changes affected by subsequent updates. This comparison of data can help you determine problems and potential solutions.

Under certain circumstances, you may have to decide whether you should apply UNDO SQL or REDO SQL to back out problem transactions. Consider generating both types of SQL files as output to an Analyze Problem Transaction job. You can use the Backout Integrity and Summary reports to compare the number and types of statements generated for each file type.

Note

In general, Log Master uses more resources to generate a Backout Integrity report than it does to generate other reports. Log Master can use more CPU time, more I/O time, and scan more log to generate a Backout Integrity report than you might anticipate based on your filter and time frame.

To get information about previously saved SQL output files, or to browse the contents of the SQL output files, from the Main Menu, select Previously Created Outputs. (For an example, see the figure "SQL Dataset Information panel" in “Output file definitions” on page 86.)

Best practice

BMC recommends that you select complete transactions, rather than updates to only some of the tables that are involved in the problem. Selecting complete transactions maintains the original transaction’s integrity. In addition, when generating UNDO SQL, include referential integrity updates to reverse the effects of cascading delete actions, or the nulling of foreign keys.

You might choose to execute generated SQL as a follow-up to performing a problem transaction analysis. In the analysis, you would generate reports and SQL for study, but not for execution. After the analysis, you can execute the SQL statements.
Using UNDO SQL

Generate UNDO SQL to reverse the effects of a problem transaction.

For example, applying UNDO SQL can change INSERT statements to DELETE statements. When you generate UNDO SQL, you are also preparing transactions to be backed out in the correct order.

The default forms of output for UNDO SQL are a Backout Integrity report and an UNDO SQL output file. The report compares the set of changes that your filter specifies against subsequent updates. Use the Backout Integrity report to determine which updates will be invalidated if you apply the generated UNDO SQL. To generate a Backout Integrity report, Log Master extends the range of your log scan to the current time. This extended range often causes Log Master to read more DB2 log files than you expect.

For an example of this procedure, see “Example 1: Backing out transactions with UNDO” on page 159.

Log Master cannot generate UNDO SQL to reverse the effects of a mass delete action (similar to a DELETE statement with no WHERE clause or a TRUNCATE statement) within a segmented or universal table space. Because of the way that DB2 logs the mass delete, Log Master can generate REDO or MIGRATE SQL in this situation, but not UNDO SQL. Similarly, the log records that DB2 creates for a LOAD REPLACE LOG NO action also prevent Log Master from generating UNDO SQL.

Example 1: Backing out transactions with UNDO

This example shows the use of Log Master to generate UNDO SQL to back out problem transactions.

For this example, assume that you are the database administrator at your company. You have scheduled batch routines to run on the production DB2 subsystem every Saturday between 10:00 P.M. and 4:00 A.M. These runs include batch jobs to:

■ Terminate employees
■ Record employee sick and vacation days
■ Record salary increases
■ Record new employees

At 2:00 A.M., you are alerted to errors in the batch job that records sick and vacation days. All other batch jobs ran without error. You are scheduled to begin payroll processing. Because data for vacation and sick days does not affect payroll processing, you allow the processing to continue as scheduled.
In this example, you know the specific range of transactions to back out, and the time range in which the batch transactions took place. Therefore, you are ready to use Log Master to generate UNDO SQL.

The overall process for performing an UNDO procedure is as follows:

Best practice
To maximize control of anomalies, BMC recommends that the table spaces involved remain unavailable to other applications while generating and executing the UNDO SQL.

1. Identify and analyze problem transactions. (See “Analysis of problem transactions” on page 157).

2. Generate UNDO SQL:
   a. Define a filter to select the correct batch job.
   b. Specify the start and end points for the log scan.
   c. Specify attributes for the Backout Integrity report and the SQL output file.
   d. Save all selections in a work ID.
   e. Generate and execute the JCL.

3. Execute UNDO SQL.
   You have the option of executing the SQL statements in the same run that generates them. If you choose not to execute the UNDO SQL in the same run, you must build a High-speed Apply job to execute the SQL. For more information, see “Executing SQL” on page 227.

To perform an UNDO procedure
For descriptions of the options on the panels referenced in this example, press F1 to access the online Help.

1. Define a filter to select the correct batch job by completing the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Select <strong>Generate UNDO SQL</strong> and press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Confirmation</td>
<td>Press Enter to accept the default of Y.</td>
<td>This step adds a Backout Integrity report as output.</td>
</tr>
</tbody>
</table>
**On this panel** | **Take this action** | **Notes**
---|---|---
Generate UNDO SQL | Select Specify Log Filter Criteria and press **Enter**. | These steps define a filter to select the correct batch job; in this example, a filter where PLAN NAME = TIMEOFF.
Selectable Fields | Type 3 in **Field** and press **Enter**. | 
Conditional Operators | Type 1 and press **Enter**. | 
Plan Name Value | Type TIMEOFF, and then press F3 until you return to the Generate UNDO SQL panel. | 

2 Specify the start and end points for the log scan by completing the following series of panels:

**On this panel** | **Take this action** | **Notes**
---|---|---
Generate UNDO SQL | Select Specify Time Frame and/or Input Source and press **Enter**. | Specify the start point as one hour before the batch job was scheduled to run.
Time Frame Specification | Type 1 and press **Enter**. | Log Master sets the end point to CURRENT. Specifying the start and end points in this way safeguards against not scanning enough log to retrieve all of the bad transactions.
Define Start Point | Type 2 in the **Options** field. In the **Date** field, type 2013-01-19. In the **Time** field, type 09.00.00.000000. Press F3 until you return to the Generate UNDO SQL panel. | 

3 Specify the destination and other attributes of the Backout Integrity report and the SQL output file by completing the following series of panels:

**On this panel** | **Take this action** | **Notes**
---|---|---
Generate UNDO SQL | Select Define Report and File Outputs and press **Enter**. | None
Report and File Outputs | Type E in the **ACT** column beside the Backout Integrity report, and then press **Enter**. | None
Report Output | Accept the default report destination, or edit the destination. Press F3 until you return to the Report and File Outputs panel. | For more information, see “Defining a default report” on page 137.
4 Save your selections in a work ID and generate the JCL by completing the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate UNDO SQL</td>
<td>Select <strong>Work ID Options, JCL Generation</strong> and press <strong>Enter</strong>.</td>
<td>For more information, see</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ “Overview of work IDs” on page 47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ “Creating a batch job from a work ID” on page 67</td>
</tr>
</tbody>
</table>

**Using REDO SQL**

In contrast to an UNDO operation (which creates SQL statements to back out problem transactions) a REDO operation creates SQL statements that you can use to reapply the valid transactions after a recovery action, while omitting the problem transactions defined by your time frame and filter.
Because a REDO operation omits the problem transactions, when you perform a recovery and then execute REDO SQL, you can restore the table spaces to a current state that does not include the problem transactions.

For example, if undesirable changes are made to a database, to resolve the problem, the database administrator (DBA) can perform the follows actions:

- Use Log Master to generate REDO SQL, defining the undesirable changes with a time frame and filter.

- Use a utility program to recover the database to a point in time before the undesirable changes.

- Execute the REDO SQL and re-apply all of the changes after that point in time, except the undesirable changes.

Figure 60 on page 163 shows how Log Master uses the time frame and filter to generate REDO SQL.

**Figure 60: Use of time frame and filter in REDO SQL**

When you generate REDO SQL statements, Log Master starts by selecting all of the log records within the table spaces defined (directly or indirectly) by your filter. To generate REDO SQL, your filter must refer to at least one specific DB2 object, such as a table space, table, or column.

Log Master also selects all of the log records within the period between the REDO recovery point and the current time. To generate REDO SQL, you must define a REDO recovery point. From this set of log records, Log Master excludes all of the log records that are selected by your filter, and included within your time frame.

Ensure that you generate REDO SQL before you recover the database. When you generate REDO SQL, Log Master extends the end point of the log scan to the current date and time, which causes Log Master to process more log records than you might expect.
Scenario using REDO SQL

This scenario describes an example of how you can use REDO SQL. In this case, assume that the following series of events occurred:

1. An image copy was taken at point 1.
2. At point 2, Plan A began applying transactions.
3. From point 3 to point 4, Plan B applied transactions that were subsequently discovered to be problem transactions. The problem transactions affected table space XYZ.

To use REDO SQL to correct the state of the table space

1. Generate a work ID that contains REDO SQL as output.
2. Specify point 1 as the recovery point as you generate the SQL.

This point is the starting RBA/LRSN of the image copy to be restored. Because the problem transactions occurred between points 3 and 4, the FROM date or RBA/LRSN should be no later than point 3, and the TO date or RBA/LRSN should be no earlier than point 4. The selection criteria is WHERE TABLESPACE = 'XYZ' AND PLAN NAME = 'B'.

The SQL generated by the REDO procedure includes all changes that occurred to table space XYZ from point 1 (the recovery point) to the current time, except changes caused by Plan B. Any changes caused by Plan B between points 3 and 4 are excluded. For a REDO procedure, the FROM date or RBA/LRSN and the TO date or RBA/LRSN specify the time range of the problem transactions which you
do not want to reapply. In this example, the REDO SQL contains only those transactions applied to table space XYZ by Plan A.

Example 2: Backing out transactions with REDO

This example illustrates using Log Master to generate REDO SQL that excludes problem transactions.

For this example, assume that you are the DBA at your company. You have scheduled batch routines to run on the production DB2 subsystem every Sunday between 12:00 A.M. and 4:00 A.M. On Monday, you are alerted to transaction errors on the database. You discover that a batch job was mistakenly run at the wrong time, and that the job has added unnecessary tax to all of the invoice records for the southern region.

In this example, you know the specific range of transactions to back out, and the time range in which the batch transactions took place. Because you want to restore the table spaces involved to a state before the point when the wrong batch job was run, you decide to perform a recover and a REDO procedure.

To perform this procedure, you must generate REDO SQL that excludes the problem transactions. Then, you recover the table spaces involved in the problem transactions to a point of consistency that is before the problem. Then, you execute the generated REDO SQL.

Generating REDO SQL follows roughly the same procedures as generating UNDO SQL with the exception that you must generate REDO SQL before you perform a recovery.

The overall process for performing an REDO procedure is as follows:

---

**Note**

Note the following information:

- Table spaces are offline from Step 3 on page 167 to Step 5 on page 168.
- To maximize control of anomalies, avoid having other users update the spaces during Step 7 on page 169.

---

1. Identify and analyze problem transactions (see “Analysis of problem transactions” on page 157).

2. Identify all of the table spaces involved, and, for those table spaces, locate a point of consistency that is before the problem transactions.
3 Place table spaces in Utility (UT) status (or STOP for the BMC NGT Recover product).

4 Generate REDO SQL:
   a Define a filter to select the correct batch job.
   b Specify the start and end points for the log scan.
   c Specify the recovery point.
   d Specify attributes for the Backout Integrity report and the SQL output file.
   e Save all selections in a work ID.
   f Generate and execute the JCL.

5 Recover table spaces and related indexes to the previous point in time.

6 Place table spaces in read/write (RW) status.

7 Execute REDO SQL.

To perform a REDO procedure

For descriptions of the options on the panels referenced in this example, press F1 to access the online Help.

1 Identify a point of recovery that exists before the point in time when the problem occurred.

2 Define a filter to select the correct batch job by completing the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Select Generate REDO SQL and press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Confirmation</td>
<td>Press Enter to accept the default of Y.</td>
<td>This step adds a Backout Integrity report as output.</td>
</tr>
</tbody>
</table>
3 Specify the start and end points for the log scan by completing the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate REDO SQL</td>
<td>Select Specify Log Filter Criteria and press Enter.</td>
<td>The filter must qualify the table spaces involved in the recovery. For example, you may identify a particular plan in the problem transactions filter, but also include a list of table spaces, tables, or databases to give Log Master the qualification required to capture all transactions that must be preserved. For REDO SQL, Log Master selects log records that do not satisfy the filter.</td>
</tr>
<tr>
<td>Time Frame Specification</td>
<td>Type 1 and press Enter.</td>
<td>Specify the start and end points to span the range of problem transactions.</td>
</tr>
<tr>
<td>Define Start Point</td>
<td>Type 2 in the Options field.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the Date field, type 2013-01-20.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the Time field, type 22.00.00.000000.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press F3.</td>
<td></td>
</tr>
<tr>
<td>Time Frame Specification</td>
<td>Type 2 and press Enter.</td>
<td></td>
</tr>
<tr>
<td>Modify End Point</td>
<td>Type 2 in the Options field.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the Date field, type 2013-01-21.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In the Time field, type 04.00.00.000000.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press F3 until you return to the Generate REDO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SQL panel.</td>
<td></td>
</tr>
</tbody>
</table>

4 Define the REDO recovery point, complete the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate REDO SQL</td>
<td>Select Specify Run Time Options and press Enter.</td>
<td>None</td>
</tr>
</tbody>
</table>

Chapter 5  Backing out problem transactions  167
<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Time Options</td>
<td>Type E in the <strong>Specify REDO Recovery Point</strong> field and press Enter.</td>
<td>By using the log mark information, you can select a log mark that meets your needs for use as a point of recovery.</td>
</tr>
<tr>
<td>REDO Recovery Point</td>
<td>Type 2 in the <strong>Options</strong> field. In the <strong>Log Mark</strong> field, type the wild card pattern <code>*.*</code>. Press Enter.</td>
<td></td>
</tr>
<tr>
<td>Mark List</td>
<td>Type I beside the log mark that you want to display information about, and then press Enter. Type S beside the log mark that you want to use as the recovery point, and then press Enter. Press F3 until you return to the Generate REDO SQL panel.</td>
<td></td>
</tr>
</tbody>
</table>

5 To specify the destination and other attributes of the Backout Integrity report and the SQL output file, complete the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate REDO SQL</td>
<td>Select <strong>Define Report and File Outputs</strong> and press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Report and File Outputs</td>
<td>Type E in the <strong>ACT</strong> column beside the Backout Integrity report, and then press Enter.</td>
<td>None</td>
</tr>
<tr>
<td>Report Output</td>
<td>Accept the default report destination and attributes, or edit them. Press F3 until you return to the Report and File Outputs panel.</td>
<td>For more information, see <strong>“Defining a default report”</strong> on page 137.</td>
</tr>
<tr>
<td>Report and File Outputs</td>
<td>Type E in the <strong>ACT</strong> column beside SQL File, and then press Enter.</td>
<td>None</td>
</tr>
</tbody>
</table>
6 Save your selections in a work ID and generate the JCL by completing the following series of panels:

<table>
<thead>
<tr>
<th>On this panel</th>
<th>Take this action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL Output</td>
<td>Type E in the REDO SQL field and press Enter.</td>
<td>For more information, see</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ “SQL output files” on page 87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ “Defining an output SQL file” on page 112</td>
</tr>
<tr>
<td>REDO SQL Output</td>
<td>Type 1 and press Enter.</td>
<td></td>
</tr>
<tr>
<td>Output Dataset Information</td>
<td>Define and set attributes for the SQL output data set, as needed. Press F3 until you return to the REDO SQL Output panel.</td>
<td></td>
</tr>
<tr>
<td>REDO SQL Output</td>
<td>Type 2 and press Enter.</td>
<td></td>
</tr>
<tr>
<td>Output Dataset Information</td>
<td>Define and set attributes for the SQL output data set, as needed. Press F3 until you return to the Generate REDO SQL panel.</td>
<td></td>
</tr>
</tbody>
</table>

7 Perform a recovery of the selected table spaces.

8 After you complete the recovery procedures, execute the REDO SQL.

## Performing backout integrity checking

Backout integrity checking is the process of checking for anomalies before backing out problem transactions.

An anomaly is a potential data conflict that can occur between a transaction within a time frame (that Log Master may UNDO or REDO) and another transaction outside of the time frame that updates the same data. This section explains how anomalies can occur, and how to handle them when backing out application transactions.
The following types of anomalies can occur when you back out application transactions:

- Anomalies between problem transactions (that need to be backed out) and good transactions (that need to be preserved)
- Anomalies between transactions that are to be re-done, and transactions that have been entered after the recoveries are performed in preparation for the redo procedure

**Phase 1: Identify and analyze problem transactions**

The following figures describe an example problem with a set of transactions. The figures illustrate the point of discovery and problem analysis.

**Figure 62: Identify problem transactions**

At the point of discovery, the DBA is alerted to a set of bad batch transactions. Transactions against the database have continued online since the batch jobs were run.
Figure 63: Analyze problem transactions

The DBA analyzes the DB2 log and determines which set of batch transactions created the problem. For these transactions, the DBA creates UNDO SQL and an Audit report, ordered by database and table space.

A decision is made to generate REDO SQL. When executed, the REDO SQL reapply the transactions not in error and omit the specified bad transactions.

During this analysis, online transactions continue to update the log.

Phase 2: Identify table space, locate point of consistency, and generate REDO SQL

The following figure illustrates the next steps to take before performing a recovery:

Figure 64: Locate a point of consistency

To perform a recovery, the DBA needs a consistent point for the set of table spaces. There is a QUIESCE point before the batch runs. The table spaces are identified from the report in the initial analysis.

The table spaces are placed in UT (utility) status. The DBA uses Log Master to generate REDO SQL.
Phase 3: Take table spaces offline and recover them

The following figure illustrates the recovery step:

**Figure 65: Stop and recover the table spaces**

```
Unrecovered log

Good batch transactions

Problem transactions

QUIESCE before batch

Point of discovery

Recover runs

More online transactions

Online transactions

Table spaces taken offline with UT status
```

Phase 4: Execute REDO SQL

At this point, you execute the generated REDO SQL.

**Figure 66 on page 173** depicts possible points at which anomalies could occur:

- **Anomaly example 1**: Anomalies can occur in this area of the log between a good update and one of the problem updates (which the DBA does not plan to redo); for example, an update to a row that was originally inserted by a problem transaction. The DBA and other personnel must analyze these anomalies either as they generate the REDO SQL, or as a stand-alone operation.

In addition to performing a backout integrity check for the anomalies in example 1, you can direct the SQL processor to control responses to this type of error. For more information, see “SQL code handling during SQL execution” on page 239.

- **Anomaly example 2**: Anomalies can occur in this area of the log between the transactions that the DBA will redo, and any changes made during the time when these transactions were "erased" by the recovery action. For example, a user might notice a missing row and insert it again before the REDO SQL can be applied. To
avoid the problem, the DBA must take steps to prevent any updates between the end of the recovery and the end of the execution of the REDO SQL.

Figure 66: Points in the log where anomalies can occur
Performing backout integrity checking
Recovering dropped objects

This chapter provides an overview of recovering dropped objects and explains how to automate drop recoveries.

Overview of automated drop recovery

Log Master helps to automate the recovery of objects that have been dropped from the DB2 catalog. Using information in the DB2 log, Log Master can create several types of output, depending on the type of recovery that you request. You also have the option of creating Job Control Language (JCL) statements that run the different forms of output in the correct order to accomplish the recovery.

**Best practice**

_BMC strongly recommends that you use the Log Master online interface to define your automated drop recovery work ID._ This work ID creates the forms of output that enable Log Master, working with a recover utility, to recover dropped objects.

Log Master works with the following recover utilities:

- NGT Recover to recover table spaces and tables
- DSN1COPY to recover a single dropped table space

**Note**

The DB2 Recover utilities that Log Master works with do not support the recovery of “versioned” dropped objects that were altered but not reorganized. For information about limitations and special handling for recovery of versioned objects, see the documentation for your Recover utility.

Identifying objects to recover

To define an automated drop recovery work ID, you must specify the DB2 objects that were dropped from the DB2 catalog, including the following information:
Type of objects to recover (table, table space, or database)

Log Master provides automated drop recovery for LOB and XML table or table space objects. When you specify a LOB or XML base table or table space to be recovered, Log Master extends drop recovery discovery to include all of the associated LOB and XML auxiliary table spaces and tables.

Name of each object that was dropped from the DB2 catalog

Time frame when the objects were dropped from the DB2 catalog

You can specify the start point or end point of a time frame in the following formats:

— Date and time (the default format)
— Log mark name
— Log address value, either a relative byte address (RBA), or a log record sequence number (LRSN)

(optional) Location to place temporary objects that can be created during recovery, which are used to recover an individual table

(optional) Image copy definitions, which are used to create output image copies during the recovery

For each object, the DB2 log contains a DROP statement. When you run the automated drop recovery work ID, Log Master scans the log to determine information about the dropped DB2 objects.

Automated drop recovery outputs

You can specify the following types of output as part of an automated drop recovery work ID:

Drop Recovery report, which includes the following information:

— Summarized information about the DB2 objects that you want to recover
— Specific image copy that should be used for the recovery
— OBID translation information

For more information, see “Example of a Drop Recovery report” on page 177.

Data definition language (DDL) statements to re-create the dropped objects in the DB2 catalog and re-establish their relationships (including granting authorizations and re-creating VIEWS)

One of the following types of syntax

You cannot generate both NGT Recover syntax and DSN1COPY syntax in the same automated drop recovery action.
— NGT Recover syntax to recover table spaces and tables in an output named RECOVER (see “NGT Recover features that Log Master uses” on page 179)

If the dropped table spaces and tables have clone tables, NGT Recover syntax (generated by Log Master) for clones in a second output named RECOVER2

— DSN1COPY syntax to recover a single table space

■ SQL statements for populating a recovered table with data
  This kind of output is required only when you recover an individual dropped table (as opposed to table spaces).

■ DB2 RUNSTATS utility commands for the object that you are recovering

■ DB2 commands to rebind any application plans that were invalidated when the objects were dropped

■ DB2 CHECK utility commands to take the following objects out of check pending status
  When you define this form of output, Log Master inserts a step in the generated JCL to run a Check Data utility.
  — Table spaces with an RI constraint
  — LOB or XML table spaces
  — LOB auxiliary table spaces
  — Temporary LOB auxiliary tables

■ JCL statements to run the different types of output in the right order to accomplish the recovery
  You can direct Log Master to run all or part of the generated JCL. The generated JCL contains multiple job steps. If necessary, you can edit the JCL to adapt it to your environment. For example, you can stop or restart the automated drop recovery action between job steps.

■ DB2 REPAIR utility commands to repair and update versions of the objects that you are recovering

**Example of a Drop Recovery report**

As part of an automated drop recovery work ID, you can request a Drop Recovery report that provides summarized information about the objects to recover.
Figure 67 on page 178 shows an example of a Drop Recovery report. For more information about how to define this report, see “Generating drop recovery output” on page 186.

**Figure 67: Example Drop Recovery report**

```
Date: 2013-01-18            LOG MASTER FOR DB2 - V11.01.00        Page:       1
Time: 10.04.20            Copyright BMC Software, Inc. 1995-2013

Drop Recovery Report

From: Mark DB2DBA.START.RANGE(0)                            (x'C32FD42FBBA2')
To: Mark DB2DBA.END.RANGE(0)                              (x'C32FD44B2E65')

Report Information:
Work ID    : DB2DBA.$$WORKID0001         Run Number:    3  Subsystem: DXW2
Description: DB2DBA AUTOMATED DROP RECOVERY--TABLE SPACE

Dropped Object: Tablespace: DB2DBADB,DB2DBAS1           OLD ObIDs   New ObIDs
    Drop RBA/LRSN: X'C32FD441E5AE'       Tablespace Name: DB2DBADB,DB2DBAS1
    Status: No Errors
    Table Name: DB2DBADB,DB2DBAB1                   363.2       363.7
    Index Name: DB2DBADB,DB2DBAI1
    Index Name: DB2DBADB,DB2DBAI2
    Table Name: DB2DBADB,DB2DBAB9                   363.8       363.13
    Index Name: DB2DBADB,DB2DBAI9
    Index Name: DB2DBADB,DB2DBAI8

    Resources for recovery:
    Full Copy: RBA/LRSN: X'C32FD43EC858'
        Timestamp: 2013-01-18-10.04.05.198276
        DSN      : DB2DBA.DB2DBA.TS1.FCOPY1
        Shlevel : Reference
        Type     : Local Primary  Dsnum  : 0
        File Seq : 0    DevType: 3390

Dropped Object: Tablespace: DB2DBADB,DB2DBAS2           OLD ObIDs   New ObIDs
    Drop RBA/LRSN: X'C32FD441E5AE'       Tablespace Name: DB2DBADB,DB2DBAS2
    Status: No Errors
    Table Name: DB2DBADB,DB2DBAB2                   363.14      363.2
    Index Name: DB2DBADB,DB2DBAI3

    Resources for recovery:
    Full Copy: RBA/LRSN: X'C32FD43FA815'
        Timestamp: 2013-01-18-10.04.06.116852
        DSN      : DB2DBA.DB2DBA.TS2.FCOPY1
        Shlevel : Reference
        Type     : Local Primary  Dsnum  : 0
        File Seq : 0    DevType: 3390
```
NGT Recover features that Log Master uses

Log Master can use the NGT Recover product or DSN1COPY to recover dropped DB2 objects. However, Log Master supports the use of DSN1COPY only to recover a single dropped table space.

Log Master can generate SYSIN syntax that controls how NGT Recover performs the actual recovery. Depending on how you define your automated drop recovery work ID, Log Master can take advantage of the following NGT Recover features:

- The OUTCOPY feature optionally builds output image copies during the recovery. You can use the outcopy output specification to dynamically allocate the output image copy data sets. Examples of outcopy syntax follow:

```
DATABASE NAME dbname OUTCOPY YES
TABLESPACE NAME dbname.tname OUTCOPY YES
REGISTER ALL
OUTCOPYDDN(BMCCPY,BMCCPZ) RECOVERYDDN(BMCRCY,BMCRCZ)
OUTPUT BMCCPY
   DDNAME hlq.OUTCPY.&DBNAME..&TSNAME..P&DSNUM NEW
   CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE
OUTPUT BMCCPZ
   DDNAME hlq.OUTCPY.&DBNAME..&TSNAME..P&DSNUM NEW
   TRACKS SPACE(20,10) UNIT(SYSDA) RELEASE
OUTPUT BMCRCY
   DDNAME hlq.OUTCPY.&DBNAME..&TSNAME..P&DSNUM NEW
   CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE
OUTPUT BMCRCZ
   DDNAME hlq.OUTCPY.&DBNAME..&TSNAME..P&DSNUM NEW
   CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE
```

- The INDEP OUTSPACE feature can be used for the recovery of a dropped table.

- The OBIDXLAT feature translates object identifiers (OBIDs) from the original table space to the recovered table space.

For more information about how to define this form of output, see “Generating drop recovery output” on page 186.

Performing an automated drop recovery

The procedures in this section describe how to create and save a new work ID to recover dropped objects.

The overall process for this task is as follows:

1. Specify the objects to recover and when they were dropped.
2. Specify the output types for the drop recovery.
3 Generate the JCL for the automated drop recovery step, and submit the job.

For examples showing how to use automated drop recovery, see “Example 1: Automated drop recovery of a single table” on page 192 and “Example 2: Automated drop recovery of a partitioned table space” on page 199.

**Specifying DB2 objects to recover**

This procedure explains how to identify the objects that were dropped.

**Before you begin**

Ensure that you understand the concepts presented in “Identifying objects to recover” on page 175.

**To specify DB2 objects to recover**

1 In the Actions category on the Main Menu, select **Generate Automated Drop Recovery**.

Log Master displays the Generated Automated Drop Recovery panel. For information about the fields on this panel, press **F1** to access the online Help.
Specify when DROP occurred
Start of Range - Date . . . . 2013-01-18 Time . . . 09.10.27.000000
End of Range - Date . . . . 2013-01-18 Time . . . 09.10.27.000000
Specify Other Range . . . . . _ (E=Edit)

Specify Outputs Desired
Drop Recovery Report . . . _ (E=Edit, D=Delete)
SYSOUT: CLASS(*) LRECL(0)
ID: USER2.**TEMPLATE0002
Report Template . . . . . _ (E=Edit, D=Delete)

Recreate DDL . . . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.RECREATE.DDL
Execute DDL . . . . . . . Y (Y=Yes, N=No)
Set SQLID . . . . . (ID for optional SET SQLID statement)
Bind Owner . . . . . (AUTHID)

NGT Recover . . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.RECOVER.CNTL
Use LOGONLY option . . . . N (Y=Yes (for Non-DB2 restore only), N=No)
OUTCOPY specification . A (A=ASCODED, B=BYPART)
Outcopy Outputs . . . . _ (E=Edit outcopy output dataset options)

DSNCOPY . . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.DSNCOPY.CNTL
Execute Copy . . . . N (Y=Yes, N=No)
Post Recover SQL . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.MIGRATE.SQL
Execute SQL . . . . . . . Y (Y=Yes, N=No)
Post Recover Rebinds . . . . (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.REBIND.CMDS
Execute Rebinds . . . . . . Y (Y=Yes, N=No)
Post Recover Checks . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.CHECK.CMDS
Execute Checks . . . . . . Y (Y=Yes, N=No)
Post Recover Runstats . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.RUNSTATS.CMDS
Execute Runstats . . . . . . Y (Y=Yes, N=No)
Post Recover Repairs . . . . _ (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.REPAIR.CMDS
Execute Repairs . . . . . . Y (Y=Yes, N=No)

Specify Recovery Type
Recovery Type . . . . . . . . R (R=RECOVER PLUS, D=DSNCOPY)

Specify Additional Options . . . . . . . . . . . . . . . . . (User defined JCL skeleton)

Press PF3 to save the workid or to generate JCL.

2  In the **Object Type** field, specify whether you want to recover a database, table space, or table.

3  In the **Object Name** field, type a valid DB2 name for the object type that you specified in **Step 2 on page 181**.

4  *(optional)* If you specified **TB** in the **Object Type** field and specified only one object name, you can define additional recovery options:

   a  Press **Enter** to refresh the panel and display the **Options** field (shown in **Figure 72 on page 193**).

   b  In the **Options** field, type **E** and press **Enter**.

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Log Master displays a panel where you can define additional recovery options. The available options depend on whether you are recovering a table space or a table.

5 If a dropped object is a table space or database and you want NGT Recover to generate output image copies, type E in the Outcopy Outputs field.

Log Master displays the NGT Recover Outcopy Specification panel (Figure 70 on page 183), which you can use to specify the output image data set models. The values that you specify on this panel describe the image copies that the NGT Recover product creates when the generated JCL runs. For information about the fields on this panel, press F1 to access the online Help.

6 (optional) To recover more than one dropped object, type E in the Additional Objects field and press Enter.

Log Master displays the Dropped Object Names Maintenance panel (Figure 69 on page 182), which you can use to create and maintain a list of DB2 objects to be recovered. For information about the fields on this panel, press F1 to access the online Help.

Figure 69: Dropped Object Names Maintenance panel

<table>
<thead>
<tr>
<th>Command</th>
<th>Scroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain the list. Press F3 when done.</td>
<td>HALF</td>
</tr>
</tbody>
</table>

Maintain the list. Press F3 when done.

Enter an action code. Then press Enter.

I=Insert  D=Delete  R=Repeat  O=Options for table objects
ACT TYPE OBJECT

Inserting objects:

DB   DB2A
TS   DB2A.TS4
TB   MYTABLE.LIST1
TB   EMPLOYEE.ACCT34

End Of List

F1=Help  F3=Exit  F4=Zoom  F7=Forward  F8=Backward  F12=Cancel

7 Complete the step appropriate to your situation:

■ If you do not want to generate output image copies during recovery, or if you do not have NGT Recover installed, skip to Step 9 on page 183.

■ If a dropped object is a table space and you want NGT Recover to generate output image copies, type O beside the table that will be recovered.

■ If a dropped object is a table and you want to specify its temporary object definition, type O beside the table to be recovered.

Log Master displays the NGT Recover Outcopy Specification panel. The values that you specify on this panel describe the image copies that NGT Recover creates.
when the generated JCL is run. For information about the fields on this panel, press F1 to access the online Help.

**Figure 70: NGT Recover Outcopy Specification panel**

<table>
<thead>
<tr>
<th>Tablespace name</th>
<th>: DB2DBA.ACCTNGTS04</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TABLE SPACE INFORMATION</strong></td>
<td></td>
</tr>
<tr>
<td>Partitions in the table space</td>
<td>0 (0=nonpartitioned, 1-4096=partitioned)</td>
</tr>
<tr>
<td>OUTCOPY specification</td>
<td>A (A=Ascoded, B=Bypart)</td>
</tr>
<tr>
<td>Clone</td>
<td>N (Y=Yes, N=No)</td>
</tr>
</tbody>
</table>

**OUTCOPYDDN specification**

<table>
<thead>
<tr>
<th>DDNAME1</th>
<th>. . . . BMCCPY (DDNAME or DDNAME prefix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Outcopy</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Primary</td>
<td>(E=Edit data set name, D=Delete)</td>
</tr>
<tr>
<td>DSN:</td>
<td>hlq.OUTCPY..DBNAME..TSNAME..P&amp;DSNUM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DDNAME2</th>
<th>. . . . BMCCPZ (DDNAME or DDNAME prefix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Outcopy</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Secondary</td>
<td>(E=Edit data set name, D=Delete)</td>
</tr>
<tr>
<td>DSN:</td>
<td>hlq.OUTCPZ..DBNAME..TSNAME..P&amp;DSNUM</td>
</tr>
</tbody>
</table>

**RECOVERYDDN specification**

<table>
<thead>
<tr>
<th>DDNAME1</th>
<th>. . . . BMCRCY (DDNAME or DDNAME prefix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Outcopy</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Primary</td>
<td>(E=Edit data set name, D=Delete)</td>
</tr>
<tr>
<td>DSN:</td>
<td>hlq.OUTRCY..DBNAME..TSNAME..P&amp;DSNUM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DDNAME2</th>
<th>. . . . BMCRCZ (DDNAME or DDNAME prefix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Outcopy</td>
<td>Y (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Secondary</td>
<td>(E=Edit data set name, D=Delete)</td>
</tr>
<tr>
<td>DSN:</td>
<td>hlq.OUTRCZ..DBNAME..TSNAME..P&amp;DSNUM</td>
</tr>
</tbody>
</table>

8 *(optional)* Specify the information that NGT Recover requires to generate output image copies and press F3.

Log Master saves your specifications and displays the Dropped Objects Names Maintenance panel.

If a dropped object is a table space or database and you want NGT Recover to generate output image copies, type E in the **Outcopy Outputs** field to specify the output image data set models.

If a dropped table space has a clone table and you want NGT Recover to generate output image copies, type Y in the **Clone** field so that Log Master directs NGT Recover to generate output images copies for clones.

9 Complete the step most appropriate to your situation:

- If the dropped object is not a table, or if you do not want to change the default values, skip to **Step 11 on page 184**.
To change the default values for the recovery of a dropped table, type O in the ACT column beside the table name and press Enter.

Log Master displays the Dropped Table Temporary Object Definition panel. For information about the fields on this panel, press F1 to access the online Help.

**Figure 71: Dropped Table Temporary Object Definition**

<table>
<thead>
<tr>
<th>Use temporary objects (INDEP)</th>
<th>Y (Y=Yes, N=No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>If INDEP is set to Y, then enter the values for temporary objects that will be used during the recovery of the dropped table.</td>
<td></td>
</tr>
<tr>
<td>Storage Group</td>
<td>SYSDEFLT</td>
</tr>
<tr>
<td>Database</td>
<td>ALPTMPDB</td>
</tr>
<tr>
<td>Table Space</td>
<td>ALPTMPTS</td>
</tr>
<tr>
<td>Owner</td>
<td>ALPTMPUS</td>
</tr>
</tbody>
</table>

If INDEP is set to N, then enter the location of the dropped table to be recovered.

Database: ALPTMPDB
Table Space: ALPTMPTS

F1=Help    F3=Exit    F4=Zoom   F12=Cancel

10 Specify the information that NGT Recover requires to create temporary objects and press F3.

Log Master saves your specifications and displays the Dropped Object Names Maintenance panel.

11 Finish specifying any additional objects for recovery, and then press F3 to return to the Generate Automated Drop Recovery panel to specify a time frame during which the objects were dropped.

**Specifying a time frame during which the objects were dropped**

This procedure explains how to specify a time frame during which objects were dropped.
Before you begin

- Ensure that you understand the concepts presented in “Identifying objects to recover” on page 175.
- Complete the procedure “To specify DB2 objects to recover” on page 180.

To specify the time frame during which the objects were dropped

1. On the Generate Automated Drop Recovery panel, in the **Specify when DROP occurred** fields, specify the start point for the time frame, as follows:

   - To specify a date and time, type over the values in the **Start of Range—Date** and **Time** fields.
   - To specify a log mark name or an RBA/LRSN, or to reset the time frame by using Logical Log File selection, complete these steps:
     1. In the **Specify Other Range** field, type **E** and press Enter.
     2. In the Time Frame Specification panel, select **Modify Start Point** and press Enter.
     3. In the Modify Start Point panel, select the format for the start point, and type the value of the log mark name or RBA/LRSN in the field provided.
     4. Press **F3** until you return to the Generate Automated Drop Recovery panel.

2. On the Generate Automated Drop Recovery panel, in the **Specify when DROP occurred** fields, specify the end point for the time frame, as follows:

   - To specify a date and time, type over the values in the **End of Range—Date** and **Time** fields.
   - To specify a log mark name or an RBA/LRSN, complete these steps:
     1. In the **Specify Other Range** field, type **E** and press Enter.
2 In the Time Frame Specification panel, select Modify End Point and press Enter.

3 Select the format for the end point, and, if necessary, type the value of the log mark name or RBA/LRSN in the field provided.

4 Press F3 until you return to the Generate Automated Drop Recovery panel to specify the output types for drop recovery.

Generating drop recovery output

The procedures in this topic explain how to define the types of output that you will use to recover dropped objects.

This topic includes the following procedures:

- “To generate a Drop Recovery report” on page 187
- “To generate DDL statements that re-create dropped objects” on page 187
- “To generate NGT Recover syntax” on page 188
- “To generate DSN1COPY syntax to recover a table space” on page 189
- “To generate post-recovery SQL statements that move table data” on page 190
- “To generate DB2 commands that rebind plans” on page 190
- “To generate DB2 utility commands to take table spaces out of check pending status” on page 190
- “To generate RUNSTATS commands” on page 191
- “To generate REPAIR commands to update versions of recovered objects” on page 191
After you complete the steps to specify one form of output, you can specify additional forms of output, as described in this section, or skip to one of the following procedures:

- Specify skeleton JCL to recover data from a source outside of DB2 (see “Creating JCL to restore data from a source outside of DB2” on page 191).
- Generate the JCL for the automated drop recovery step and submitting the job (see “Creating a batch job from a work ID” on page 67).

**Before you begin**

- Ensure that you understand the concepts presented in this topic.
- Complete the procedures in “To specify DB2 objects to recover” on page 180 and “Specifying a time frame during which the objects were dropped” on page 184.

**To generate a Drop Recovery report**


   Log Master displays the Report Destination Options panel.

2. Choose a report destination and press Enter.

   Log Master displays an output information panel.

3. Specify the data set or SYSOUT options required to process the report in your environment, and then press F3 to return to the Generate Automated Drop Recovery panel.

   The options that you specified appear under the Drop Recovery Report field.

4. *(optional)* To use a template for the Drop Recovery report, type E in the Drop Recovery Report field and press Enter.

   Log Master displays a panel on which you can choose to use a report template stored in the Repository, or a template defined in a data set. For more information about using a report template, see “Creating a customized report template” on page 141.

**To generate DDL statements that re-create dropped objects**


   Log Master displays the Output Dataset Information panel.
2 Specify the data set options required to allocate a data set in your environment, and then press F3 to return to the Generate Automated Drop Recovery panel.

3 To include statements in the generated JCL that execute the generated DDL statements, type Y in the **Execute DDL** field.

4 (*optional*) To specify an authorization ID to execute DDL statements that is different than the ID that submits the job, type an authorization ID in the **Set SQLID** field.

   Log Master generates a SET CURRENT SQLID statement and inserts it at the start of the generated DDL statements.

5 (*optional*) To specify an authorization ID used to bind programs and generate application plans that is different than the ID that submits the job, type an authorization ID in the **Bind Owner** field.

   Log Master uses this authorization ID to bind an application plan when the product executes DDL statements. If you do not specify a value, Log Master uses the value of the BINDOWN installation option. If the installation option value is not specified, Log Master uses the user ID of the person that submitted the job.

**To generate NGT Recover syntax**

1 On the Generate Automated Drop Recovery panel, in the **Specify Outputs Desired** section, type E in the **RECOVER PLUS** field. Press Enter.

   Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a data set in your environment, and then press F3 to return to the Generate Automated Drop Recovery panel.

   Log Master allocates two data sets, RECOVER and RECOVER2 outputs.

   - RECOVER output has NGT Recover syntax for the recovery of the table spaces and tables.

   - RECOVER2 has NGT Recover syntax for the recovery of the clones.

   Specify the RECOVER data set here and RECOVER2 will use the same attributes as the RECOVER data set. The naming convention for RECOVER2 is based on the RECOVER data set model. For more information, see the *Log Master for DB2 Reference Manual*.

3 To include statements in the generated JCL that cause Log Master to run NGT Recover using the generated syntax, type Y in the **Execute Recover** field.

4 Specify whether the syntax should include the **LOGONLY** option.
This option directs NGT Recover to use only data from log records to perform the recovery, and it applies to all of the DB2 objects in the current automated drop recovery action.

- To use image copies to recover the data, type **N**. This is the default value.
- To avoid using image copies (if you intend to recover the table space data set outside of the automated drop recovery job stream), type **Y**.

5 Specify whether the OUTCOPY syntax should use the **ASCODED** or **BYPART** option.

Depending on the image copies that Log Master selects as input sources for the automated drop recovery, NGT Recover can create separate output image copies for each partition, or create one combined image copy for the entire table space. This option applies to all table spaces that you are recovering.

- To create output image copies in the same format (either DSNUM 0 or partitioned) as the input image copies, type **A**.
  
  To determine the format of the input image copies, see the Drop Recovery report.

- To create an output image copy for each partition in the table space (regardless of the format of the input image copies), type **B**.

6 To specify the data set names for your output image copies, access the Dropped Object Name Maintenance panel and type **O** in the **ACT** field of the table space.

---

**Note**

Ensure that you specify data set names for your output image copies before you execute the automated drop recovery.

---

**To generate DSN1COPY syntax to recover a table space**

When you define this form of output, Log Master generates JCL that includes statements which run DSN1COPY to recover a single dropped table space.

1 On the Generate Automated Drop Recovery panel, in the **Specify Outputs Desired** section, type **E** in the **DSN1COPY** field. Press Enter.

   Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a partitioned data set (PDS) in your environment, and then press **F3** to return to the Generate Automated Drop Recovery panel.
The data set must be a PDS to contain multiple members that Log Master generates.

3 Verify that the **Execute Copy** field contains a value of Y.

4 Type **D** in the **Recovery Type** field and press **Enter**.

**To generate post-recovery SQL statements that move table data**

1 On the Generate Automated Drop Recovery panel, in the **Specify Outputs Desired** section, type **E** in the **Post Recover SQL** field. Press **Enter**.

Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a data set in your environment, and then press **F3** to return to the Generate Automated Drop Recovery panel.

3 To include statements in the generated JCL that cause Log Master to execute the generated SQL statements, type **Y** in the **Execute SQL** field.

When the SQL statements are executed, they migrate data from a temporary table used during the recovery process to the recovered version of the original table.

**To generate DB2 commands that rebind plans**

1 On the Generate Automated Drop Recovery panel, in the **Specify Outputs Desired** section, type **E** in the **Post Recover Rebinds** field. Press **Enter**.

Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a data set in your environment, and then press **F3** to return to the Generate Automated Drop Recovery panel.

3 To include statements in the generated JCL that cause Log Master to execute the generated DB2 BIND commands for the recovered objects, type **Y** in the **Execute Rebinds** field.

**To generate DB2 utility commands to take table spaces out of check pending status**

1 On the Generate Automated Drop Recovery panel, in the **Specify Outputs Desired** section, type **E** in the **Post Recover Checks** field. Press **Enter**.

Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a data set in your environment, and then press **F3** to return to the Generate Automated Drop Recovery panel.
3 To run the generated JCL to take the table spaces out of check pending status, type Y in the Execute Checks field.

Log Master generates the default DDNAME specifications for SYSUT1, SORTOUT and SYSER in the JCL. For the UNIT value, Log Master uses the value of the WKUNIT installation option, if specified, or SYSALLDA.

To generate RUNSTATS commands

1 On the Generate Automated Drop Recovery panel, in the Specify Outputs Desired section, type E in the Post Recover Runstats field. Press Enter.

Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a data set in your environment, and then press F3 to return to the Generate Automated Drop Recovery panel.

3 To include statements in the generated JCL that cause Log Master to execute the generated RUNSTATS commands for the recovered object, type Y in the Execute Runstats field.

To generate REPAIR commands to update versions of recovered objects

1 On the Generate Automated Drop Recovery panel, in the Specify Outputs Desired section, type E in the Post Recover Repairs field. Press Enter.

Log Master displays the Output Dataset Information panel.

2 Specify the data set options required to allocate a data set in your environment, and then press F3 to return to the Generate Automated Drop Recovery panel.

3 Type Y in the Execute Repairs field.

This step includes statements in the generated JCL that cause Log Master to execute the generated REPAIR commands for the recovered object.

Creating JCL to restore data from a source outside of DB2

To recover data from a source outside of DB2, you can specify skeletal JCL to accomplish the recovery.

For example, you might need to restore the recovered objects from a DASD pack backup. Use this procedure to tell Log Master where to access the JCL necessary to restore the data from the outside source.
To specify your own JCL for recovery

1 Create a PDS member that contains JCL statements to restore the data from your backups outside of DB2.

Log Master treats this member as an ISPF skeleton. You must store the member in a data set that is in the ISPSLIB DD name concatenation of your TSO procedure.

Within an ISPF skeleton, you have the option to access certain ISPF variables within your JCL. The ALPSJCL member in the HLQ.DBPLIB library contains ISPF variables that you can use in your skeleton member (where HLQ represents a high-level qualifier that is assigned in your environment during installation). All JCL statements in your member must adhere to ISPF file tailoring rules. For more information about file tailoring, see the appropriate ISPF technical documentation from IBM.

2 On the Generate Automated Drop Recovery panel, in the Non-DB2 Restore field, specify the name of the PDS member that contains your JCL.

Log Master incorporates your JCL within its generated JCL. Log Master inserts your recovery JCL after the STOPCMDS job step. When you generate and run the job, the product runs your JCL to perform data recovery for the specified objects.

Example 1: Automated drop recovery of a single table

For this example, assume that a DBA at your company mistakenly dropped a table from an accounting database three days ago.

Because the table was stored in a large table space with several dozen tables, you noticed the mistake only this morning. The accounting department runs a weekly application that will update the table tonight.

Your task is to recover the table and restore the data to the point when the drop occurred. The following information is available to use for the recovery:

- Table space name: ACCTG.WEEKLY
- Table name: ACCTG.PAYROLL_STATS
- Time frame: 01/18/2013, between noon and 4 p.m.

Step 1: Create the automated drop recovery job for a single table

Specify the values to recover the table.
Use the procedures in “Performing an automated drop recovery” on page 179 to perform this step. An example is shown in Figure 72 on page 193. Note the following details:

- The Drop Recovery report is not required for this example.
- When you specify a single object to be recovered, and that object is a table or a table space, Log Master displays the **Options** field under **Specify Dropped Object(s)**. To display a panel on which you can define whether Log Master uses temporary objects to recover your table, and the physical and logical location of the temporary objects, type **E** in the **Options** field.

**Figure 72: Values for automated drop recovery of a single table**

```
Generate Automated Drop Recovery

Command ===> Generate Automated Drop Recovery

Work ID : DB2DBA.TBRCV1
Description : DB2DBA 2013-01-19 09.10.26 DROP RECOVERY

Specify Dropped Object(s)
  Object Type . . . TB
  (DB=Database, TS=Table Space, TB=Table)
  Object Name . . . ACCTG.PAYROLL_STATS
  Options . . . . . . _ (E=Edit options)
  Additional Objects . . . . . (E=Enter additional object names)

Specify when DROP occurred
  Start of Range  - Date . . . 2013-01-15 Time . . . 12.00.00.000000
  End of Range   - Date . . . 2013-01-15 Time . . . 16.00.00.000000

Specify Other Range . . . . . _ (E=Edit)

Specify Outputs Desired
  Drop Recovery Report . . . . _ (E=Edit, D=Delete)
    SYSOUT: CLASS(*) LRECL(0)
    Report Template . . . . . _ (E=Edit, D=Delete)
      ID: DB2DBA.$$TEMPLATE0001

  Recreate DDL . . . . . . . . _ (E=Edit data set name, D=Delete)
    DSN: DB2DBA.DROPREC.RECREATE.DDL
    Execute DDL . . . . . . . Y (Y=Yes, N=No)
    Set SQLID . . . . . . . . . . (ID for optional SET SQLID statement)
      Bind Owner . . . . . . . . . . (AUTHID)

  RECOVER PLUS . . . . . . . . _ (E=Edit data set name, D=Delete)
    DSN: DB2DBA.DROPREC.RECOVER.CNTL
    Execute Recover . . . . . Y (Y=Yes, N=No)
    OUTCOPY specification . . . A (A=ASCODED, B=BYPART (use Options to specify dataset info))
    DSN1COPY . . . . . . . . . . . (E=Edit data set name, D=Delete)
      DSN: DB2DBA.DROPREC.DSN1COPY.CNTL
      Execute Copy . . . . . . . N (Y=Yes, N=No)

  Post Recover SQL . . . . . . . _ (E=Edit data set name, D=Delete)
    DSN: DB2DBA.DROPREC.MIGRATE.SQL
    Execute SQL . . . . . . . Y (Y=Yes, N=No)

  Post Recover Rebinds . . . . _ (E=Edit data set name, D=Delete)
    DSN: DB2DBA.DROPREC.REBIND.CMDS
    Execute Rebinds . . . . . Y (Y=Yes, N=No)

  Post Recover Checks . . . . . _ (E=Edit data set name, D=Delete)
    DSN: DB2DBA.DROPREC.CHECK.CMDS
    Execute Checks . . . . . . Y (Y=Yes, N=No)

  Post Recovery Runstats . . . _ (E=Edit data set name, D=Delete)
    DSN: DB2DBA.DROPREC.RUNSTATS.CMDS
```
Execute Runstats . . . . . Y (Y=Yes, N=No)

Post Recover Repairs . . . . . (E=Edit data set name, D=Delete)
DSN: USER2.DROPREC.REPAIR.CMDS

Execute Repairs . . . . . Y (Y=Yes, N=No)

Specify Recovery Type
Recovery Type . . . . . . . . R (R=RECOVER PLUS, D=DSN1COPY)

Specify Additional Options . . .
Non-DB2 Restore . . . . . . . (User defined JCL skeleton)

Press PF3 to save the workid or to generate JCL.

Step 2: Review the JCL

After you save the work ID and generate the JCL, review the job.

The generated JCL contains multiple job steps, and, if necessary, you can modify the JCL to adapt it to your environment. For example, you can stop or restart the automated drop recovery action between job steps. Figure 73 on page 194 shows an example of the JCL created for this example.

Figure 73: Sample JCL: Automated drop recovery of a table space with a clone table

```
//DB2DBALM JOB (XXXX), 'AUTO DROP RECOVERY', CLASS=A, MSGCLASS=X.
//   NOTIFY=&SYSUID
//**********************************************************************
//*
//*               LOG MASTER FOR DB2 V11.2.00
//*
//*     DSN: DB2DBA.DEV.DROPREC.JCL(EXMPL01)
//*
//*     GENERATED BY USER: DB2DBA3
//*               ON DATE: 2015/03/19
//*               AT TIME: 10:38
//*
//**********************************************************************
//*
//**********************************************************************
//* ALLOCATE THE DATASETS FOR THE AUTOMATED DROP RECOVERY PROCESS
//**********************************************************************
//*
//ALLOC EXEC PGM=IEFBR14
//RECD5 DD DSN=DB2DBA3.DROPREC.RECOVER.CNTL,
//      DISP=(NEW,CATLG,DELETE),
//      SPACE=(CYL,(1,1),RLSE),
//      UNIT=SYSDA,
//      RECFM=FB,LRECL=80
//RECD5 DD DSN=DB2DBA3.DROPREC.RECOVER.CNTL.R2,
//      DISP=(NEW,CATLG,DELETE),
//      SPACE=(CYL,(1,1),RLSE),
//      UNIT=SYSDA,
//      RECFM=FB,LRECL=80
//REBDS DD DSN=DB2DBA3.DROPREC.REBIND.CMDS,
//      DISP=(NEW,CATLG,DELETE),
//      SPACE=(CYL,(1,1),RLSE),
//      UNIT=SYSDA,
//      RECFM=FB,LRECL=80
//CHKDS DD DSN=DB2DBA3.DROPREC.CHECK.CMDS,
//      DISP=(NEW,CATLG,DELETE),
//      SPACE=(CYL,(1,1),RLSE),
//      UNIT=SYSDA,
//      RECFM=FB,LRECL=80
```
//REPAIR DD DSN=DB2DBA3.DROPREC.REPAIR.CMDS, DISP=(NEW,CATLG,DELETE), SPACE=(CYL,(1,1),RLSE), UNIT=SYSDA, RECFM=FB,LRECL=80
//RUNDS DD DSN=DB2DBA3.DROPREC.RUNSTATS.CMDS, DISP=(NEW,CATLG,DELETE), SPACE=(CYL,(1,1),RLSE), UNIT=SYSDA, RECFM=FB,LRECL=80

EXECUTE LOGSCAN STEP

LOGMSTR EXEC PGM=ALPMAIN, PARM='DHA,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)', COND=(4,LT), REGION=0M
STEPLIB DD DISP=SHR,DSN=product.libraries
DD DISP=SHR,DSN=DB2.DSNEXIT
DD DISP=SHR,DSN=DB2.DSNLOAD
ALPPRINT DD SYSOUT=* SQLPRINT DD SYSOUT=* SYSTEM DD SYSOUT=* ALPDUMP DD SYSOUT=* SYSUOMP DD SYSOUT=* SYSIN DD *,DLM=##
/* DB2DBA3.TBRCV01 */
/* DB2DBA3 2015-03-19 10.12.27 DROP RECOVERY */
OPTION FILTERREL AND EXECUTION MODE CURRENT SORTOPTS FILSZ NONE HISTORY WRITE WORKID DB2DBA3.TBRCV01 DESC "DB2DBA3 2015-03-19 10.12.27 DROP RECOVERY"

DROPRECOVERY TABLE NAME ACCTG.PAYROLL_STATS TEMPORARY OBJECTS STOGROUP SYSDEFLT DATABASE RECOVER TABLESPACE RCVYTS OWNER ACCTG RECREATE DATASET DB2DBA3.DROPREC.RECREATE.DDL NEW CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE EXECUTE RECOVER DATASET DB2DBA3.DROPREC.RECOVER.CNTL OLD OUTCOPY ASCODED CHECK DATASET DB2DBA3.DROPREC.CHECK.CMDS OLD REPAIR DATASET DB2DBA3.DROPREC.REPAIR.CMDS OLD MIGRATE DATASET DB2DBA3.DROPREC.MIGRATE.SQL NEW CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE REBIND DATASET DB2DBA3.DROPREC.REBIND.SQL NEW FROM DATE(2015-03-18) TIME(12.00.00.000000) TO DATE(2015-03-18) TIME(16.00.00.000000) ## SQLCODES DD DUMMY /*

Performing an automated drop recovery

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Results of the job to recover a single table

When you run the JCL that Log Master generates, it accomplishes the following actions:

- Creates an empty version of the dropped table in the original table space.
- Creates a temporary table space, and depending on the values that you specified, Log Master might also create a temporary database.
- Creates a temporary table (in the temporary table space) with the same structure as the dropped table.
- Recovers data into the temporary table.
- Migrates data from the temporary table to the empty table in the original table space.
- Drops the temporary table, temporary table space, and temporary database, if you specified one.
- Gathers statistics for the dropped object.
Rebinds any application plans that were invalidated when the table was dropped.

Takes the table spaces out of check pending status.

Example 2: Automated drop recovery of a partitioned table space

For this example, assume that a table space that should have been dropped from your test environment was mistakenly dropped from your production environment. You need to recover this table space, and you want to use NGT Recover to create output image copies of the recovered table space.

The following information is available for the recovery:

- Table space name: ACCTGTS
- Database name: ACCTGDB

Step 1: Create the automated drop recovery job for a partitioned table space

Specify the values to recover the table space as shown in the following example.

Use the procedures described in “Performing an automated drop recovery” on page 179.

Figure 74: Values for recovery of a partitioned table space

```
Generate Automated Drop Recovery

Command ===>
DB2 : DB2A
Work ID . . : DB2DBA.TBRCV2
Description : DB2DBA 2013-01-18 17.30.26 DROP RECOVERY

Specify Dropped Object(s)
Object Type . . TS (DB=Database, TS=Table Space, TB=Table)
Object Name . . ACCTGDB.ACCTGTS
Options . . . . E (E=Edit options)
Additional Objects . . _ (E=Enter additional object names)

Specify when DROP occurred
Start of Range - Date . . . 2013-01-18 Time . . . 09.00.00.000000
End of Range - Date . . . 2013-01-18 Time . . . 12.30.00.000000
Specify Other Range . . . . _ (E=Edit)

Specify Outputs Desired
Drop Recovery Report . . . . _ (E=Edit, D=Delete)
SYSOUT: CLASS(*) LRECL(255)
Report Template . . . . _ (E=Edit, D=Delete)
ID: DB2DBA.$$TEMPLATE0003
Recreate DDL . . . . . . . . _ (E=Edit data set name, D=Delete)
DSN: DB2DBA.DROPREC.RECREATE.DDL
Execute DDL . . . . . . . . Y (Y=Yes, N=No)
```
When you specify a single object to be recovered, and that object is a table or table space, Log Master displays the **Options** field under Specify Dropped Object(s). To display a panel on which you can define the output image copies, type **E** in the **Options** field.

Specify the values as shown in **Figure 75 on page 200**. Notice that you type **0** in the **Partitions in the table space** field. This value causes NGT Recover to create one output image copy that contains all of the partitions of the table space, instead of one image copy for each partition.

To dynamically allocate outcopy data sets, type **Y** in the **Dynamic Output** field, or type **E** to edit or select the output data set specification.

**Figure 75: Values for NGT Recover Outcopy Specification panel**

<table>
<thead>
<tr>
<th>NGT Recover Outcopy Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablespace name . . : ACCTDB.ACCTGTS</td>
</tr>
<tr>
<td>TABLE SPACE INFORMATION</td>
</tr>
<tr>
<td>Partitions in the table space . . : 0 (0=nonpartitioned, 1-254=partitioned)</td>
</tr>
<tr>
<td>OUTCOPY specification . . . . . . . : A (A=Ascoded, B=Bypart)</td>
</tr>
<tr>
<td>Clone . . . . . . . . . . . . . . . : N (Y=Yes, N=No)</td>
</tr>
</tbody>
</table>
Step 2: Review the JCL for an automated drop recovery of a partitioned table space

After you save the work ID and generate the JCL, review the job.

The generated JCL contains multiple job steps, and, if necessary, you can edit the JCL to adapt it to your environment. For example, you can stop or restart the automated drop recovery action between job steps. Figure 76 on page 201 shows an example of the JCL created for this purpose.

Press PF3 to save the work ID or to generate JCL.
Performing an automated drop recovery

// RECFM=FB,LRECL=80
// RECS2
DD DSN=DB2DBA3.DROPREC.RECOVER.CNTL.R2,
  DISP=(NEW,CATLG,DELETE),
  SPACE=(CYL,(1,1),RLSE),
  UNIT=SYSDA,
  RECFM=FB,LRECL=80
// REBDS
DD DSN=DB2DBA3.DROPREC.REBIND.CMDS,
  DISP=(NEW,CATLG,DELETE),
  SPACE=(CYL,(1,1),RLSE),
  UNIT=SYSDA,
  RECFM=FB,LRECL=80
// CHKDS
DD DSN=DB2DBA3.DROPREC.CHECK.CMDS,
  DISP=(NEW,CATLG,DELETE),
  SPACE=(CYL,(1,1),RLSE),
  UNIT=SYSDA,
  RECFM=FB,LRECL=80
// REPAIR
DD DSN=DB2DBA3.DROPREC.REPAIR.CMDS,
  DISP=(NEW,CATLG,DELETE),
  SPACE=(CYL,(1,1),RLSE),
  UNIT=SYSDA,
  RECFM=FB,LRECL=80
// RUNDS
DD DSN=DB2DBA3.DROPREC.RUNSTATS.CMDS,
  DISP=(NEW,CATLG,DELETE),
  SPACE=(CYL,(1,1),RLSE),
  UNIT=SYSDA,
  RECFM=FB,LRECL=80
/
/
**************************************************************************************
EXECUTE LOGSCAN STEP
***************************************************************************************/
/
//LOGMSTR EXEC PGM=ALPMAIN,
// PARM='DHA,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)',
// COND=(4,LT),
// REGION=0M
// STEPLIB DD DISP=SHR,DSN=product.libraries
// DD DISP=SHR,DSN=DB2.DSNEXIT
// DD DISP=SHR,DSN=DB2.DSNLOAD
// ALPPRINT DD SYSOUT=* 
// SQLPRINT DD SYSOUT=* 
// SYSOUT DD SYSOUT=* 
// ALPDUMP DD SYSOUT=* 
// SYSTERM DD SYSOUT=* 
// SYSUDUMP DD SYSOUT=* 
// SYSSIN DD *,DLM=##
// DB2DBA3.TSRCV02
// DB2DBA3 2015-03-19 10.39.18 DROP RECOVERY
/

OPTION
  FILTERREL AND EXECUTION MODE CURRENT
SORTOPTS
  FILSZ NONE
  HISTORY WRITE
WORKID DB2DBA3.TSRCV02
  DESC "DB2DBA3 2015-03-19 10.39.18 DROP RECOVERY"

DROPRECOVERY
  TABLESPACE NAME ACCTGDB.ACCTGTS OUTCOPY NO
  RECREATE DATASET DB2DBA3.DROPREC.RECREATE.DDL NEW CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE
  EXECUTE
  RECOVER DATASET DB2DBA3.DROPREC.RECOVER.CNTL OLD OUTCOPY ASCODED
  CHECK DATASET DB2DBA3.DROPREC.CHECK.CMDS OLD
  REPAIR DATASET DB2DBA3.DROPREC.REPAIR.CMDS OLD

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MIGRATE DATASET DB2DBA3.DROPREC.MIGRATE.SQL NEW
CYLINDERS SPACE(1,1) UNIT(SYSDA) RELEASE
REPORT SYSPUT
CLASS(*) LRECL(132) NOHOLD
FROM DATE(2015-03-18) TIME(09.00.00.000000)
TO DATE(2015-03-18) TIME(12.30.00.000000)
##
//SQLCODES DD DUMMY
/*
*******************************************************************************/
//* THIS STEP ISSUES DB2 -STOP COMMANDS FOR THE OBJECTS BEING RECOVERED
*******************************************************************************/
/*
STOPCMDS EXEC PGM=IKJEFT01,
  COND=(4,LT)
STEPLIB DD DISP=SHR,DSN=DB2.DSNEXIT
       DD DISP=SHR,DSN=DB2.DSNLOAD
//SYSTSIN DD *
  DSN SYSTEM(DHA)
  -STOP DATABASE(ACCTGDB) SPACENAM(ACCTGTS)
END
/*
SYSPRINT DD SYSOUT=* 
SYSTSPRT DD SYSOUT=* 
/*
*******************************************************************************/
//* THIS STEP EXECUTES RECOVER PLUS TO RECOVER THE DROPPED OBJECTS.
*******************************************************************************/
/*
RECOVER EXEC PGM=AFRMAIN,
  PARM='DHA,,NEW/RESTART,MSGLEVEL(1)',
  REGION=0M,
  COND=(4,LT)
STEPLIB DD DISP=SHR,DSN=product.libraries
  DD DISP=SHR,DSN=DB2.DSNEXIT
  DD DISP=SHR,DSN=DB2.DSNLOAD
//SYSIN DD DISP=SHR,DSN=*.ALLOC.RECDS
//SYSPRINT DD SYSOUT=* 
//SYSTSPRT DD SYSOUT=* 
//SYSSOUT DD SYSOUT=* 
//SYSUDUMP DD SYSOUT=* 
//SYSERR DD SYSOUT=* 
/*
*******************************************************************************/
//* THIS STEP EXECUTES RECOVER PLUS TO RECOVER THE ADDITIONAL DROPPED
//* OBJECTS SUCH AS CLONE TABLES
*******************************************************************************/
/*
RECOVER2 EXEC PGM=AFRMAIN,
  PARM='DHA,,NEW/RESTART,MSGLEVEL(1)',
  REGION=0M,
  COND=(4,LT)
STEPLIB DD DISP=SHR,DSN=product.libraries
  DD DISP=SHR,DSN=DB2.DSNEXIT
  DD DISP=SHR,DSN=DB2.DSNLOAD
//SYSIN DD DISP=SHR,DSN=*.ALLOC.RECDS2
//SYSPRINT DD SYSOUT=* 
//SYSTSPRT DD SYSOUT=* 
//SYSSOUT DD SYSOUT=* 
//SYSUDUMP DD SYSOUT=* 
//SYSERR DD SYSOUT=* 
/*
*******************************************************************************/
//* THIS STEP ISSUES DB2 -START COMMANDS FOR THE OBJECTS BEING RECOVERED
*******************************************************************************/
/*
Performing an automated drop recovery
FILTERREL AND EXECUTION MODE CURRENT
SORTOPTS
FILSZ NONE
HISTORY WRITE
WORKID DB2DBA3.TSRCV02
DESC "DB2DBA3 2015-03-19 10.39.18 DROP RECOVERY"
EXEC SQL DB2DBA3.DROPRE.CMDS
##
//SQLCODES DD DUMMY
//*
//**********************************************************************
//* EXECUTE RUNSTATS ON THE DROPPED OBJECTS
//**********************************************************************
//*
//RUNSTAT EXEC PGM=DSNUTILB,PARM='DHA',
//       REGION=0M,
//       COND=(4,LT)
//STEPLIB DD DISP=SHR,DSN=DB2.DSNEXIT
//       DD DISP=SHR,DSN=DB2.DSNLOAD
//UTPRINT DD SYSOUT=*,HOLD=YES
//SYSPRINT DD SYSOUT=*,HOLD=YES
//SYSLIB DD DISP=SHR,
//DSN=DB2DBA3.DROPRE.RUNSTATS.CMDS
//**********************************************************************
//* REBIND THE PROGRAMS AFFECTED BY DROPPING THE OBJECTS
//**********************************************************************
//*
//REBINDS EXEC PGM=IKJEFT01,
//       COND=(4,LT)
//STEPLIB DD DISP=SHR,DSN=DB2.DSNEXIT
//       DD DISP=SHR,DSN=DB2.DSNLOAD
//SYSTSIN DD *
DSN SYSTEM(DHA)
// DD DISP=SHR,DSN=DB2DBA3.DROPRE.REBIND.CMDS
// DD *
END
//SYSPRINT DD SYSOUT=* 
//SYSTSPRT DD SYSOUT=* 

Results of the job to recover a partitioned table space

After you submit the automated drop recovery job, Log Master and NGT Recover accomplish the following actions:

- Create the table space
- Recover data into it
- Gather statistics on the table space
- Rebind any application plans that were invalidated when the table space was dropped
- Take the table spaces out of check pending status
Automated drop recovery troubleshooting

This section describes problems that might occur with automated drop recovery, and actions to prevent the problems from occurring.

Failure to re-create dropped objects

Log Master can generate the DDL statements required to re-create dropped objects and their relationships, or you can provide these statements yourself (for example, by using saved copies of CREATE DDL statements).

To prevent errors, be sure to execute the generated (or provided) DDL statements to re-create the dropped objects at the correct point in the automated drop recovery.

- If Log Master generates the DDL statements, ensure that you specify Y in the **Execute DDL** field of the Generate Automated Drop Recovery panel (or specify the EXECUTE keyword in the RECREATE DATASET clause of the DROPRECOVERY statement).

- If you provide the DDL statements, ensure that you execute them before you execute the automated drop recovery.

If you do not re-create the dropped objects either during or before the initial step in the automated drop recovery, Log Master issues message BMC097667, stating that **ALL XLAT OBIDS WERE NOT RESOLVED**. The message indicates that Log Master cannot obtain OBIDs for the new objects because the objects do not exist.

Referential integrity relationships with dropped objects

If your automated drop recovery includes objects that are part of referential integrity (RI) constraints, DB2 places the table spaces into check pending status after the NGT Recover job step in the automated drop recovery.

Log Master cannot perform a table-level automated drop recovery of a table with an RI constraint in the following cases:

- Recovery of the parent table only, when a dependent table exists in the database
  
  When a primary key is added for the RI table to be recovered, check pending status is placed on its dependent table space. Running CHECK DATA on the dependent table space does not remove the check pending status before the data
is migrated to the parent table. In a later job step, migrating the parent table would result in SQLCODE -904 because of the check pending status.

As a possible workaround, add the foreign key on the dependent table after migrating the data to the parent table. That is, modify the DDL to comment out the `ALTER dependentTable ADD FOREIGN KEY` statement before executing the DDL. After migrating the data to the parent table, execute the `ALTER dependentTable ADD FOREIGN KEY` statement.

- Recovery of a self-referencing table
  Migrating a self-referencing table results in SQLCODE -533 and SQLCODE -811. As a possible workaround, if an RI table is the only table in the table space, try performing a drop recovery of the table space. Doing so recovers the table from a full image copy; therefore, the SQL step to migrate the data is not necessary.

### Problems within automated drop recovery scan range

Several situations can prevent Log Master from completing an automated drop recovery if they occur between the applicable image copy that contains your DB2 objects, and the point when your objects were dropped.

For example, if this time frame includes a run of a DB2 Load or Reorg utility with LOG NO specified, the product cannot complete the recovery. This situation also occurs if the time frame includes a Point-in-Time (PIT) recovery.

If this type of situation prevents the product from completing your recovery, the product issues message BMC097667, stating a reason (for example, `LOG NO UTILITY RAN WITHIN RECOVER RANGE`, or `POINT IN TIME RECOVERY WITHIN RECOVER RANGE`).

### Failure to create a temporary table space

When you recover a dropped table, Log Master can generate the DDL statements that are required to create a temporary table space that holds a temporary copy of the table, or you can provide these statements yourself.

If you provide the DDL statements, ensure that you execute them and create the temporary table space before executing the automated drop recovery.

If the temporary table space for the copy of the dropped table does not exist, the product issues message BMC097667, stating `TEMPORARY TABLESPACE FOR DROPPED TABLE NOT IN DB2 CATALOG`. 
Log only drop recovery

Some environments use methods other than NGT Recover and image copies to perform the initial recovery of dropped objects, and then direct NGT Recover to use only data from log records to complete the recovery.

If you specify Y in the Use LOGONLY option field of the Generate Automated Drop Recovery panel, Log Master assumes that you use your own methods (for example, backups outside of DB2) to perform the initial recovery. The product issues message BMC097667 as it generates the JCL for the automated drop recovery, stating LOG ONLY SPECIFIED.

Log Master cannot automate the drop recovery action because you must modify the JCL before executing the automated drop recovery. In the JCL generated by Log Master, insert a step to recover the dropped objects using the methods available in your environment. Insert the step as follows:

- After the job step (named STOPCMNDS) that stops the table spaces to be recovered
- Before the subsequent job step (named RECOVER)
Migrating data changes

This section provides an overview of migration and examples of how to use Log Master for data migration.

Migration overview and considerations

The Log Master for DB2 product can use the information stored in log records to generate SQL statements or output load files.

You can migrate data changes on an ongoing basis or an ad hoc basis, and specify log scans, reports, and file outputs to:

- Migrate changes to shadow tables after an initial full migration
- Migrate specific updates to another system for test or audit
- Build load data that reflects the changes to audit on another system

After you create a set of shadow tables, Log Master can use the information from log records to generate SQL statements. You can execute these statements against your shadow tables to bring them up-to-date. Use the following features to enhance this capability:

- Select only certain columns for migration.
- Include or exclude updates caused by referential integrity.
- Include or exclude updates caused by activity defined within a trigger.
- Migrate only complete transactions and automatically stage incomplete transactions for the next migration (using a special type of Log Master log scan called an ongoing log scan).
- Create output load files for bulk migration.
- Migrate database changes to other platforms. Log Master includes versions of the High-speed Apply Engine that run on mainframe DB2 subsystems, or on
distributed systems (UNIX or Windows) against target databases on Oracle or IBM’s DB2 for Linux, UNIX, and Windows (LUW).

### Ongoing processing

You must use ongoing processing for any sequential migration tasks to avoid missed data.

When a job is an ongoing job, Log Master automatically adjusts the range of the time frame to begin when the last log scan ended. In addition, open transactions at this point are staged, and are included if they are complete in the new time frame.

As Figure 77 on page 210 shows, the possibility of missing data exists, even when you use a log mark with quiesce as the start point of a log scan. In this figure, the log scan begins after the start of the unit of recovery. The first update to the relevant table in the unit of recovery takes place after the start point (log mark with quiesce). Because the start point of the log scan is after the start of the unit of recovery, Log Master will not include all transactions associated with the unit of recovery in the log scan output.

**Figure 77: Example of defining a start point**

For more information about ongoing processing, see the chapter about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

### Special considerations in the DB2 log

Before you move data to a new location, be aware of special circumstances that can occur in the DB2 log that you might need to accommodate.

For example, when Log Master scans the DB2 log records resulting from certain load actions, it can encounter log records that cause it to generate SQL statements that, when executed, result in negative SQL codes. Similarly, if the load action includes duplicate rows in the data that is loaded, you can encounter negative SQL codes. For more information about special considerations for output files and SQL, see the
Using Log Master for data migration

This section presents several examples of how you can use Log Master to migrate data changes.

Example 1: Ongoing migration with adjusted ranges

You can create jobs to migrate data changes on an ongoing basis.

In this separate database, the tables and columns are identical to those in the production database, but additional indexes exist to support different usage. The tables in the separate database are referred to as shadow tables.

For this example, assume that you are a DBA for a nation-wide travel agency. The president of the agency wants to monitor data concerning the number of customers receiving frequent-flyer discounts. He wants to search for data by a different index, and he wants to check the data on a daily basis.

You decide to set up a decision-support database to track and report on customers receiving frequent-flyer discounts. You create a set of shadow tables and populate them with data from the production database. The production database and the decision-support database have the same primary index with differing secondary indexes. You define a log mark at a quiesce of the table spaces involved.

Figure 78 on page 211 shows the overall process of migrating the data with an ongoing job.

Figure 78: Migrating data with an ongoing process (overview)
You can run the ongoing job repeatedly, without changing the syntax. Notice how Log Master tracks the open transactions at the end of a run, and adjusts the scan range to include those transactions in the next run. Log Master does not reprocess any transactions that were completed during a previous run, even though it might scan part of the same log range again.

Table 8 on page 212 provides a high-level task list for this example.

**Table 8: High-level tasks for data migration with adjusted ranges**

<table>
<thead>
<tr>
<th>Task</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create the decision-support database.</td>
<td>“Performance of an initial full migration” on page 212</td>
</tr>
</tbody>
</table>
| Define a filter that selects specific table space transactions. | ■ “Filter definitions” on page 71  
■ “Defining a filter in a log scan step” on page 101 |
| Define a time frame that starts from the same point of consistency used by NGT Recover, and ends at the current time. | ■ “Time frame definitions” on page 81  
■ “Defining a time frame” on page 109  
■ The Migration of data changes figure in “Ongoing migration with adjusted ranges job” on page 215 |
| Modify the output options for the default Summary report and SQL file (as needed). | ■ “SQL output files” on page 87  
■ “Defining a default report” on page 137 |
| Save your selections in a work ID.                     | “Overview of work IDs” on page 47                                           |
| Generate JCL and save it for batch submittal.          | “Creating a batch job from a work ID” on page 67                           |

**Performance of an initial full migration**

You can use the BMC NGT Recover product to build the table spaces and index sets for the receiving DB2 subsystem by using image copies, change accumulation files, and logs made for recovery purposes on the sending (production) DB2 subsystem.

To create the decision-support database, perform the following steps:

1. Create the database, table spaces, tables, and primary indexes.

2. Establish a point of consistency.
3 Use the INDEPENDENT OUTSPACE and OBIDXLAT features of NGT Recover to re-create the table spaces and primary indexes, and to translate object IDs.

4 Add the new indexes for the decision-support database by using DDL statements on the decision-support subsystem.

For many environments, the mass migration of data on a daily basis is time consuming and expensive. By using Log Master, you can migrate just the data changes, which is a convenient and quick way to update the decision-support database on an ongoing basis.

**Using the online interface to specify the log scan step**

You specify the ongoing migration through the online interface only once.

It is not necessary to access the interface to make changes for subsequent runs of the job. “Ongoing migration with adjusted ranges job” on page 215 explains how Log Master adjusts time frame ranges with each subsequent batch job. Only completed transactions are migrated.

**Note**

You cannot define a log scan as ongoing if your input source is one of the following:
- Specific DB2 log files (INPUT DB2LOG)
- Logical log files (INPUT LLOG)

**Before you begin**

Define a work ID for migration with a log mark step. You use the log mark for the initial migration as the start point of the time frame in this procedure.

**To define a filter that selects specific table space transaction**

1 From the Actions category on the Main Menu, select Generate MIGRATE SQL and press Enter.

Log Master displays the Generate Migrate SQL panel.

2 Select Specify Log Filter Criteria and press Enter.

3 Use the Structured or Free Form filter interface to define search criteria, and then press F3 to return to the Generate MIGRATE SQL panel.

The filter for this example must select log records from customer-related tables that have data that is not null in the fields that are related to frequent-flyer discounts.
To define a time frame for ongoing migration

1. On the Generate MIGRATE SQL panel, select Specify Time Frame and/or Input Source and press Enter.

Log Master displays the Time Frame Specification panel. The following figure shows the panel with values for this example.

**Figure 79: Time Frame Specification panel**

```
================================ Time Frame Specification =========================
Command ===> _________________________________________________________________  SSID: DBAN
Work ID . . : ABC.$$WORKID0001
Description : ABC 2013-01-18 09.18.26 MIGRATE
Start of Log Scan. . . . . : ENDMASSLOAD(00000)
End of Log Scan. . . . . : CURRENT
Log File Source. . . . . : Subsystem BSDS
Options . . . .  1. Modify Start Point
                  2. Modify End Point
                  3. Reset Time Frame using Log File Selections
Ongoing Process. . . . . Y (Y=Yes, N=No)
Rerun/Reprocess Options:
                  1. Rerun Run Number. . . (Run Sequence Number or LASTRUN)
                  OR From Start of Run Number. (Run Sequence Number or LASTRUN)
Reset/Purge Options:
                  1. Generate New Handle ID . . N (Y=Yes, N=No)
                  OR Reset Handle ID . . . . N (Y=Yes, N=No)
                  2. Purge . . . . . . N (Y=Yes, N=No)
F1=Help    F3=Exit   F12=Cancel
```

2. Specify a start point and an end point for the time frame. For this example, define the time frame as follows:

- Proposed start point: log mark ENDMASSLOAD(00000), which marked the point of consistency for the first migration
- End point: CURRENT

3. To indicate that the job is an ongoing job, in the Ongoing Process field, type Y and press F3 to return to the Generate MIGRATE SQL panel.

To modify the output options

1. On the Generate MIGRATE SQL panel, select Define Report and File Outputs and press Enter.

Log Master displays the Report and File Outputs panel. The default output for migrating data changes are a Summary report and a MIGRATE SQL file.

2. Add an Open Transaction report and press F3 to return to the Generate MIGRATE SQL panel.
To save the selections in a work ID

1. On the Generate MIGRATE SQL panel, select **Work ID Options, JCL Generation**. Log Master displays the Work ID File Menu.

2. Select **Save As** and press **Enter**. Log Master displays the Work ID Name Entry panel.

3. Save the work ID with the name shown in Figure 80 on page 215 and press **F3**. Log Master displays the Work ID File Menu.

**Figure 80: Work ID Name Entry panel**

MIGRATE ====================== Generate Migrate SQL =====================

C .-------------------------------------------------. ________________________
| FILE ============ Work ID File Menu =========== |               SSID: DBAN
W |   .-----------------------------------------------------------------------.
D | W | SAVE AS ===================== Work ID Name Entry ==================== |
|   |                                                                       |
T | S | Type in the information then press F3 to update the repository        |
|   |                                                                       |
S | A | Work ID . . . . ABC.MIGRATE$ACCT                                      |
O |   | Description . . .                                                     |
|   |    DAILY MIGRATION OF ACCOUNTING RECORDS TO DECISION SUPPORT DB.      |
|   | Work ID Security . . . R (W=Read/Write, R=Read Only, N=No Access)    |
|   | Date Format. . . . . . I  (U=USA, E=EUR, I=ISO, J=JIS)                |
|   |                                                                       |
| F | F13=Help   F15=Exit   F24=Cancel                                      |
'-- '-----------------------------------------------------------------------'

To generate and save the JCL

1. On the Work ID File Menu, select **Generate JCL** and press **Enter**.

2. Verify that the correct values for JCL generation are entered in the fields of the Generate JCL panel, (such as JCL data set name and job statement information).

3. To generate the JCL, press **Enter**.

4. To save the JCL, press **F3**.

**Ongoing migration with adjusted ranges job**

To consistently migrate data from the production to the decision-support database, you decide to run the saved job each day. Then, you take the SQL generated on the production subsystem and apply it to the decision-support subsystem.

Log Master automatically tracks the range (start and end point of the time frame) and any open transactions. **Figure 81 on page 216** shows the range that is defined for the first batch job. The time frame starts at the point of consistency that was
established when the mass migration was performed, and ends at the current time. In this example, open transactions occurred near the end of the range.

Figure 81: Migration of data changes

![Diagram of data migration](image1)

Figure 82 on page 216 represents the scan range for the next batch job.

Figure 82: Migration of data with an ongoing job

![Diagram of ongoing data migration](image2)

Any open transactions (units of recovery) that were discovered in the previous log scan are selected the next time that you run the job. For an ongoing log scan, Log Master determines the start point of the scan range by using the end point of the previous run, and adjusting that value to include the lowest RBA or LRSN value of the previous open transactions. Log Master ignores any transactions that were completed in the adjusted portion of the scan range.

As Log Master processes an ongoing log scan, it issues message BMC097777 or BMC097778 to display any transactions (URIDs) that were open at the end of the previous run of the log scan, and that would cause Log Master to adjust its scan range.

To improve product performance, when possible, schedule ongoing log scans to run before the following actions:

- Running any utilities that can change the location of rows within a table space (for example, a DB2 Reorg utility)
- Executing any data definition language (DDL) statements that change the structure of a table (for example, an ALTER COLUMN SET DATA TYPE statement)
Example 2: Migration of changes with set ranges

This example uses the scenario described in Example 1. However, in this example, instead of setting the range of the time frame from a point of consistency to the current time, you set the time frame from a log mark to another log mark. The log marks use a Log Master feature to create points of consistency (quiesce points).

Be sure to create quiesce points if you use this technique. If you create the log marks without quiesce points, you can fail to capture transactions that are in process at the beginning or end of each run.

Table 9 on page 217 provides a high-level task list for this example.

Table 9: High-level tasks for data migration with set ranges

<table>
<thead>
<tr>
<th>Task</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create the decision-support database.</td>
<td>“Performance of an initial full migration” on page 212</td>
</tr>
<tr>
<td>Specify the log mark and log scan jobs for the daily migration.</td>
<td>“Creating batch jobs to specify the log mark and log scan jobs” on page 218</td>
</tr>
</tbody>
</table>
| Define a log mark for the point of consistency (quiesce point) used in the first mass migration of data. | ■ “Log mark definitions” on page 95  
 ■ “Defining a log mark in a log scan step” on page 122 |
| Define a filter that selects specific table space transactions.     | ■ “Filter definitions” on page 71  
 ■ “Defining a filter in a log scan step” on page 101 |
| Define a log mark step to create a quiesce point at the beginning of the repeated job. | ■ “Log mark definitions” on page 95  
 ■ “Defining a log mark in a log scan step” on page 122 |
| Define a time frame that starts and ends at two relative versions of a log mark. | ■ “Time frame definitions” on page 81  
 ■ “Defining a time frame” on page 109 |
| Modify the output options for the default Summary report and SQL file (as needed). | ■ “SQL output files” on page 87  
 ■ “Defining a default report” on page 137 |
| Save your selections in a work ID.                                 | “Overview of work IDs” on page 47                                                              |
| Generate JCL and save it for batch submittal.                      | “Creating a batch job from a work ID” on page 67                                               |
| Run the ongoing migration job.                                     | “Ongoing migration with set ranges job” on page 219                                            |
Creating batch jobs to specify the log mark and log scan jobs

After performing the initial full migration of data from the production subsystem, perform the daily migration. This topic describes the daily migration.

For more information about performing an initial full migration, see “Performance of an initial full migration” on page 212.

To perform the daily migration

1 Define a Log Master batch job to create a log mark with a point of consistency (a quiesce point) for the table spaces involved. Give that point a log mark name of ENDBATCH.

2 Run the batch job.

3 Create a second (repeatable) Log Master batch job that contains the following job steps:

   ■ A step to define a log mark, create a quiesce point, and assign a log mark name to that point, also named ENDBATCH
   
   By repeating the same log mark name, you create two relative versions of the log mark. For more information about versions of log mark names, see the chapter about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

   ■ A step to define a log scan with the time frame of ENDBATCH(-1) to ENDBATCH(0)
   
   At this point, ENDBATCH(-1) refers to the log mark version that was created during the first job, and ENDBATCH(0) refers to the log mark version that was created during the first step of the current job. The log scan produces a MIGRATE SQL file and a Summary report. This output captures the data changes for migration.

4 Run the second batch job one day after the initial full migration.

Tip

You can run the repeatable job daily to capture the data changes for migration to the decision-support database. The relative versions of the log marks always define a time frame from the log mark created during the previous run, to the log mark created at the beginning of the current run.
Ongoing migration with set ranges job

To consistently migrate data to the decision-support database, run the repeatable Log Master job each day. Then, apply the SQL that you generated on the production subsystem to the decision-support subsystem.

To avoid changing the time frame every day, you used relative versions of log marks to define the time frame. The log marks were defined with quiesce points.

Each time that you run the job, the start point of ENDBATCH(-1) refers to the log mark version created during the previous run, and ENDBATCH(0) refers to the log mark version created during the first step of the current run. Figure 83 on page 219 shows the relative versions of the log mark names after the second run of the repeatable job.

To improve product performance, when possible, schedule ongoing jobs to run before the following actions:

- Running any utilities that can change the location of rows within a table space (for example, a DB2 Reorg utility)
- Executing any DDL statements that change the structure of a table (for example, an ALTER COLUMN SET DATA TYPE statement)

For more information about ongoing log scans, see the chapter about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

Figure 83: Migration of data changes with set ranges

Example 3: Ad hoc migration of changes

For this example, assume that the auditing department has asked you to set up a table that contains data for a particular set of company invoices. The auditors want to report on new invoices for government sales for the past week.

To meet this request, you define a new table similar to table DB2DBA.GOVERNMENT_SALES_INVOICES that resides on your production subsystem. You want to populate the table with only the information that the
auditors need. Therefore, you decide to generate MIGRATE SQL for only specific columns in the new table.

Table 10 on page 220 provides a high-level task list for this example.

Table 10: High-level tasks for ad hoc data migration

<table>
<thead>
<tr>
<th>Task</th>
<th>References</th>
</tr>
</thead>
</table>
| Define a filter that selects specific transactions for government sales, and that selects only insert actions (new invoices). | ■ “Filter definitions” on page 71  
■ “Defining a filter in a log scan step” on page 101 |
| Define a time frame that starts from a specific date and time and ends at a specific date and time. | ■ “Time frame definitions” on page 81  
■ “Defining a time frame” on page 109 |
| Modify the output options for the default Summary report and SQL file (as needed). | ■ “SQL output files” on page 87  
■ “Defining a default report” on page 137 |
| Define MIGRATE SQL to include only certain columns for a specified table. | |
| Save your selections in a work ID. | “Overview of work IDs” on page 47 |
| Generate JCL and save it for batch submittal. | “Creating a batch job from a work ID” on page 67 |
| Run the ongoing migration job. | “Running the ad hoc migration job” on page 222 |

To define the filter and time frame

1 Define the filter as instructed in “To define a filter that selects specific table space transaction” on page 213, and use the Structured or Free Form filter interface to define search criteria.

The filter for this example selects records for a specific object, the DB2DBA.GOVERNMENT_SALES_INVOICES table.

2 To define the time frame, complete the steps in “To define a time frame for ongoing migration” on page 214, and type Y in the Ongoing Process field.

For this example, define start and end points with appropriate date and time values. Figure 84 on page 220 shows the values for this example.

Figure 84: Time frame using date and time for ranges

<table>
<thead>
<tr>
<th>Command</th>
<th>Work ID</th>
<th>Description</th>
<th>Start of Log Scan</th>
<th>End of Log Scan</th>
<th>Log File Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Updated</td>
<td>NCH2.$$WORKID0002</td>
<td>NCH2 2013-01-18 16.02.25 MIGRATE</td>
<td>2011-03-18 00.00.00.000000</td>
<td>2011-03-18 13.00.00.000000</td>
<td>Subsystem BSDS</td>
</tr>
</tbody>
</table>
To modify the output options

1. On the Generate MIGRATE SQL panel, select **Define Report and File Outputs** and press **Enter**.

Log Master displays the Report and File Outputs panel. A Summary report and MIGRATE SQL file are the default output for migrating data changes.

2. To edit the MIGRATE SQL data set, type **E** in the **ACT** column and press **Enter**.

Log Master displays the SQL Output panel.

3. Perform the following actions:
   a. Specify MIGRATE SQL data set attributes for the SQL output data set and SQL template data set.

   b. To specify column inclusion, type **E** in the **Create Include/Exclude Columns** field and press **Enter**.

Log Master displays the Column Include/Exclude Table List panel.

   **Figure 85: Column Include/Exclude Table List panel**

<table>
<thead>
<tr>
<th>ACT</th>
<th>INC/EXC</th>
<th>OWNER</th>
<th>TABLE</th>
<th>COL ENTRIES</th>
<th>DB2DBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>I</td>
<td>DB2DBA</td>
<td>GOVERNMENT_SALES&gt;&gt;</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>********************* End Of List **********************</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   c. To add a column to the list, type **E** in the **ACT** column, and type **I** in the **INC/EXC** column.

   d. In the **OWNER** and **TABLE** columns, specify the table that contains the specific columns that you want to include in the output.

   e. To enter the table name GOVERNMENT_SALES_INVOICES, press **F4** in the **TABLE** column.

For more information, see “Displaying long DB2 object names” on page 44. **Figure 85 on page 221** shows the panel after you specify the table. No columns...
have been included in, or excluded from, table DB2DBA.GOVERNMENT_SALES_INVOICES at this point.

f Press Enter.

Log Master displays the Column Include List panel (Figure 86 on page 222).

g Type the names of the columns that you want to include in the generated SQL Output data set, as shown in Figure 86 on page 222, and then press F3 until you return to the Generate MIGRATE SQL panel.

**Figure 86: Column Include List panel**

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Maintain the list then press Exit:</th>
<th>Insert</th>
<th>Delete</th>
<th>Repeat</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GOVT_INVOICE_NUM&gt;&gt;</td>
<td>Enter an action code then press Enter:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SALESMAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INVOICE_TOTAL</td>
<td>***** End Of List ******</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SQL Output</td>
<td>F1=Help F3=Exit F4=Zoom F7=Forward F8=Backward F12=Cancel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**To save the selections in a work ID**

1 To save your selections under a work ID, complete the steps in “To save the selections in a work ID” on page 215.

**To generate and save the JCL**

1 To generate JCL for batch submittal, complete the steps in “To generate and save the JCL” on page 215.

**Running the ad hoc migration job**

To migrate the data that the auditors requested, apply the SQL that you generated on the production subsystem to the table that you created for the auditors.
Example 4: Building a load file to migrate historical data

For this example, assume that the auditors for your company have requested that you create a table that shows the changes to all payroll records for employees that work at your largest office.

The original changes affect a table named PAYROLL in your production database. On the receiving subsystem, you define a new table similar to a table named PAYROLL that resides on your production system. However, the new table has a primary key that was defined as nonunique.

Because you will be adding data directly into the new historical table, you create a load file as your Log Master output. The load file contains separate before and after images for each record. You use the load file to populate the new table, and to audit changes in data. You must add columns to the new table to accommodate the informational columns of data that Log Master adds to the records in the output load file.

Auditors can query historical data from the new table. For example, if one of the columns in the table is an employee number, they can request all log records where that column is changed, and verify all insert, update, delete, and exchange actions that affected employee numbers. They can select log records relating to a specific employee or group of employees.

Table 11 on page 223 provides a high-level task list for this example.

Table 11: High-level tasks for load file data migration

<table>
<thead>
<tr>
<th>Task</th>
<th>References</th>
</tr>
</thead>
</table>
| Define a filter that selects transactions for employees at the site requested. |▪ “Filter definitions” on page 71  
▪ “Defining a filter in a log scan step” on page 101 |
| Define a time frame.                                                  |▪ “Time frame definitions” on page 81  
▪ “Defining a time frame” on page 109 |
| Define data set attributes for the default report, and optionally, specify an additional Audit report. | “Defining a default report” on page 137 |
| Define a load output data set that includes two separate before and after images of the selected transactions. |▪ “Output file definitions” on page 86  
▪ “Load output files” on page 91 |
| **Note:** Note: In this example, do not generate a MIGRATE SQL output file. |                                                     |
| Save your selections in a work ID.                                   | “Overview of work IDs” on page 47                      |
| Generate JCL and save it for batch submittal.                        | “Creating a batch job from a work ID” on page 67       |
| Apply the load file.                                                 | “Applying the load file” on page 226                   |
To define the filter and time frame

1. To define the filter, complete the steps in “To define a filter that selects specific table space transaction” on page 213, and use the Structured or Free Form filter interface to define search criteria, as shown in Figure 87 on page 224.

**Figure 87: Example filter**

```
FILTERS ================ Structured Filter Maintenance =========== Line 1 of 2
Command ===> ____________________________________________ Scroll ===> HALF
SSID: DBAN
Work ID . . : NCH2.$$WORKID0003
Description : NCH2 2013-01-18 13.44.05 MIGRATE
Updated Version:V11.01.00

Type one or more action codes then press Enter:
ACT    SELECTABLE FIELD    OPERATOR  VALUE
-      NETPAY              CHANGED
-    AND  SITE                =         LARGE_OFFICE

*************************************************************************** End Of List **************************************************************************
```

The filter for this example selects records with any changes to the ABC.PAYROLL.NETPAY column. (Log Master does not display the fully qualified column name.)

2. Press F3 to return to the Generate MIGRATE SQL panel.

3. To define the time frame, complete the steps in “To define a time frame for ongoing migration” on page 214.

   For this example, specify a time frame range for the day that you run the payroll batch job.

4. Press F3 to return to the Generate MIGRATE SQL panel.

To modify the output options

1. On the Generate MIGRATE SQL panel, select Define Report and File Outputs, and then press Enter.

   Log Master displays the Report and File Outputs panel.

2. Type I in the ACT column and press Enter.

   Log Master displays the Output Options panel.


   Log Master displays the Load Output panel.

**Figure 88: Load Output panel**

```
Command ===> Load Output
```

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4 Type **E** in the **Load File** and **Load Control File** fields and press **Enter**.

Log Master displays the Output Dataset Information panel.

5 Specify the name and attributes for each data set, and then press **F3** to return to the Load Output panel.

6 To specify that the load file is to contain two separate sets of before and after log record images, type **S** (for Both Images Separately) in the **Update Record Options** field, and then press **F3** to return to the Report and File Outputs panel.

**Figure 89: Report and File Outputs panel**

<table>
<thead>
<tr>
<th>Command ==&gt;</th>
<th>Report and File Outputs</th>
<th>Scroll ==&gt;</th>
<th>CSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work ID . . : NCH2.$WORKID0003</td>
<td></td>
<td></td>
<td>SSD : DBAM</td>
</tr>
<tr>
<td>Description : NCH2 2013-01-18 13.44.05 MIGRATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enter an action code. Then press Enter.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I=Insert D=Delete E=Edit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT TYPE</td>
<td>DESCRIPTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ Report</td>
<td>SUMMARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sysout: Class(*)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ Load File</td>
<td>Data File: &amp;SYSUID..D&amp;DATE..T&amp;TIME..LOAD.DATA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cntl File: &amp;SYSUID..D&amp;DATE..T&amp;TIME..LOAD.CNTL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ SQL File</td>
<td>Terse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migrate File: &amp;SYSUID..D&amp;DATE..T&amp;TIME..MIGRATE.SQL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Include Trigger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Include ROLLBACK No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>******************************** End of List *******************************</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 To delete the default MIGRATE SQL output file, type **D** in the **ACT** column beside the SQL file and press **Enter**.

8 *(optional)* To add an Audit report, type **I** in the **ACT** column.

For more information, see “Audit report” on page 321.
9 Press F3 until you return to the Generate MIGRATE SQL panel.

**To save the selections in a work ID**

1 To save your selections under a work ID, complete the steps in “To save the selections in a work ID” on page 215.

**To generate and save the JCL**

1 To generate JCL for batch submittal, complete the steps in “To generate and save the JCL” on page 215.

**Applying the load file**

This topic explains how to apply the load file.

**To apply the load file**

1 Take the load file generated on the production subsystem and load it into the new table that you created for the auditors.

**To change the names of the columns**

1 Edit the load control file by selecting Previously Created Outputs on the Main Menu.
Executing SQL

This chapter describes how the Log Master for DB2 product executes generated SQL statements. In most cases, the term SQL statements refers to both data manipulation language (DML) and data definition language (DDL) statements.

Methods of executing SQL statements

Log Master uses the High-speed Apply Engine to execute SQL statements, including specific methods that generate and execute SQL statements for certain situations, and general methods to execute any set of SQL statements. Log Master provides methods for SQL execution in the Log Master online interface, in the product’s batch interface, and some methods in both interfaces.

To access all features of High-speed Apply, use the batch interface to independently code JCL that runs High-speed Apply.

You can control how Log Master responds to SQL codes as it executes SQL statements. To specify limited SQL code handling, you include an Exec SQL step in your work ID. To specify more extensive SQL code handling, you generate High-speed Apply JCL through the online interface or by coding High-speed Apply JCL independently.

Specific methods for generating and executing SQL statements

The following table describes the product’s methods to generate and execute SQL statements for certain situations.

The specific methods are detailed elsewhere in this manual, or in the Log Master for DB2 Reference Manual, as indicated in the table.
Table 12: Specific methods to generate and execute SQL statements

<table>
<thead>
<tr>
<th>Method</th>
<th>Online interface</th>
<th>Batch interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execute option for UNDO SQL statements</td>
<td>Panel: SQL Output Field: Execute SQL</td>
<td>Statement: LOGSCAN Keywords: SQL UNDO EXECUTE</td>
</tr>
<tr>
<td>When you generate UNDO SQL statements, you can direct Log Master to execute the statements after it writes them. The product includes the SQL execution as part of a log scan step within the work ID. For more information, see:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ “Example 1: Backing out transactions with UNDO” on page 159</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Section about syntax in the Log Master for DB2 Reference Manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Execute option for UNDO DDL statements</td>
<td>Panel: UNDO DDL Output Field: Execute DDL</td>
<td>Statement: LOGSCAN Keywords: DDL UNDO EXECUTE</td>
</tr>
<tr>
<td>When you generate UNDO DDL statements, you can direct Log Master to execute the statements after it writes them. The product includes the DDL execution as part of a log scan step within the work ID. For more information, see:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ “Defining an output DDL file” on page 119</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Section about syntax in the Log Master for DB2 Reference Manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automated Drop Recovery (Re-create DDL statements)</td>
<td>Panel: Generate Automated Drop Recovery Field: Execute DDL or Execute SQL (for post-recovery SQL statements)</td>
<td>Statement: DROPRECOVERY Keywords: RECREATE DATASET EXECUTE</td>
</tr>
<tr>
<td>You can direct Log Master to execute DDL statements that re-create the dropped objects. The product includes the DDL execution as part of an automated drop recovery step within the work ID. The product also provides a separate EXECSQL step for the post-recovery SQL statements that it generates to recover a dropped table. For more information, see:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ “Generating drop recovery output” on page 186</td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Section about syntax in the Log Master for DB2 Reference Manual</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

General methods for generating and executing SQL statements

The following table describes the product’s general methods to execute the SQL statements contained in an existing file, and summarizes the High-speed Apply features that are available with each method.

For more information about High-speed Apply features that respond to SQL codes, see “SQL code handling during SQL execution” on page 239.
Table 13: General methods to generate and execute SQL statements

<table>
<thead>
<tr>
<th>Method</th>
<th>Available High-speed Apply features</th>
<th>Online interface</th>
<th>Batch interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXEC SQL</td>
<td>Execution of SQL statements, plus:&lt;br&gt;■ object mapping (translation of object names during generation, also called SQLXLAT, provided during the log scan step, not part of EXECSQL)&lt;br&gt;■ limited conflict rules (responding to SQL codes during execution, also called SQLCODES)</td>
<td>From the Main Menu, select&lt;br&gt;&lt;strong&gt;Create or Edit Work IDs&lt;/strong&gt;, and add an Execute SQL step to a work ID.</td>
<td>Not available</td>
</tr>
<tr>
<td>Generated High-speed Apply JCL</td>
<td>All features of EXECSQL, plus:&lt;br&gt;■ Object mapping (translation of object names during execution)&lt;br&gt;■ More extensive options for conflict rules&lt;br&gt;■ Multi-threaded execution of SQL statements (multiple agents)&lt;br&gt;■ Control over distribution of work between agents&lt;br&gt;■ Ability to defer SQL statements or units of work in a separate file&lt;br&gt;■ Control over frequency of commit actions (size of units of work)&lt;br&gt;■ More control over binding of High-speed Apply static plans&lt;br&gt;■ More control over retry actions in case of conflicts</td>
<td>From the Main Menu, select&lt;br&gt;&lt;strong&gt;Generate High-speed Apply JCL&lt;/strong&gt;. Follow the sequence of panels to specify High-speed Apply configuration parameters. You can then generate JCL for a separate job that runs High-speed Apply using your parameters.</td>
<td>Not available</td>
</tr>
</tbody>
</table>
### Method
Independently coded High-speed Apply JCL
For more information, see “Example 1: SQL code handling with independently coded High-speed Apply JCL” on page 253.

### Available High-speed Apply features
All features of the High-speed Apply Engine, including the following features not available in generated High-speed Apply JCL:
- Restart capability
- Distribution to preserve original units of work
- More High-speed Apply features

### Online interface
Not available

### Batch interface
Code a separate job or job step that explicitly runs the High-speed Apply Engine. Specify configuration parameters either in a separate configuration file or in-stream in your JCL.

<table>
<thead>
<tr>
<th>Method</th>
<th>Available High-speed Apply features</th>
<th>Online interface</th>
<th>Batch interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independently coded High-speed Apply JCL</td>
<td>All features of the High-speed Apply Engine, including the following features not available in generated High-speed Apply JCL:</td>
<td>Not available</td>
<td>Code a separate job or job step that explicitly runs the High-speed Apply Engine. Specify configuration parameters either in a separate configuration file or in-stream in your JCL.</td>
</tr>
</tbody>
</table>

### Examples using JCL for EXECSQL

The following figure shows JCL that executes SQL statements by using an EXECSQL statement in a separate job.

This example:

- Includes three tables
- Contains one job that generates SQL statements and translates the table names during generation (by including the SQLXLAT DD statement)
- Contains a second job to execute the SQL against the target tables (by using an EXECSQL statement)

For an example that uses the Log Master online interface to execute SQL statements with EXECSQL, see “Adding an execute SQL or DDL step to a work ID” on page 60.

---

Figure 90: JCL example, EXECSQL

```sql
/**************************************************************************
// ** LOG MASTER FOR DB2
// ** DSN: 'DB2DBA.JCL.EXSQL(ESQL$E7)'
// ** GENERATED BY USER: DB2DBA3
// **************************************************************************
// >>>>>>> GENERATE MIGRATE SQL <<<<<<
//**************************************************************************
//MIGSQL1 EXEC PGM=ALPMAIN.
// PARM="DGA1,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)",REGION=OM
//STEPLIB DD DISP=SHR,DSN=product.libraries
```
Examples using JCL for EXECSQL

Chapter 8  Executing SQL  231
Table 14 on page 232 compares this example using the EXECSQL method with examples that perform the same basic tasks using other methods.

Table 14: EXECSQL examples compared with other methods

<table>
<thead>
<tr>
<th>Example figure</th>
<th>Method</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>The JCL sample in “Example 2: High-speed Apply JCL generated by the online interface” on page 235</td>
<td>Generated High-speed Apply JCL</td>
<td>• Uses High-speed Apply to translate table names during execution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enables multi-threaded execution (multiple agents)</td>
</tr>
<tr>
<td>The JCL sample in “Example using independently coded High-speed Apply JCL” on page 237</td>
<td>Independently coded High-speed Apply JCL</td>
<td>• Uses High-speed Apply to translate table names</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enables multi-threaded execution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enables the product’s restart capability</td>
</tr>
</tbody>
</table>

Examples using generated High-speed Apply JCL

This section provides examples of using the generated High-speed Apply JCL method.

Example 1: Using the online interface to generate High-speed Apply JCL

This example shows the actions that you take in the Log Master online interface to generate High-speed Apply JCL that will execute the SQL statements contained in a specific file.

This example:

• Includes three tables

• Shows the use of High-speed Apply to translate the table names during execution (instead of the SQLXLAT DD statement used with EXECSQL)

• Shows the use of a High-speed Apply parameter to enable multi-threaded execution

High-speed Apply can use multiple agents (separate DB2 threads) to access and update DB2 objects during SQL execution. High-speed Apply uses only the number of agents that it needs. You can influence the number of agents by using
configuration parameters. For more information, see the section about configuration parameters in the *High-speed Apply Engine Reference Manual*.

**To generate High-speed Apply JCL**

1. On the Main Menu panel, select **Generate High-speed Apply JCL** and press **Enter**.

2. On the High-speed Apply JCL Generation panel (Figure 91 on page 233), complete the following steps:
   
   a. In the **Input Type** field, type *SQL*.  
      BMC recommends that you explicitly specify input type SQL.
   
   b. In the **SSID** field, type *DGA1*.
   
   c. In the **FileName** field, type *DB2DBA.DEV.OUTSQ1*.
   
   d. In the **Edit Object Mapping Rules** field, type *E*.
   
   e. Press **Enter**.

   **Figure 91: High-speed Apply JCL Generation panel**

   ![High-speed Apply JCL Generation panel](image)

   High-speed Apply JCL Generation
   
   **Command ===>**
   
   **StartUp Parameters**
   
   InputType: SQL
   
   **DistributionTuning Parameters**
   
   PartitionClustering: N (Y=Yes, N=No)
   
   **SSID: DGA1**
   
   **FileName: DB2DBA.DEV.OUTSQ1**
   
   **Conflict Parameters**
   
   RetryFail: ________
   
   **BindTuning Parameters**
   
   StatementCount: _____
   
   **RetryLimit: _____**
   
   **MaxPackages: _____**
   
   **RetryValue: _____**
   
   **Syncronous: N (Y=Yes, N=No)**
   
   **Bind Parameters**
   
   AuthId: ________
   
   **LogicalLog Parameters**
   
   SqlType: _______
   
   **BindOwner: ________**
   
   **CollectionId: ________**
   
   **ConflictFile Parameters**
   
   FileName: ___________________________________________
   
   **SingleFile: Y (Y=Yes, N=No)**
   
   **CommitTriggers Parameters**
   
   StatementCount: _____
   
   **Agent Parameters**
   
   MaxAgents: _____
   
   **Edit Conflict Rules: _ (E=Edit)**
   
   **Edit Object Mapping Rules: E (E=Edit)**
   
   Press PF3 to save the workid or to generate JCL. Press PF12 to cancel.

3. On the High-speed Apply Object Mapping Specification panel, perform the following steps:
Note

This step specifies the High-speed Apply configuration parameters (object mapping parameters) to translate table names for migration.

This example translates only table names, but you can also translate column names within a table. If you translate column names, insert column rows below the row of the table that contains the columns.

a In the **SOURCE NAME** field, type `DB2DBADB.DB2DBAT1`.

b In the **TARGET NAME** field, type `DB2DBADB.MIGSQLT1`.

c Press **Enter**.

d To insert a new row, type **T** in the **ACT** field and press **Enter**.

e Using the values shown in Figure 92 on page 234, in the new row, type the original and translated names of the second table in their respective fields, and then press **Enter**.

```
Figure 92: High-speed Apply Object Mapping Specification panel

<table>
<thead>
<tr>
<th>ACT</th>
<th>TYPE</th>
<th>SOURCE NAME</th>
<th>TARGET NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TABLE</td>
<td>DB2DBA.DB2DBAT1</td>
<td>DB2DBA.MIGSQLT1</td>
</tr>
<tr>
<td></td>
<td>TABLE</td>
<td>DB2DBA.DB2DBAT3</td>
<td>DB2DBA.MIGSQLT3</td>
</tr>
<tr>
<td></td>
<td>TABLE</td>
<td>DB2DBA.DB2DBAT5</td>
<td>DB2DBA.MIGSQLT5</td>
</tr>
</tbody>
</table>
```

f Repeat these substeps for the third table.

g Press **F3** until you return to the Work ID File Menu.

4 On the Work ID File Menu panel, perform the following steps:

a Select **Save As**.

b Select **Generate JCL**.

For an example, see “Creating a batch job from a work ID” on page 67.
Example 2: High-speed Apply JCL generated by the online interface

The following figure includes the JCL of a separate High-speed Apply job that was generated from the Log Master online interface.

This example:

- Includes three tables
- Contains one job that generates SQL statements (for migrating data to a set of parallel tables)
- Includes a separate High-speed Apply job that executes the SQL against the target tables. The High-speed Apply job uses configuration parameters to:
  — Translate the table names during execution (/OBJECTMAP/ section)
  — Enable multi-threaded execution of the SQL statements (/AGENT/ section)

Figure 93: JCL example, generated High-speed Apply JCL

```sql
LOG MASTER FOR DB2
DSN: 'DB2DBA.JCL.EXSQL(ESQL$E3)'
GENERATED BY USER: DB2DBA3

============================================
MIGSQL1
EXEC PGM=ALPMAIN,
PARM='DGA1,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)',REGION=0M
STEPLIB DD DISP=SHR,DSN=product.libraries
DD DISP=SHR,DSN=DB2.DSNEXIT
DD DISP=SHR,DSN=DB2.DSNLOAD
ALPPRINT DD SYSOUT=* 
SYSPUT DD SYSOUT=* 
ALPDPUMP DD SYSOUT=* 
SYSSDUMP DD SYSOUT=* 
SYSIN DD *,DLM=##
/*
DB2DBA.$$WORKID0001                                      */
/* DB2DBA 2013-01-18 GENERATE MIGRATE SQL                   */
OPTION
FILTERREL AND EXECUTION MODE CURRENT
DATEFMT ISO
WORKID DB2DBA.$$WORKID0001
DESC "DB2DBA GENERATE MIGRATE SQL"
LOGSCAN
SQL MIGRATE DATASET
DB2DBA.DEV.OUTSQ1 SHR
TEMPLATE
DB2DBA.DEV.OUTSQTE1 SHR
FROM DATE(01/18/2013) TIME(10.32.05.000000)
TO DATE(01/18/2013) TIME(10:35:15.000000)
WHERE
TABLE NAME IN (DB2DBADB.DB2DBAT1, 
DB2DBADB.DB2DBAT3, 
DB2DBADB.DB2DBAT5)
#
```
Table 15 on page 236 compares this example using the generated High-speed Apply JCL method with examples that perform the same basic tasks using other methods.

<table>
<thead>
<tr>
<th>Example figure</th>
<th>Method</th>
<th>Differences</th>
</tr>
</thead>
</table>
| JCL sample in “Examples using JCL for EXECSQL” on page 230 | EXECSQL | ■ To translate table names, the EXECSQL example includes the Log Master SQLXLAT DD statement (to translate table names during SQL generation), instead of High-speed Apply object mapping parameters (which translate during SQL execution).  
■ EXECSQL does not support multi-threaded execution of SQL statements (multiple agents). |
Example using independently coded High-speed Apply JCL

The following figure shows independently coded JCL for a separate High-speed Apply job that executes the SQL statements that are contained in a specific file.

This example:

- Includes three tables
- Shows the use of High-speed Apply to translate the table names during execution, instead of during generation with the SQLXLAT DD statement (parameters in the /ObjectMap/ section)
- Shows the use of a High-speed Apply parameter to enable multi-threaded execution (in the /Agent/ section)

For more information, see “To generate High-speed Apply JCL” on page 233.

- Shows the use of High-speed Apply parameters to enable restart processing (in the /Restart/ section)

If your operating system or database environment fails during SQL execution, you can continue running High-speed Apply from the point of the failure, instead of from the start of the input file. This feature prevents the product from repeating transactions that have already been processed. To use this feature, you must create a restart table within DB2, and define the restart table within your High-speed Apply configuration. For more information about restart tables, see the section about restart and recovery in the High-speed Apply Engine Reference Manual.

Figure 94: JCL example, independently coded High-speed Apply JCL

```plaintext
  /**************************************************************************
  //*              LOG MASTER FOR DB2
  //* DSN: 'DB2DBA.JCL.EXSQL(ESQL$E5)' *
  /***************************************************************************/
  //*> GENERATE BY USER: DB2DBA3
  /***************************************************************************/
  >>>> GENERATE MIGRATE.SQL <<<<
  /***************************************************************************/
  //*/MISQL1 EXEC PGM=ALPMAIN.
```
Example using independently coded High-speed Apply JCL

---

```
// PARM='DGA1,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)',REGION=OM
//STEPLIB DD DISP=SHR,DSN=product.libraries
// DD DISP=SHR,DSN=DB2.DSNEXIT
// DD DISP=SHR,DSN=DB2.DSNLOAD
//ALPPRINT DD SYSOUT=* 
//SYSOUT DD SYSOUT=* 
//ALPDUMP DD SYSOUT=* 
//SYSUDUMP DD SYSOUT=* 
//SYSSIN DD *,DLM=##
/* DB2DBA.$$WORKID0001                                      */
/* DB2DBA 2013-01-18 GENERATE MIGRATE SQL                   */
OPTION FILTERREL AND EXECUTION MODE CURRENT
DATEFMT ISO
WORKID DB2DBA.$$WORKID0001
DESC "DB2DBA GENERATE MIGRATE SQL"
LOGSCAN
SQL MIGRATE DATASET DB2DBA.DEV.OUTSQ1 SHR
TEMPLATE
DB2DBA.DEV.OUTSQTE1 SHR
FROM DATE(01/18/2013) TIME(10.32.05.000000)
TO DATE(01/18/2013) TIME(10:35:15.000000)
WHERE
TABLE NAME IN (DB2DBADB.DB2DBAT1,
DB2DBADB.DB2DBAT3,
DB2DBADB.DB2DBAT5)

#  
# LOG MASTER FOR DB2
# DSN: 'DB2DBA.JCL.EXSQL(ESQL$E6)'
# GENERATED BY USER: DB2DBA3
# EXECUTE MIGRATE SQL
#EXEC SQL1 EXEC PGM=APTBMAIN,PARM='SSID=DGA1',REGION=OM
//STEPLIB DD DISP=SHR,DSN=product.libraries
// DD DISP=SHR,DSN=DB2.DSNEXIT
// DD DISP=SHR,DSN=DB2.DSNLOAD
//APPTERR DD SYSOUT=* 
//APTPRINT DD SYSOUT=* 
//SYSOUT DD SYSOUT=* 
//SYSPRINT DD SYSOUT=* 
//SYSDUMP DD DSN=DB2DBA.DEV.APPLY.SYSMDUMP,
//             DISP=(NEW,CATLG,CATLG),
//             UNIT=(SYSALLDA,3),SPACE=(CYL,(50,25),RLSE)
//SYSTERM DD SYSOUT=* 
//SYSERR DD SYSOUT=* 
//SYSSIN DD *,DLM=##
/StartUp/ 
InputType=SQL
FileName=DB2DBA.DEV.OUTSQ1

/Restart/ 
RestartType=New/R restart
RestartID=DB2DBA

/Agent/ 
MaxAgents=5

/ObjectMap/ 
SourceTable=DB2DBADB.DB2DBAT1
TargetTable=DB2DBADB.MIGSQLT1
SourceTable=DB2DBADB.DB2DBAT3
TargetTable=DB2DBADB.MIGSQLT3
```
Table 16 on page 239 compares this example using the independently coded High-speed Apply JCL method with examples that perform the same basic tasks using other methods.

Table 16: Independently coded High-speed Apply JCL examples compared with other methods

<table>
<thead>
<tr>
<th>Example figure</th>
<th>Method</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>The figure in “Examples using JCL for EXECSQL” on page 230</td>
<td>EXECSQL</td>
<td>■ To translate table names, the EXECSQL example includes the Log Master SQLXLAT DD statement, instead of High-speed Apply object mapping parameters.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ This method does not support:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Multi-threaded execution of SQL statements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>— Restart capability</td>
</tr>
<tr>
<td>The figure in “Example 2: High-speed Apply JCL generated by the online interface” on page 235</td>
<td>Generated High-speed Apply JCL</td>
<td>This method does not support restart capability.</td>
</tr>
</tbody>
</table>

SQL code handling during SQL execution

Log Master validates any SQL updates that it performs as it executes SQL statements.

In addition, the product examines the SQL codes that DB2 returns, and takes appropriate action based on your specifications.

Note

The High-speed Apply Engine distributed with Log Master does not alter how DB2 generates SQL codes or responds to them; it alters only how High-speed Apply responds to the SQL codes.

For example, if a user is not authorized to update a table and attempts to do so, DB2 will not update the table, and will generate SQL code -551. High-speed Apply does not override this condition, even if your code handling rules specify IGNORE for the -551 code. (In this example, DB2 does not update the table, but High-speed Apply does not report the failure).
Table 17 on page 240 summarizes SQL code handling for each of the product’s general methods for executing SQL.

Table 17: SQL code handling summary

<table>
<thead>
<tr>
<th>SQL execution method</th>
<th>Online interface</th>
<th>Batch interface</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECSQL</td>
<td>SQL Execution Codes Handler Maintenance panel</td>
<td>Insert an SQLCODES DD statement directly in your JCL.</td>
<td>“Handling SQL codes with EXECSQL” on page 240</td>
</tr>
<tr>
<td>Generated High-speed Apply JCL</td>
<td>Main Menu option Generate High-speed Apply JCL</td>
<td>Not available</td>
<td>“Handling SQL codes with generated High-speed Apply JCL” on page 246</td>
</tr>
<tr>
<td>Independently coded High-speed Apply JCL</td>
<td>Not available</td>
<td>Code a separate job or job step that explicitly runs High-speed Apply. Specify configuration parameters in a separate configuration file or in-stream in your JCL.</td>
<td>“Handling SQL codes with independently coded High-speed Apply JCL” on page 253</td>
</tr>
</tbody>
</table>

Handling SQL codes with EXECSQL

With EXECSQL, any responses that you define override the product’s default SQL code handling responses.

To define an SQL code response with EXECSQL, specify the following items:

- Statement type
- Condition
- Response

For example, an SQL code response could specify a statement type of insert, a condition of -803, and a response of abort.

Statement type

The statement type indicates the kind of SQL statements to which a code handling rule applies.
This item correlates to the different xxxConflict sections specified in configuration parameters for the High-speed Apply Engine. The variable xxx represents a statement type, such as Insert or Delete. Use any of the following values as the statement type:

- INSERT
- UPDATE
- DELETE
- DDL (includes data definition language statements and EXCHANGE statements)
- ALL (includes any valid DML or DDL statement)

**Condition**

The condition indicates the type of returned SQL code that triggers a given Log Master response.

This item corresponds to the High-speed Apply "Code" configuration parameter. Table 18 on page 241 lists the available condition values.

Table 18: Condition values for SQL code handling

<table>
<thead>
<tr>
<th>SQL code value</th>
<th>Log Master takes the specified action when DB2 returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEGATIVE</td>
<td>Any negative SQL code</td>
</tr>
<tr>
<td>POSITIVE</td>
<td>Any positive SQL code</td>
</tr>
<tr>
<td>A positive or negative number</td>
<td>The SQL code identified by the number</td>
</tr>
<tr>
<td>SQLWARNx</td>
<td>A warning message and the warning number is the same as x. The value of x can be any number from 0 to 9, or the letter A. (Note that 0 means any warning.) Consult the IBM SQLCA documentation for more information.</td>
</tr>
<tr>
<td>MULTIPLE</td>
<td>Any SQL code that indicates the executed SQL statement caused the update or deletion of more than one row. In normal execution, the product generates SQL that updates one row per statement.</td>
</tr>
</tbody>
</table>

**Response**

The response indicates the type of action that Log Master takes when it encounters a given SQL code.

This item corresponds to the High-speed Apply "Action" configuration parameter. Table 19 on page 242 lists the available response values.
### Table 19: Response values for SQL code handling

<table>
<thead>
<tr>
<th>Response value</th>
<th>Log Master actions</th>
</tr>
</thead>
</table>
| IGNORE         | ■ Ignores the given error code  
                  ■ Does not set a condition |
| WARN           | ■ Writes a message in the ALPPRINT output  
                  ■ Sets a return code of 4 |
| ROLLBACK       | ■ Writes a message in the ALPPRINT output  
                  ■ Sets a return code of 4  
                  ■ Rolls back the current unit of work  
                  ■ Skips all subsequent SQL statements in the current unit of work |
| TERMINATE      | Terminates execution with return code 12 |
| ABORT          | ■ Writes a message in the ALPPRINT output  
                  ■ Rolls back the current unit of work  
                  ■ Terminates execution with return code 12 |

Note: If the SQL was generated by Log Master with a COMMIT FREQUENCY greater than 1, a unit of work in the SQL file could include multiple units of work from the original log data.

Table 20 on page 242 shows the Log Master default SQL code responses for statement type ALL:

### Table 20: Default responses for SQL code handling, EXECSQL

<table>
<thead>
<tr>
<th>Condition</th>
<th>Default response</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEGATIVE</td>
<td>ABORT</td>
</tr>
<tr>
<td>POSITIVE</td>
<td>WARN</td>
</tr>
<tr>
<td>SQLWARN0</td>
<td>WARN</td>
</tr>
<tr>
<td>MULTIPLE</td>
<td>WARN</td>
</tr>
</tbody>
</table>

As it processes the SQL code responses that you specify, the High-speed Apply Engine distributed with Log Master creates the following ordered lists:

- Inserts
- Updates
- Deletes
- DDL

Each SQL code response appears in the appropriate list, or, if the statement type is ALL, in all lists. The last response in the list overrides any previous responses if you:
Override a default response
- Define multiple responses for the same combination of statement type and condition

Example 1: SQL code handling with EXECSQL in the online interface

Using EXECSQL, you can define responses to SQL codes in the Log Master online interface. Based on the responses that you define, the product generates an SQLCODES DD statement, and includes it in the JCL that it generates from your work ID.

For this example, assume that you are the database administrator for a corporation. You have just discovered that all of the invoices that were recorded for the last week were accidentally deleted. However, customers have continued to call in with changes to their invoices, and you know that several operators have created new records with the updates.

To recover from the deletions, you must perform an UNDO process, which includes generating UNDO SQL. However, because the operators have already reinserted certain rows, some of the INSERT statements in the UNDO SQL (reversing the accidental deletions) will fail with an SQL code of -803. You need to define special handling for the -803 code.

You decide to take the following actions:

1. Generate UNDO SQL statements to reverse the accidental deletions.
2. Generate a Backout Integrity report and a Detail report.
   The reports provide the information needed to resolve any discrepancies that you might discover later. You can perform this step at the same time that you generate the UNDO SQL statements.

3. In the Log Master online interface, define a response to the -803 SQL code as shown in Figure 95 on page 243. When the product encounters duplicate records, it issues a warning instead of aborting the job.

Figure 95: SQL Execution Codes Handler Maintenance panel

SQLCODES             SQL Execution Codes Handler Maintenance       Line 1 of 2
Command ===> ________________________________________________ Scroll ===> HALF
SSID : DBAN
Specify the Default Codes:  (I=Ignore, W=Warn, T=Term, R=Rollback, A=Abort)
Negative SQL code . . . . . . . . A     SQL Warning . . . . . . . . . . . W
Positive SQL code . . . . . . . . W     Multiple Update/Delete . . . . . . W
Specify Additional SQL Handlers . . Y  (Y=Yes, N=No)
Type one or more codes. Then press Enter.
ACT . . . . . (I=Insert, D=Delete, R=Repeat)
UPD TYPE . . (A=All, I=Insert, U=Update, D=Delete, L=DDL)
CONDITION . . (NEG, POS, MULT, +nnn, -nnn, Wx where x = 0-9,A)
RESPONSE . . (I=Ignore, W=Warn, T=Term, R=Rollback, A=Abort)
4 Execute the generated UNDO SQL statements, using the special SQL code handling.

5 Use the information in the Backout Integrity and Detail reports to verify each warning that DB2 generates for duplicate INSERT statements. You can use the Detail report information to update the record to the correct status.

**Example 2: JCL for SQL code handling with EXECSQL**

You can use EXECSQL to define responses to SQL codes in the product’s batch interface. To take this action, insert the SQLCODES DD statement directly in your JCL.

For information about the product’s default SQLCODES rules, see the relevant table in “Response” on page 241.

The format of an individual SQLCODES rule is

\[ \text{statement type (condition)} = \text{response} \]

In this format,

- \text{statement type} represents a value listed in “Statement type” on page 240.
- \text{condition} represents a value listed in “Condition” on page 241.
- \text{response} represents a value listed in “Response” on page 241.

Figure 96 on page 245 shows JCL that performs basic SQL code handling with EXECSQL (using an SQLCODES DD statement). This example:

- Includes three tables
- Contains one job that generates SQL statements and translates the table names during generation
- Contains a second job to execute the SQL against the target tables
  The second job uses an SQLCODES DD statement to define special handling for the following SQL codes:
  - For SQL code -803, the product issues a warning whenever it executes an INSERT statement that encounters a duplicate row.
— For SQL code +100, the product ignores any UPDATE statements that do not affect any rows in the target table.

Figure 96: JCL example, SQL code handling: EXECSQL

```sql
//**********************************************************************
//*     LOG MASTER FOR DB2
//*     DSN: 'DB2DBA.JCL.EXSQL(ESQL$E7)'
//*     GENERATED BY USER: DB2DBA3
//**********************************************************************
//*              >>>>> GENERATE MIGRATE SQL <<<<<
//**********************************************************************
//MIGSQL1 EXEC PGM=ALPMAIN,
//          PARM='DGA1,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)',REGION=0M
//STEPLIB DD DISP=SHR,DSN=product.libraries
//          DD DISP=SHR,DSN=DB2.DSNEXIT
//          DD DISP=SHR,DSN=DB2.DSNLOAD
//ALPPRINT DD SYSDUMP=*  
//          DD SYSCPRT=*  
//          DD SYSDUMP=*  
//          DD SYSCPRT=*  
//SYSIN DD *,DLM=##
/* DB2DBA.$$WORKID0001                                      */
/* DB2DBA 2013-01-18 GENERATE MIGRATE SQL                   */
OPTION
    FILTERREL AND EXECUTION MODE CURRENT
DATEFMT ISO
WORKID DB2DBA.$$WORKID0001
DESC "DB2DBA GENERATE MIGRATE SQL"

LOGSCAN
SQL MIGRATE DATASET
DB2DBA.DEV.OUTSQ1 SHR
TEMPLATE
DB2DBA.DEV.OUTSQTE1 SHR
FROM  DATE(01/18/2013) TIME(09.22.15.000000)
TO    DATE(01/18/2013) TIME(09:23:45.000000)
WHERE
   TABLE NAME IN (DB2DBADB.DB2DBAT1,  
    DB2DBADB.DB2DBAT3,  
    DB2DBADB.DB2DBAT5)
##
//SQLXLAT DD *
   TABLE DB2DBADB.DB2DBAT1 -> DB2DBADB.MIGSQLT1
   TABLE DB2DBADB.DB2DBAT3 -> DB2DBADB.MIGSQLT3
   TABLE DB2DBADB.DB2DBAT5 -> DB2DBADB.MIGSQLT5

//**********************************************************************
//*     LOG MASTER FOR DB2
//*     DSN: 'DB2DBA.JCL.EXSQL(ESQL$E8)'
//*     GENERATED BY USER: DB2DBA3
//**********************************************************************
//*              >>>>> EXECUTE MIGRATE SQL <<<<<
//**********************************************************************
//EXESQL1 EXEC PGM=ALPMAIN,
//          PARM='DGA1,,MSGLEVEL(2),ALPOPTS(ALP$OPTS)',REGION=0M
//STEPLIB DD DISP=SHR,DSN=product.libraries
//          DD DISP=SHR,DSN=DB2.DSNEXIT
//          DD DISP=SHR,DSN=DB2.DSNLOAD
//ALPPRINT DD SYSDUMP=*  
//          DD SYSCPRT=*  
//          DD SYSDUMP=*  
//          DD SYSCPRT=*  
//SYSIN DD *,DLM=##
/* DB2DBA.$$WORKID0002                                */
/* DB2DBA 2013-01-18 GENERATE MIGRATE SQL               */
```
Table 21 on page 246 compares this example using the EXECSQL method with examples that perform the same basic tasks using other methods.

Table 21: EXECSQL examples compared with other methods

<table>
<thead>
<tr>
<th>Example figure</th>
<th>Method</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure in “Example 2: High-speed Apply JCL for SQL code handling generated by</td>
<td>Generated High-speed Apply JCL</td>
<td>This example uses High-speed Apply configuration parameters that enable you</td>
</tr>
<tr>
<td>online interface” on page 251</td>
<td></td>
<td>to respond more productively to SQL codes.</td>
</tr>
<tr>
<td>Figure in “Example 1: SQL code handling with independently coded High-speed</td>
<td>Independently coded High-speed Apply JCL</td>
<td>This example:</td>
</tr>
<tr>
<td>Apply JCL” on page 253</td>
<td></td>
<td>■ Uses High-speed Apply configuration parameters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Shows how to divide the configuration parameters into sections based on the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>statement type</td>
</tr>
</tbody>
</table>

Handling SQL codes with generated High-speed Apply JCL

In addition to the SQL code responses available with EXECSQL, generated High-speed Apply JCL provides the ability to:

- Defer a statement or a unit of recovery, and write the deferred statements to a file for examination and subsequent execution

- Retry a statement in response to SQL codes that indicate either "time out" conditions or referential integrity (RI) conflicts

- Roll back a statement (as opposed to unit of recovery)

- Skip a statement or a unit of recovery (normally used after a rollback)

For an example of how to use generated High-speed Apply JCL for SQL code handling with the online interface, see “Example 1: SQL code handling with
generated High-speed Apply JCL in the online interface” on page 248. Using the online interface, you can specify an SQL code and a product action.

For example, an SQL code response could specify a code of -803, an action of DeferStatement, and an action of Continue. Notice that with High-speed Apply, you can specify more than one action for each code. You can then generate JCL for a separate job that runs High-speed Apply using your parameters.

Any responses that you define override the product’s default SQL code handling responses.

**Code**

The code indicates the type of returned SQL code that triggers a given action. This item corresponds to the "Condition" parameter specified with EXECSQL.

The available code values are:

- Negative
- Positive
- $n$nn (positive number of an individual SQL code)
- -$n$nn (negative number of an individual SQL code)
- SQLWARN$x$
- MultipleRows
- NoRows
- TimeOut
- RIConflict

For more information about SQL codes and code types, see the section about conflict resolution in the *High-speed Apply Engine Reference Manual*.

**Action**

The action indicates the type of action that the product takes when it encounters a given SQL code.

This item corresponds to the "Response" parameter specified with EXECSQL. The available action values are:

- Abort
- Continue
- DeferStatement
- DeferUR
- Display
For more information about actions for conflict resolution, see the section about conflict resolution in the High-speed Apply Engine Reference Manual.

Table 22 on page 248 lists the High-speed Apply default SQL code responses.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Default response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>Abort</td>
</tr>
<tr>
<td>Positive</td>
<td>Warn</td>
</tr>
<tr>
<td>SQLWarnx</td>
<td>Warn</td>
</tr>
<tr>
<td>MultipleRows</td>
<td>Warn</td>
</tr>
<tr>
<td>NoRows</td>
<td>Warn</td>
</tr>
<tr>
<td>TimeOut</td>
<td>Retry</td>
</tr>
<tr>
<td>RIConflict</td>
<td>Abort</td>
</tr>
</tbody>
</table>

**Example 1: SQL code handling with generated High-speed Apply JCL in the online interface**

The following example lists the actions that you take in the Log Master online interface to define responses to SQL codes.

Based on the responses that you define, the product generates a separate High-speed Apply JCL generation step in your work ID. This example:

- Operates on three tables
- Assumes an existing Log Master job that generates SQL statements (for migrating data to a set of parallel tables)
- Contains a separate High-speed Apply job that executes the SQL against the target tables. The High-speed Apply job:
— Defines a separate conflict file, where deferred statements are written for subsequent processing, examination, or research

— Defines special handling for SQL code -803 to write any SQL statements that encounter a duplicate row into a conflict file for subsequent processing

— Defines special handling for SQL code +100 to write any statements that do not affect any rows in the target table into the conflict file for examination and research

**To define SQL code responses using generated High-speed Apply JCL**

1. On the Main Menu panel, select **Generate High-speed Apply JCL** and press **Enter**.

2. On the High-speed Apply JCL Generation panel, complete the following steps:
   a. Under **Startup Parameters**, specify the following field values as shown in Figure 97 on page 249:
      - **Input Type**: SQL
      - **SSID**: DGA1
      - **FileName field**: DB2DBA.DEV.OUTSQ1
   b. Under **ConflictFile Parameters**, type DB2DBA.DEFER.D&DATE..T&TIME in the **FileName** field.
   c. At the bottom of the panel, type E in the **Edit Conflict Rules** field.
   d. Press **Enter**.

**Figure 97: High-speed Apply JCL Generation**

```
High-speed Apply JCL Generation

Command ==> StartUp Parameters                DistributionTuning Parameters
    InputType: SQL                PartitionClustering: N (Y=Yes, N=No)
    SSID: DGA1                      RIClustering: Y (Y=Yes, N=No)
    FileName: DB2DBA.DEV.OUTSQ1

Conflict Parameters                BindTuning Parameters
    RetryFail: _________               StatementCount: _________
    RetryLimit: _______                MaxPackages: _______                    Synchronous: N (Y=Yes, N=No)
    RetryValue: _______

Bind Parameters                   LogicalLog Parameters
    AuthId: ________                     SqlType: _______
    BindOwner: ________
    CollectionId: ________

ConflictFile Parameters
    FileName: DB2DBA.DEFER.D&DATE..T&TIME.
    SingleFile: Y (Y=Yes, N=No)

CommitTriggers Parameters          Agent Parameters
    StatementCount: ______                MaxAgents: ______

Edit Conflict Rules: E (E=Edit) Edit Object Mapping Rules: (E=Edit)
```
3 On the High-speed Apply Conflict Specification panel, complete the following steps:

a In the ACT field, type I and press Enter.

b Specify the following field values, as shown in Figure 98 on page 250:
   ■ CODE field: -803
   ■ ACTION 1 field: DeferStatement
   ■ ACTION 2 field: Continue

   **Figure 98: High-speed Apply Conflict Specification panel (updated)**
   ![High-speed Apply Conflict Specification panel](image)

   Specify values for the High-speed Apply AnyConflict Parameters.
   Displayed rules are either product defaults or previously entered rules.
   Edit displayed rules or type an action code (ACT) and press Enter.
   ```plaintext
   ACT - I= Insert, D=Delete, R=Repeat
   ACT CODE     ACTION 1           ACTION 2
   —            ABORT             _________________
   —            POSITIVE          WARN             _________________
   —            MULTIPLETROWS   WARN             _________________
   —            NOROWS           WARN             _________________
   —            TIMEOUT          RETRY             _________________
   —            RCONFLICT       ABORT             _________________
   —            -803             DEFERSTATEMENT   CONTINUE
   —            100             DEFERSTATEMENT   CONTINUE
   END OF LIST
   ```

c Press Enter.

d In the ACT field of the newly entered rule, type I and press Enter.

e In the blank row, specify the following field values:
   ■ CODE field: 100
   ■ ACTION 1 field: DeferStatement
   ■ ACTION 2 field: Continue

f Press Enter.

g Press F3 until you return to the Work ID File Menu.

**Note**

Placing new rules at the bottom of the list ensures that they override the product’s
default conflict resolution rules.

This combination of actions causes the product to write any statement that
encounters the -803 SQL code into the conflict file, and continue processing with
the next statement in the input file.
On the Work ID File Menu panel:

a Select **Save As**.

b Select **Generate JCL**.

For an example, see “Creating a batch job from a work ID” on page 67.

**Example 2: High-speed Apply JCL for SQL code handling generated by online interface**

The following figure shows JCL that performs basic SQL code handling with generated High-speed Apply JCL.

This example shows the JCL that Log Master generates when you follow the steps shown in “Handling SQL codes with generated High-speed Apply JCL” on page 246.
Table 23 on page 253 compares this example using the generated High-speed Apply JCL method with examples that perform the same basic tasks using other methods.
Table 23: Generated High-speed Apply JCL examples compared with other methods

<table>
<thead>
<tr>
<th>Example figure</th>
<th>Method</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>The figure in “Example 2: JCL for SQL code handling with EXECSQL” on page 244</td>
<td>EXECSQL</td>
<td>This example ignores SQL codes or issues warning messages, instead of preserving the SQL statements that encounter SQL codes in a separate conflict file. EXECSQL does not support a separate conflict file.</td>
</tr>
<tr>
<td>The figure in “Handling SQL codes with independently coded High-speed Apply JCL” on page 253</td>
<td>Independently coded High-speed Apply JCL</td>
<td>This example divides the configuration parameters into sections based on the statement type. The online interface does not generate the High-speed Apply configuration parameters that provide different responses when different types of SQL statements encounter the same SQL code.</td>
</tr>
</tbody>
</table>

Handling SQL codes with independently coded High-speed Apply JCL

This general method provides access to all High-speed Apply Engine SQL code responses.

The other general methods (EXECSQL and generated High-speed Apply JCL) provide access to subsets of responses, but to access all responses, you must code High-speed Apply JCL yourself. For example, when you code the JCL yourself, you can define separate SQL code responses based on statement type.

To use this method for SQL code handling, code a separate job or job step that explicitly runs High-speed Apply. Specify configuration parameters either in a separate configuration file or in-stream in your JCL. The following pages show independently coded High-speed Apply JCL that defines SQL code responses.

Example 1: SQL code handling with independently coded High-speed Apply JCL

The figure below shows JCL that performs SQL code handling with independently coded High-speed Apply JCL.

This example:

- Includes three tables
- Assumes an existing Log Master job that generates SQL statements (for migrating data to a set of parallel tables)
Contains a separate job that uses High-speed Apply to execute SQL against the target tables. The High-speed Apply job defines:

- A separate conflict file where deferred statements are written for subsequent processing, examination, or research

- Special handling for SQL code -803 to write any INSERT statements that encounter a duplicate row into a separate conflict file for subsequent processing

- Special handling for SQL code +100 to issue an error message and terminate processing on any DELETE statements, and to write any UPDATE statements into a separate conflict file for examination and research
Figure 100: JCL example, SQL code handling: independently coded JCL

```bash
// LOG MASTER FOR DB2
// DSN: 'DB2DBA.JCL.EXSQL(ESQLS811)'
// GENERATED BY USER: DB2DBA3

// >>>>> GENERATE MIGRATE SQL <<<<<<<
// EXEC PGM=ALPMAIN
// PARM='DGAL1.MLEVEL(1),ALP6OPTS(ALP6OPTS)',REGION=0M
// SE Helvetica DD DISP=SHR,DSN=product.libraries
// DD DISP=SHR,DSN=DB2.OSREXIT
// DD DISP=SHR,DSN=DB2.OSNLOAD
// SYSPRINT DD SYSOUT=*'
// SYSPRINT DD SYSOUT='*
// SYSSUMP DD SYSOUT='*
// SYSPRINT DD SYSOUT='*
// SYSDUMP DD SYSOUT='*
// SYSDUMP DD SYSOUT='*
// SYSSIN DD * DLM='

// SYSIN Syntax Omitted. See Previous Figures for SYSIN Syntax.

// >>>>> EXECUTE MIGRATE SQL <<<<<<
// EXEC PGM=APPMAIN,PARM='SSID=DGAL1',REGION=0M
// SE Helvetica DD DISP=SHR,DSN=product.libraries
// DD DISP=SHR,DSN=DB2.OSREXIT
// DD DISP=SHR,DSN=DB2.OSNLOAD
// /APPRER DD SYSOUT='*
// /APPRER DD SYSOUT='*
// /APPRER DD SYSOUT='*
// /APPRER DD SYSOUT='*
// /APPRER DD SYSOUT='*
// /APPRER DD SYSOUT='*
// /APPRER DD * DLM='
// /StartUp/
// InputType=SQL
// FileName=DB2DBA.DEVS.OUTSQL
// /Restart/
// RestartType=New
// RestartID=DB2DBA
// /Agent/
// MaxAgents=5
// ConflictFile=/
// FileNameModel=DB2DBA.DEFER.DDEDATE.time.
// SingleFile=Yes
// InsertConflict Code=803
// Action=DeleteStatement
// Action=Continue
// UpdateConflict Code=100
// Action=DeleteStatement
// Action=Continue
// DeleteConflict Code=100
// Action=Abort
// ObjectMap/
// SourceTable=DB2DBA.DB2DBAT1
// TargetTable=DB2DBA.MIGSQLT1
// SourceTable=DB2DBA.DB2DBAT3
// TargetTable=DB2DBA.MIGSQLT3
// SourceTable=DB2DBA.DB2DBAT5
// TargetTable=DB2DBA.MIGSQLT5
```

High-speed Apply configuration parameters to define conflict file for deferred statements

Configuration parameters for SQL code -803 with INSERT statements

Configuration parameters for SQL code +100 with UPDATE statements

Configuration parameters for SQL code +100 with DELETE statements
The following table compares this example using the independently coded High-speed Apply JCL method with examples that perform the same basic tasks using other methods.

Table 24: Independently coded JCL examples compared with other methods

<table>
<thead>
<tr>
<th>Example figure</th>
<th>Method</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>JCL sample in “Example 2: JCL for SQL code handling with EXECSQL” on page 244</td>
<td>EXECSQL</td>
<td>In this example, the SQLCODES rules: ■ Continue processing for SQL code 100 ■ Issue a warning message for SQL code -803 The rules cannot defer statements because EXECSQL does not support conflict files. (You can examine the statements and results of SQL execution by using the file defined by the SQLPRINT DD statement.)</td>
</tr>
<tr>
<td>JCL sample in “Example 2: High-speed Apply JCL for SQL code handling generated by online interface” on page 251</td>
<td>Generated High-speed Apply JCL</td>
<td>This example combines SQL code responses for all statement types. The online interface does not generate the High-speed Apply configuration parameters for separate responses based on statement type.</td>
</tr>
</tbody>
</table>
This chapter describes using Log Master to process objects over time.

Overtime mode overview

The overtime mode feature of the Log Master for DB2 product enables you to examine DB2 objects over a period of time, regardless of whether the objects have been dropped. Overtime mode enables Log Master to resolve the conflict between the following points:

- To read DB2 log records, Log Master needs information about the structure of any DB2 objects that are referenced in the log records. Log Master normally gets this information from the DB2 catalog.

- When a DB2 object is dropped, DB2 deletes all references to the object from the DB2 catalog. When an object is dropped and re-created, Log Master cannot use information in the DB2 catalog because the structure of the object might have changed, particularly the internal DB2 object identifiers such as DBIDs, PSIDs, or OBIDs.

Log Master refers to dropped DB2 objects (or DB2 objects that have been dropped and re-created) as old objects. Overtime mode enables Log Master to process log records related to old objects, and obtain structure definitions of old objects from sources other than the DB2 catalog.

To use overtime mode, you must accomplish the following basic tasks:

- Obtain the structure definitions of the old objects
- Use the structure definitions to read log records about the old objects

To specify overtime mode, use one of the following methods:

- Execution Mode field on the Work ID Run Time Options panel
- EXECUTION MODE keyword of the OPTION statement in batch syntax
- EXECMODE installation option
Special considerations for overtime mode

Be aware of the following considerations as you use overtime mode:

- **Multiple instances of DB2 objects**
  Log Master refers to the version of a DB2 object that exists between one create action and a following drop action as an instance of that object. Depending on the time frame of your log scan, and the times when the object is dropped or re-created, Log Master can encounter log records related to multiple instances of the same DB2 object.

- **Row completion processing**
  By default, Log Master does not perform all row completion processing when it runs in overtime mode. Therefore, for Log Master to retrieve data related to an old object, one of the following conditions must exist. If neither condition exists, Log Master attempts to perform some row completion, but might issue error messages when it cannot complete all log records.

  — The old object was defined with Data Capture Changes (DCC) during your selected time frame. If DCC was turned on, the selected log records are complete, and Log Master does not perform completion processing.

  — You provide image copy data sets that contain the old objects that you require, and you tell Log Master to use them by setting a run time option.
  
  If the old objects were not defined with DCC, and you have image copies that contain the old objects that you reference, you can take the following actions to increase the chances of successful row completion processing, but Log Master might not be able to complete the log records.

  1. On the Work ID Run Time Options panel, type **Y** in the **Attempt Completion** field.

  2. In the **Specify Image Copies** field, to specify the names of image copy data sets that contain the old objects, type **E**.

  3. Enter the names of image copy data sets that contain the selected objects. Depending on the activity related to the old objects, you might need to specify multiple image copy data sets.

  For more information about using run time options, see “Editing work ID run time options” on page 56

Costs of overtime mode

Before attempting to obtain the benefits of overtime mode, consider the extra costs of running in overtime mode described in this section.
Taking the following actions can reduce the extra costs of overtime mode:

- Use overtime mode only when you actually need to retrieve data from old objects or store structure definitions of old objects. Use the current mode for normal processing of other Log Master jobs.

- Limit the DB2 objects that you access in overtime mode (or store definitions for) to the most critical objects that you are most likely to access later.

**Increased size of DB2 log files**

To completely ensure that Log Master can complete all log records in overtime mode, all old objects that you reference in overtime mode must have been defined with DCC during the time frame of your log scan.

Using DCC might increase the size of your DB2 log files, depending on your environment. To learn if and how much your log files will increase, use the Log Master Data Capture Changes report. For more information, see “Data Capture Changes report” on page 341.

**Increased processing requirements**

If you use an old objects data set, Log Master performs extra processing to check for errors in (and validate the data obtained using) the old objects data set.

In overtime mode, Log Master must keep track of the different instances of each DB2 object. Because of this and other overhead, an overtime job typically uses more resources and experiences more processing overhead than a job that runs in current mode. The additional requirements of overtime mode cause Log Master to:

- Examine every log record in the log scan for the object name (because it cannot rely on the current OBIDs from the DB2 catalog)

- Generate an additional log scan to search for any DB2 catalog activity that affects the objects in the filter

- Examine the DB2 catalog, the DB2 EDM pool, and the Log Master Repository tables for information about all of the objects that it encounters in the log records

In overtime mode, Log Master uses other sources to obtain structure definitions of old objects. To make this possible, you must perform extra processing to update these sources, such as:

- Running periodic (or ongoing) jobs that update the Log Master Repository with structure definitions for your old objects
  
  Use either of the following methods to perform this processing:
— Generate JCL that updates the Repository by using the Generate REPOS UPDATE JCL choice on the Main Menu

— Add a Repository maintenance step to an existing work ID, or add Repository update function to an existing log scan step

■ Performing an extra, often extensive log scan that updates the Repository with structure definitions for your old objects

■ Performing manual research and data entry to create an old objects data set with the structure definitions for your old objects

**Increased size of the Old Objects Table**

Overtime mode increases the amount of data that Log Master stores in the Old Objects Table of the Repository, increasing the size of this table.

To reduce the size of the Old Objects Table, periodically take one of the following actions:

■ Generate the JCL to perform this action by using the Generate REPOS DELETE JCL choice on the Main Menu.

■ Delete information from the table directly (without generating and executing JCL), by using the Delete/Display Repository Tables choice on the Main Menu.

**When to use overtime mode**

The situations in which you need to use overtime mode are either *predictable* or *unpredictable*.

**Predictable situations**

*Predictable* situations occur when you have periodic windows of drop and re-create activity.

For example:

■ You might periodically repartition a large table, requiring you to drop the table and re-create it with new partition key values.
Your environment might define a window for structural changes to a database (changes in column data type, data length, and so forth). Some of these changes might require a drop and re-create action.

Whenever the current time is after a drop or drop and re-create action, but you need to retrieve database changes that occurred before the action, you can use overtime mode to do so. When you know about such windows in advance, you can use overtime mode proactively.

Unpredictable situations

Unpredictable situations occur when requirements change, assumptions turn out to be incorrect, or an error occurs.

For example:

- You might drop a DB2 object for valid reasons, only to learn that new requirements mean you must retrieve database changes related to that object.

- An application can drop a DB2 object in error, or a procedural error can cause applications to be run incorrectly, resulting in a dropped DB2 object. You might be able to correct the error if you can capture the database changes that related to the dropped object.

Although you cannot predict when these situations occur, you can be prepared when they do. If you have periodically captured and stored the structure definitions of your critical DB2 objects, you can take corrective action much more quickly.

Obtaining old object structure definitions

Log Master must obtain information about the structure of old objects before it can interpret any log records related to the old objects.

In overtime mode, you can use the following sources for old object structure definitions:

- DB2 log (recommended source)
  Log Master can extract the required information from the log records that DB2 generates when you create or drop the object, and from the current DB2 catalog. The log and the DB2 catalog are maintained by DB2, which makes them more
reliable than other sources. BMC strongly recommends that you use these DB2-maintained sources when you run in overtime mode.

These sources can be used with either the proactive or the reactive method of obtaining structure definitions.

- provide the structure definitions to Log Master in an old objects data set, after obtaining them by using other resources (deprecated source)

If you have no better source for obtaining old object structure definitions, you can use other sources in your environment, such as backups outside of DB2, archived DDL statements, and so forth, to determine the structure definitions of old objects. You can then enter the definitions in a data set called an old objects data set.

Use an old objects data set only if you:
- Have not already stored structure definitions in the Repository
- Cannot pinpoint the time when your old objects were created or dropped precisely enough to make it practical to read DB2 log files covering that period

**WARNING**

BMC strongly recommends against using this source. As it uses an old objects data set, Log Master attempts to check for errors and validate data, but Log Master is completely dependent on the information in the data set. If the definitions are incorrect, Log Master can misinterpret some or all of the retrieved data.

For a detailed example, see “Overtime mode examples” on page 270.

You can use the following methods to obtain old object structure definitions:

- With the proactive method, you obtain the structure definitions in advance so that you have them when you need them. For more information, see “Using the proactive method to obtain old object structure definitions” on page 263.

- With the reactive method, you wait until you need to access old objects before you obtain the structure definitions. The reactive method requires less preparation, but lengthens the response time when you need to retrieve data about old objects.
  
  With this method:
  
  — You have not maintained old object structure definitions in the Repository.
  
  — You can obtain old object structure definitions from the DB2 log (see “Using the reactive method (with the DB2 log) to obtain old object structure definitions” on page 266), or an old objects data set (see “Using the reactive method (with an old objects data set) to obtain old object structure definitions” on page 267).

When you read input from logical log files, you do not need to perform a separate step to obtain old object structure definitions. For more information, see “Log scan input sources” on page 268.
Using the proactive method to obtain old object structure definitions

For most situations, BMC recommends that you use the proactive method and regularly run jobs to update the Old Objects Table in the Repository with DB2 object structure definitions.

The proactive method provides a quicker response when you need to retrieve data about old objects, but it requires processing in advance to maintain the structure definitions, as follows.

To update the Old Objects Table in the Repository

1. Define your set of old objects by using a Log Master filter or WHERE clause.
2. Use the filter in the following sequence of jobs:
   a. Initial Repository update job
      This step reads the current DB2 catalog (but no log records), and stores the current structure definitions of your old objects in the Old Objects Table (ALPOLD0) of the Log Master Repository.
   b. Ongoing job (run periodically)
      This step updates the initial structure definitions with any changes for your old objects in the Old Objects Table. Run this job as part of regular, periodic processing. The ongoing job automatically reads the period since the previous run. The filter must specify the set of old objects. This job reads the DB2 catalog and any log records related to old objects.
      For information about steps to take if you add objects, see “Considerations for the proactive method” on page 263. For an example of how to use an ongoing job, see “Example 2: Updating the Repository on an ongoing basis” on page 276.
   c. Retrieval job (run when you need to retrieve data about old objects)
      This step scans the objects and time frame that you require, running in overtime mode. It retrieves actual database changes related to the set of old objects. If you have performed steps A and B, this step should be the only action that you need to perform to retrieve data related to your old objects.

Considerations for the proactive method

Be aware of the following considerations before using the proactive method:
Consider using Log Master ongoing capabilities for Repository update jobs. For more information about ongoing processing, see “Using Log Master for data migration” on page 211.

When you update the Old Objects Table, Log Master can generate an output DDL file or a Catalog Activity report, but it cannot generate other forms of output in the same log scan, such as other reports or SQL.

If you add objects to the set of old objects, you must perform the following actions:

— Update your filter to add the new objects before the ongoing job processes the log that contains the create action for any new objects.

— If you must update your filter after the ongoing job has processed the log containing any create actions, run another job that:
  — Specifies the updated filter
  — Updates the Repository from the DB2 catalog (similar to the "initial update" job)

Repository update jobs are extremely important if your environment sets the DB2CAT installation option to NEVER. If this option is NEVER, and you do not update the repository, the results of overtime processing can be unreliable.

— In order to keep the Repository current, you must update it from the DB2 catalog after updating the old objects in the catalog.

— Schedule jobs that update the Repository to run:
  — Before any regular production processing
    For example, if you run a set of jobs every week, you should run a job to update the repository before you run the weekly processing jobs.
  — Before any DB2 Load or Reorg actions that update compression dictionaries or that might assign table rows to different record ID (RID) values

The following table summarizes the proactive method, with relevant online interface panels and fields, and batch syntax:
### Table 25: Overtime summary: Proactive method

<table>
<thead>
<tr>
<th>Step</th>
<th>Relevant online interface panels and field values</th>
<th>Relevant batch interface SYSIN syntax</th>
</tr>
</thead>
</table>
| 1. Initial repository update | ■ Work ID Run Time Options panel  
— Execution Mode = O  
■ Time Frame Specification panel  
— Ongoing Process = N  
■ Log Scan Parameters panel  
— Process DB2 Catalog Records = Y  
— Update Old Objects Table = Y  
— Source of Updates  
  DB2 Catalog = Y  
  DB2 Log = N | OPTION  
EXECUTION MODE OVERTIME  
LOGSCAN ...  
REPOS UPDATE  
PRIME FROM DB2CATALOG  
NOSCAN  
DB2CATALOG YES  
FROM ... TO ..  
WHERE filter$^a$ |
| 2. Periodic, ongoing update | ■ Work ID Run Time Options panel  
— Execution Mode = O  
■ Time Frame Specification panel  
— Ongoing Process = N  
■ Log Scan Parameters panel  
— Process DB2 Catalog Records = Y  
— Update Old Objects Table = Y  
— Source of Updates  
  DB2 Catalog = Y  
  DB2 Log = Y | OPTION  
EXECUTION MODE OVERTIME  
LOGSCAN ...  
REPOS UPDATE  
PRIME FROM DB2CATALOG  
DB2CATALOG YES  
FROM ... TO ...  
WHERE filter$^a$  
ONGOING HANDLE handle_ID |
| 3. Data retrieval | ■ Work ID Run Time Options panel  
— Execution Mode = O | OPTION  
EXECUTION MODE OVERTIME  
LOGSCAN ...  
FROM ... TO ...  
WHERE filter$^a$ |

---

$^a$ The filter must specify the set of old objects.
Using the reactive method (with the DB2 log) to obtain old object structure definitions

When using the reactive method using the DB2 log, Log Master must access the DB2 log files that cover the time when your old objects were dropped or re-created.

This method can also cause Log Master to read a large number of log records to locate structure definitions.

To obtain old object data reactively from the DB2 log

1 To retrieve old object data, run a Repository update job using the information in the following table.

   Note
   The table includes relevant online interface panels and fields, and summarized batch syntax. For full syntax, see the chapter about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

<table>
<thead>
<tr>
<th>Relevant online interface panels and field values</th>
<th>Relevant batch interface SYSIN syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work ID Run Time Options</td>
<td>OPTION</td>
</tr>
<tr>
<td>— Execution Mode = O</td>
<td>EXECUTION MODE OVERTIME</td>
</tr>
<tr>
<td>Log Scan Parameters</td>
<td>LOGSCAN ...</td>
</tr>
<tr>
<td>— Process DB2 Catalog Records = Y</td>
<td>REPOS UPDATE</td>
</tr>
<tr>
<td>— Update Old Objects Table = Y</td>
<td>DB2CATALOG YES</td>
</tr>
<tr>
<td>— Source of Updates</td>
<td>FROM ... TO ...</td>
</tr>
<tr>
<td>DB2 Catalog = N</td>
<td>WHERE filter</td>
</tr>
<tr>
<td>DB2 Log = Y</td>
<td></td>
</tr>
</tbody>
</table>

Note: The filter must specify the set of old objects.

The job reads DB2 log files to obtain structure definitions for the set of old objects.

The time frame of this job must include either the create action or the drop action for each old object for which you will retrieve data in Step 2 on page 266. This job must run successfully before you perform Step 2 on page 266 to retrieve data.

2 When you need to retrieve data about old objects, run a retrieval job to scan the objects and time frame that you require, running in overtime mode.

Use the information in the following table.
Obtaining old object structure definitions

Note
The table includes relevant online interface panels and fields, and summarized batch syntax. For full syntax, see the chapter about Log Master for DB2 syntax in the Log Master for DB2 Reference Manual.

<table>
<thead>
<tr>
<th>Relevant online interface panels and field values</th>
<th>Relevant batch interface SYSIN syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Work ID Run Time Options</td>
<td>OPTION</td>
</tr>
<tr>
<td>— Execution Mode = O</td>
<td>EXECUTION MODE OVERTIME</td>
</tr>
<tr>
<td></td>
<td>LOGSCAN ...</td>
</tr>
<tr>
<td></td>
<td>FROM ... TO ...</td>
</tr>
<tr>
<td></td>
<td>WHERE filter</td>
</tr>
<tr>
<td>Note: The filter must specify the set of old objects.</td>
<td></td>
</tr>
</tbody>
</table>

This job retrieves actual database changes related to the set of old objects.

Using the reactive method (with an old objects data set) to obtain old object structure definitions

This method is completely dependent on the accuracy of the structure definitions in the old objects data set, and consequently more prone to errors than other methods. With this method, you have not maintained old object structure definitions in the Repository.

To retrieve data about old objects reactively from an old objects data set

1. Create an old objects data set using your own sources to obtain the structure definitions.

   The time frame defined for each old object in the old objects data set (create/drop RBA/LRSNs) must include the time frame that is specified in the job in Step 2 on page 267. The old objects data set must contain correct structure definitions in the correct format.

   For an example of one way to do this, see “Overtime mode examples” on page 270.

2. After you create an old objects data set, you can run a log scan to retrieve data, using the structure definitions that you have provided.

   Use the information in the following table:
### Log scans for overtime mode

Log Master provides overtime features as part of a log scan.

As you work with overtime log scans:

- **Consider the input source for your log scan**
  
  The input source of your log scan determines whether you must perform a separate step during overtime processing. Some types of overtime processing can require an additional input source.

- **Specify the log scan parameters that are used with the overtime batch processing mode**

#### Log scan input sources

You can use the following input sources for overtime processing:

- **Currently available log files**
  
  You must perform either a separate log scan to obtain the structure definitions for your old objects, or provide structure definitions in an old objects data set. This is the default input source for log scans, and is equivalent to specifying `Subsystem B SDS` on the Log File Selection panel or `INPUT B SDS` in batch syntax.
- Individual DB2 log files
  You must perform either a separate log scan to obtain the structure definitions for your old objects, or provide structure definitions in an old objects data set. To select this input source, specify **Specific DB2 Log Files** on the Log File Selection panel or **INPUT DB2LOG** in batch syntax.

- Logical log files
  You do not need to perform a separate step to obtain structure definitions or provide an old objects data set. If a logical log file conforms to the published format, it includes structure definitions for all DB2 objects contained in the file. To select this input source, specify **Specific Logical Log Files** on the Log File Selection panel or **INPUT LLOG** in batch syntax. If you specify more than one logical log file as input (directly or by specifying a GDG base), Log Master automatically runs in overtime mode.

- Input image copies
  Specify image copy data sets as an input source when the old objects reside in a compressed table space, or to enable row completion processing in overtime mode. Log Master uses the image copy to obtain a compression dictionary or complete log records.
  To specify this input source, use the **Specify Image Copies** field on the Work ID Run Time Options panel or the **IMAGECOPY** statement in batch syntax. For more information about specifying input image copies, see the chapter about Log Master for DB2 syntax in the *Log Master for DB2 Reference Manual*.

**Log scan parameters**

You specify the log scan options related to overtime processing on the Log Scan Parameters panel.

For descriptions of the options on the panel (**Figure 101 on page 269**), press **F1** to access the online Help.

**Figure 101: Log Scan Parameters panel**

<table>
<thead>
<tr>
<th>Log Scan Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process DB2 Catalog Records . . . N (Y=Yes, N=No)</td>
</tr>
<tr>
<td>Specify REDO Recovery Point . . . (E=Edit, D=Delete)</td>
</tr>
<tr>
<td>Old Objects Dataset ............. (E=Edit, D=Delete)</td>
</tr>
<tr>
<td>Sort Option .................... (E=Edit)</td>
</tr>
<tr>
<td>Update Old Objects Table Parameters</td>
</tr>
<tr>
<td>Update Old Objects Table ...... N (Y=Yes, N=No)</td>
</tr>
</tbody>
</table>

Log scans for overtime mode
Overtime mode examples

The examples in this section illustrate how you can use Log Master in overtime mode to process log records related to old objects, and obtain structure definitions of old objects from sources other than the DB2 catalog.

Before using the procedures in this section:

- Ensure that you understand the concepts and considerations in “Obtaining old object structure definitions” on page 261
- Review the following material:
  - “Getting started with Log Master” on page 43
  - “Defining a log scan” on page 69

Example 1: Creating an old objects data set to read old log records

For this example, assume that your company’s auditor has requested an audit of changes that were made to employee data before the implementation of a new database design.

The auditor has specifically requested to review all changes made on January 18, 2013 by employee number 71001, who was terminated on January 18. The employee had access to table ACMEHR.EMPINFO in table space ACMEHR.T$EMPINF.

Your environment has dropped and re-created this table space several times since that date. You have always defined it with DATA CAPTURE CHANGES (DCC). However, you do not know exactly when this particular version of the table was dropped.

To use Log Master to report on the changes for that day, you must make Log Master aware of the previous definition of the table. You can do this by creating an old objects data set that contains the following kinds of information:

- Internal identifiers of the table (DBID, PSID, OBID values)
Finding object IDs

You have an image copy data set that was created two days before the date of interest. A backup partitioned data set (PDS) contains the old table definition.

Use the image copy to find the old object IDs (DBID, PSID, and OBID) for this table space and table. You can use the IBM utility DSN1PRNT to print this information from the image copy data set, as shown in the following figure:

**Figure 102: Example JCL: DSN1PRNT utility**

```
// CLASS=Q,MSGCLASS=X,MSGLEVEL=(1,1)
//*
//JS0010 EXEC PGM=DSN1PRNT,
// PARM='PRINT(0,2),FORMAT'
//STEPLIB   DD DSN=DB2.DSNLOAD,DISP=SHR
//SYSPRINT  DD SYSOUT=* 
//SYSUT1    DD DSN=RDAMSM.ICDBAN.ACMEHR.T$EMPINF.G0005V00,
// Disp=(SHR,KEEP,KEEP)
```

The output from DSN1PRNT will look similar to the following figure:

**Figure 103: Example DSN1PRINT output**

```
DSN20001 START OF DSN1PRNT FOR JOB ACMEHRPR JS0020
DSN20001 INPUT DSNAME = RDAMSM.ICDBAN.ACMEHR.T$EMPINF.G0005V00 , SEQ
HEADER PAGE:  PGCOMB='10'X  PGLOGRBA='000000000000'X  PGLOGID='FF'X  PNUMBER='000000'X
  PGFLAGS='18'X
  PGOBID='02900002'X  HPGPREF='00000001'X  HPGREL='C6'X
  HPGTBLC='0001'X  HPGROID='0003'
  HPGSSNM='SYSDEFLT'  HPGVCATN='DBANCAT'
  HPGDRBA='0019456752F6'X
  FOEND='N'
SPACE MAP PAGE:  PGCOMB='10'X  PAGIDFREE='000000000000'X  PAGID='01'X
  PAGFREE='2160'X  PAGFREE='0870'X  PAGFREEP='1876'X  PAGFREEP='0754'X
  PAGHOLE1='0000'X  PAGMAXID='1D'X
  PAGTAIL:  PAGIDFREE='00'X  PAGIDFREE='0870'X
ID-MAP FOLLOWS:
  01 0014 0054 0094 00D4 0114 0154 0194 01D4
  09 0214 0254 0294 02D4 0314 0354 0394 03D4
  11 0414 0454 0494 04D4 0514 0554 0594 05D4
  19 0614 0654 0694 06D4 0714
```

Overtime mode examples
Examine the output of DSN1PRNT to find the object IDs that you need. Search for the following fields:

- **HPGOBID**
  
  — The DBID of the database is represented as a hexadecimal value in the first two bytes of this field (0290 in the DSN1PRINT output figure).

  — The PSID of the table space is represented as a hexadecimal value in the last two bytes of the field (0002 in the DSN1PRINT output figure).

- **PGSOBD**
  
  Locate this field in the header information for each row. The OBID of the table containing that row is represented as a hexadecimal value (0003 in the DSN1PRINT output figure).

The values in this report are represented as hexadecimal values. At the point when you enter the values for Log Master, you must denote them as hexadecimal (x’0003’) or convert them to decimal values.

### Indicating the time frame with RBAs or LRSNs

To read old log records relating to an old table, indicate the range of log when the old definition of the table was in effect (using RBA/LRSNs).

The beginning of this range does not have to be the actual RBA/LRSN when the old table was created, but it must be far enough back in time to include your time frame (the log records that you intend to process). For this example, you decide to use HPGRBRBA from the image copy data set as the CREATE RBA.

The end of the range (called the DROP RBA) does not have to be the actual RBA/LRSN when the old table was dropped, but it must be far enough forward in time to include your time frame (the log records that you intend to process). To find a value to use for the DROP RBA, run the Print Log Map utility (Figure 104 on page 272) and find the ending RBA of the last log data set created on the day of interest.

**Figure 104: Example JCL: Print Log Map utility**

```
//ACMEHRPL JOB (PALP),'ACME PRT LOG',NOTIFY=&SYSUID,CLASS=Q,MSGCLASS=X
//*====================================================================
//PRTLOG  EXEC PGM=DSNJU004
//STEPLIB   DD DSN=DB2.DSNLOAD,DISP=SHR
//SYSUT1    DD DSN=DBANCAT.BSDS01,
//             DISP=(SHR,KEEP,KEEP)
//SYSPRINT DD  SYSOUT=*  
```
The output from the Print Log Map utility includes the entry shown in Figure 105 on page 273, which represents the last log created on June 3.

**Figure 105: Example output: Print Log Map utility**

<table>
<thead>
<tr>
<th>DSN=DEDLCAT.ARCHLOG1.A0041312</th>
<th>2010.315 17:00:15.3 2010.315 17:13:41.6</th>
<th>PASSWORD=(NULL) VOL=126575 UNIT=CARTVTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>00194299F00</td>
<td>00194575AFFF</td>
<td>CATALOGUED</td>
</tr>
<tr>
<td>2010.315 17:14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Building the old objects data set

Now you are ready to begin building an old objects data set to be used as input to Log Master.

#### To build an old objects data set

1. Enter the information about OBIDs and CREATE and DROP RBAs that you have found:

   ```plaintext
   DBID X'0290' PSID X'0002' OBID X'0003'
   CREATE RBA X'0019456752F6'
   DROP RBA   X'00194575AFFF'
   ``

2. Append the old CREATE TABLE statement that you obtained from the backup PDS:

   ```plaintext
   CREATE TABLE ACMEHR.EMPINFO(
     EMPNO     INTEGER  NOT NULL WITH DEFAULT,
     FNAME     CHAR(15),
     MI        CHAR(1),
     LNAME     CHAR(20),
     SSN       CHAR(9),
     MSALARY   DECIMAL(6,2),
     PRIMARY KEY(EMPNO DESC),
     UNIQUE (EMPNO DESC)
   )
   IN ACMEHR.T$EMPINF DATA CAPTURE CHANGES;
   ``

You have completed your old objects data set for this table. For more information about this data set, see the chapter about Log Master for DB2 syntax in the *Log Master for DB2 Reference Manual*.

3. You can use the Log Master online interface to generate JCL to process the log records (for an example, see “Example 3: Reporting on log records for dropped objects” on page 278), or code your own Log Master SYSIN statements as follows:

   ```plaintext
   OPTION
     FILTERREL AND
     EXECUTION MODE OVERTIME
   OLD OBJECTS BMCALP.AUDIT.SETUP(ACMEHR)
   WORKID RDAMSM.ACMEHR
   ```
Figure 106 on page 274 shows a sample Audit report that lists the changes made by employee number 71001 (as requested in this example).

**Figure 106: Sample output for Example 1**

Use the following procedure to scan the log with the old objects data set that you created.

**To report on log records using an old objects data set**

1. To refine log record selection, define an independent filter using the filter criteria shown in Figure 107 on page 275.
For instructions, see “Adding a filter association to a log scan step” on page 103.

Figure 107: Filter for an old objects data set

<table>
<thead>
<tr>
<th>FILTERS</th>
<th>Structured Filter Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command</td>
<td>____________________________</td>
</tr>
<tr>
<td>SSID</td>
<td>DBAN</td>
</tr>
<tr>
<td>Filter Name</td>
<td>BMC.EMPNO</td>
</tr>
<tr>
<td>Description</td>
<td>Updated Version: V11.01.00</td>
</tr>
</tbody>
</table>

Type one or more action codes. Then press Enter.

C=Catalog Search  I=Insert  D=Delete  E=Edit  O=Logical OR

ACT SELECTABLE FIELD OPERATOR VALUE
_ EMPNO = 71001

********************************* End Of List *********************************

2 Create a work ID and add a log scan step as shown in Figure 108 on page 275.

For instructions, see “Creating and accessing a work ID” on page 54 and “Adding a log scan step to a work ID” on page 57.

Figure 108: Log scan for Example 1

<table>
<thead>
<tr>
<th>WORKID</th>
<th>Work ID Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command</td>
<td>____________________</td>
</tr>
<tr>
<td>SSID</td>
<td>DBAN</td>
</tr>
<tr>
<td>Work ID</td>
<td>NCH.$$WORKID0001</td>
</tr>
<tr>
<td>Description</td>
<td>NCH 2013-01-18 22.45.00</td>
</tr>
<tr>
<td>Updated Version</td>
<td>V11.01.00</td>
</tr>
</tbody>
</table>

Work ID Batch Options . . _ (E=Edit)

Type an action code. Then press Enter.

I=Insert  D=Delete  E=Edit

ACT STEP TYPE DESCRIPTION
_ Log Scan Inputs : DB2 Subsystem BSDS
From : 2013-01-18 00.00.00.000000
To : 2013-01-18 21.31.10.000000
Filter(s) : BMC.EMPNO
Output(s) : AUDIT
Log Mark : None
Repos Upd : None

3 To include the old objects data set in the log scan step, complete the following series of panels:

a On the Work ID Maintenance panel, type E in the ACT column and press Enter.

b On the Log Scan Options panel, select Define Log Scan Parameters and press Enter.

For an example of the panel, see “Adding a log scan step to a work ID” on page 57.

c On the Log Scan Parameters panel, type E in the Old Object Data Set field and press Enter.

For an example of the panel, see “Log scan parameters” on page 269.
On the Old Objects Dataset Name Entry panel, select **Specify an Old Objects Dataset** and type the name of the data set that you created earlier in this example. Press **Enter**.

For an example of the panel, see **Figure 109 on page 276**.

**Figure 109: Old Objects Dataset Name Entry panel**

<table>
<thead>
<tr>
<th>Current Old Objects Dataset</th>
<th>Proposed Old Objects Dataset</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 1. Search for an Old Objects Dataset 2. Specify an Old Objects Dataset</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Press **F3** until you return to the Work ID Maintenance panel.

On the Work ID Maintenance panel, type **E** in the **Work ID Batch Options** field and press **Enter**.

On the Work ID Run Time Options panel, type **O** (Overtime) in the **Execution Mode** field. Press **F3** until you return to the Work ID File Menu.

For instructions and an example of the panel, see “Editing work ID run time options” on page 56.

On the Work ID File Menu panel, select **Save As**, and then select **Generate JCL** for batch submittal.

For an example of the panel, see “Creating a batch job from a work ID” on page 67.

**Example 2: Updating the Repository on an ongoing basis**

For this example, assume that you have a test environment in which you plan to drop and re-create a table on an ongoing basis. You populate this table with data each time that you re-create the table for performance testing.

Occasionally, you might need to re-create a previous version of the table to allow you to run reports, or create SQL. To do this, use Log Master to create an ongoing log scan that will update the Repository every time the table’s definition changes.
Log Master makes an entry into the Repository for each version of the table definition.

The information stored in the Repository enables Log Master to scan the log for records associated with a particular version of the table definition. To run this job, use the overtime execution mode.

Use the following procedure to perform these tasks.

**To update the Repository on an ongoing basis**

1. Create a work ID and add a log scan step as shown in “To report on log records using an old objects data set” on page 274.

   For instructions, see “Creating and managing work IDs” on page 53 and “Adding a log scan step to a work ID” on page 57.

2. Define the log scan filter, time frame, and make it an ongoing process using the values shown in Figure 110 on page 277.

   **Figure 110: Work ID Maintenance panel**

   ![Work ID Maintenance panel]

   For instructions, see “Defining a log scan step” on page 99.

3. Specify the log scan parameters to update the Old Objects Table using the DB2 log as a source, as shown in Figure 111 on page 277, and then press F3 until you return to the Work ID Maintenance panel.

   **Figure 111: Log Scan Parameters panel**

   ![Log Scan Parameters panel]
4 On the Work ID Maintenance panel, type E in the Work ID Batch Options field and press Enter.

5 On the Work ID Run Time Options panel, type O (Overtime) in the Execution Mode field and press F3 until you return to the Work ID File Menu.

6 Save the work ID and generate JCL for batch submittal.

For instructions, see “Creating a batch job from a work ID” on page 67.

**Example 3: Reporting on log records for dropped objects**

For this example, assume that the auditor for your company wants to examine the updates to a table that you dropped two weeks ago. You do not want to recover the table, so you use Log Master to retrieve the old table structure definition.

Because you know the time frame when the table was dropped, you decide to use Log Master to scan the log and update the Repository’s Old Objects Table with the old table structure definition.

**To create a filter and report for old objects that are no longer in the DB2 catalog**

1 Create a filter that controls selection of the object structure definition.

   For this example, the filter must select the old version of the ACCOUNT table, and name the filter BMC.OLDTABLE. For instructions, see “Adding a filter association to a log scan step” on page 103.

2 Create a new work ID.

   For instructions, see “Creating and accessing a work ID” on page 54.

3 Specify a log scan step for the work ID with the following specifications:
a Associate the filter that you created with the work ID.

For instructions, see “Adding a filter association to a log scan step” on page 103.

For an example of the Maintain Filter Associations panel for this example, see Figure 112 on page 279.

**Figure 112: Maintain Filter Associations panel**

```
Command ==> ________________________________________________ Scroll ==> HALF
SSID : DB2R
Work ID . . : NCH.$$WORKID0001
Description : NCH 2009-11-18 14.06.16
Maintain the Current Selected Filters list OR
Add to the list by typing a Filter Name (may be
wildcarded). Then press Enter.
Filter Name . . . ___________________________
Filters Like : BMC.*
Current Selected Filters
D=Delete from Selected List  I=Information  B=Browse
ACT FILTER NAME                  DESCRIPTION
_    BMC.OLDTABLE                 SELECT THE OLD ACCOUNTING TABLE
****************************** End Of List *******************************
```

b Define the time frame start and end points for the log scan step by date.

For this example, you know that the old table was dropped on September 16, between 9:00 and 10:00 in the morning. For instructions, see “Defining a time frame” on page 109.

c Specify an Audit report and a Detail report as output, using the standard default versions of the reports.

For instructions, see “Reports from the log scan” on page 85.

4 Press **F3** until you return to the Work ID Maintenance panel.

5 In the **Work ID Batch Options** field, type **E** and press **Enter**.

6 On the Work ID Run Time Options panel, type **O** (Overtime) in the **Execution Mode** field, and then press **F3** until you return to the Work ID File Menu.

7 Save the work ID and generate JCL for batch submittal.

For instructions, see “Creating a batch job from a work ID” on page 67.
Overtime mode examples
Log Master *for DB2* expert information

This chapter includes information on row completion processing, getting SYSOBD information, working with changes resulting from referential integrity, working with large volume columns, and working with Log Master and memory.

### Row completion processing and your jobs

The following table summarizes key concepts of row completion processing and the impact it can have on your jobs.

**Table 26: Summary of row completion processing**

<table>
<thead>
<tr>
<th>Category</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Key concepts</strong></td>
<td>▪ DB2 log records for insert and delete actions contain a complete image of the table row. DB2 log records for update actions might not contain a complete image. Unless the table is defined with Data Capture Changes (DCC), the update log records might contain only part of the table row (enough to include all of the changed data).</td>
</tr>
<tr>
<td></td>
<td>▪ Log Master needs complete row images to produce complete output. If a table is not defined with DCC, the product must perform row completion processing to obtain the complete image of each update action.</td>
</tr>
<tr>
<td></td>
<td>▪ Log Master uses the following sources to complete log records:</td>
</tr>
<tr>
<td></td>
<td>— The current table space</td>
</tr>
<tr>
<td></td>
<td>— Image copies</td>
</tr>
<tr>
<td></td>
<td>— Other DB2 log records (for example, insert or delete actions of the same table row)</td>
</tr>
<tr>
<td></td>
<td>▪ Log Master uses record IDs (RIDs) to perform row completion processing.</td>
</tr>
</tbody>
</table>
### Definition of row completion processing

Row completion processing is the work that Log Master performs to obtain a complete image of the table row involved in an update action.

For an insert or delete action, the DB2 log record contains a complete row image so no row completion processing is required. For an update action, the DB2 log record contains a completerow image if the table is defined with DCC. If the table is not defined with DCC, the log record might not contain a complete row image. Log Master must then examine sources beyond the log records selected by your log scan to construct a complete image of the row at the time of the update.

### Row completion example

The following example deals with one row in a table that is not defined with DCC.
The original time frame of the log scan includes Update 1, but does not include the insert action for the row. When Log Master reads the log files covering the original range, it captures the log record of Update 1.

The log record of Update 1 does not contain a complete row image. To obtain a complete row image, Log Master can:

— Read the current table space to obtain the current image of the row
— Read the DB2 log covering the period between the end point of the time frame and the current version of the table space
  This action is called extend processing and it enables the product to capture the log record of Update 2. Log Master actually reads log files only up to the point of the most recent updates to any table space pages that contain the rows that Log Master must complete.
— Start with the table space image, and then use the information in the captured log record to roll back Update 2
  Log Master can now create a complete image of the table row both before and after Update 1.

This example shows only one of several types of row completion processing. Log Master can use other sources, such as image copies, to complete row images. For more information, see “Sources for row completion processing” on page 284.

You can influence which source Log Master uses for row completion by using product options. For more information, see “Influencing row completion processing” on page 287.

### Considerations for row completion processing

The following considerations apply to row completion processing:
**Columns and changed data**

Without DCC, the log record of an update action can contain only the part of the table row that includes changed data.

This changed data starts with the first changed byte, and ends with either the last changed byte or the last byte in the row. The changed data does not correspond to the columns in the row; it can start in the middle of one column or end in the middle of another.

**Actions that cause row completion processing**

Log Master performs row completion processing when it takes any of the following actions on the log records of DB2 objects that were not defined with the DCC attribute:

- Selecting any log records based on column value
- Generating SQL output files
- Generating load output files
- Generating logical log output files
- Generating Audit, Backout Integrity, Catalog Activity, Detail, or Drop Recovery reports

Other actions (other types of reports) do not require row completion processing.

**Sources for row completion processing**

The following table describes the sources that Log Master can use to complete log records:

<table>
<thead>
<tr>
<th>Source</th>
<th>To use this source, Log Master</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current table space</td>
<td>■ Locates the corresponding table rows in the current table spaces</td>
</tr>
<tr>
<td></td>
<td>■ Reads any intervening log files</td>
</tr>
<tr>
<td></td>
<td>■ Reverses or &quot;rolls back&quot; all of the changes between the current table spaces and the</td>
</tr>
<tr>
<td></td>
<td>incomplete log records</td>
</tr>
<tr>
<td>Image copies</td>
<td>■ Locates the closest image copies (or other SYSCOPY events, such as LOAD LOG YES actions)</td>
</tr>
<tr>
<td></td>
<td>■ Reads the corresponding table rows from the image copies</td>
</tr>
<tr>
<td></td>
<td>■ Reads any intervening log files</td>
</tr>
<tr>
<td></td>
<td>■ Either applies or reverses all of the changes between the image copies and the incomplete log records</td>
</tr>
</tbody>
</table>
To use this source, Log Master

<table>
<thead>
<tr>
<th>Source</th>
<th>To use this source, Log Master</th>
</tr>
</thead>
</table>
| DB2 log records| - Scans the log records within your time frame to locate log records of insert or delete actions on the corresponding table rows  
                 - Either applies or reverses all of the changes between the insert or delete actions and the incomplete log records  
                 
                 **Note:** This method of row completion is successful only when the entire row is logged within the time frame of your log scan. |

### Image copies and row completion processing

Log Master frequently uses image copies for row completion processing, and to obtain compression dictionaries.

Log Master uses image copies as follows:

- When Log Master requires image copies, it attempts to read the different types of image copies in the following order: local primary (LP), local backup (LB), remote primary (RP), remote backup (RB).

- Consider running regular jobs to update the Repository with copies of compression dictionaries. This action does not reduce row completion processing, but it can improve performance by enabling Log Master to avoid mounting image copies to retrieve dictionaries to process log records of compressed table spaces.

- Log Master can read Instant Snapshot image copies created on intelligent hardware storage devices by BMC Next Generation Technology Copy *for DB2 for z/OS* with SNAPSHOT UPGRADE FEATURE (SUF).

- Log Master can read encrypted image copies created by NGT Copy if the name of the key data set is provided by using the KEYDSNAM installation option.

- Log Master can read cabinet copies created by NGT Copy. Cabinet copies contain a group of table spaces and indexes within a single cabinet file to provide performance improvements when managing large numbers of small table spaces.

- To read Instant Snapshot, encrypted, or cabinet image copies, both Log Master and NGT Copy must use the same instance of the BMC Software table BMC_BMCXCOPY.

- Log Master cannot read Data Facility Storage Management System (DFSMS) concurrent image copies, regardless of how they were created (by using the CONCURRENT keyword of a DB2 Copy utility or by using DFSMS outside of DB2). If the only available source for row completion processing or a dictionary is a concurrent image copy, Log Master can encounter errors or terminate abnormally.
Extend and rescan

Several types of row completion processing require Log Master to read additional DB2 log records outside of your time frame.

Figure 114 on page 286 shows the basic ways that Log Master reads these additional log records: rescan processing or extend processing.

With rescan processing, Log Master either reads log records that are older than the start point of your time frame, or re-reads log records within the original time frame. For example, Log Master can read the log records between an available image copy and your start point.

With extend processing, Log Master reads log records that are newer than the end point of your time frame. For example, Log Master can read all log records between your end point and the current time, or only those records between your end point and an available image copy.

Figure 114: Extend / rescan processing

Log Master performs rescan or extend processing to ensure that it can apply or roll back all of the changes to a row that occur between the point of a row completion source (like an image copy or the current table space), and your time frame.

Events that limit row completion processing

DB2 log records contain record ID (RID) values that associate each log record with the corresponding row within a table space. Log Master uses these RIDs during row completion processing.

Many environments regularly run DB2 utility programs to maintain their databases. However, some actions performed by these utility programs cause DB2 to change the location of rows within the table space, and possibly assign the rows to different RID values. The most common of these actions are:

- A database reorganization action (using a DB2 Reorg utility)
- A database load action (using a DB2 Load utility with the REPLACE keyword)
After one of these actions, the rows assigned to RID values in the affected DB2 table spaces might not match the rows assigned to those RID values in previously created log records. If Log Master cannot be certain that the RID values in a given source (image copy, table space, or other log records) match the RID values in the log records that Log Master is examining, Log Master does not use that source for row completion processing.

Figure 115 on page 287 shows an example of a situation in which Log Master attempts to obtain a complete row image of Update 1. Normally, Log Master might select the current table space as its source, because doing so requires that Log Master read only a small amount of log records between the current time and the end point of the time frame.

However, because an action that changes row locations occurs between the source (the current table space) and the log record of Update 1, Log Master cannot be certain that the RID values are the same; therefore, it does not use the table space for row completion. In this case, Log Master instead selects the previous image copy as a source and performs rescan processing.

Figure 115: Row completion example showing action that changes row locations

If it cannot find a source for row completion processing, Log Master cannot complete the required log records, and terminates with an error message. This situation rarely occurs unless multiple actions that change row locations occur without subsequent image copies, or no image copies are available. Standard practices of recoverable DB2 operation normally prevent such situations.

Note
A Point-in-Time (PIT) recovery (performed by a DB2 Recovery utility) can also limit the sources Log Master uses for row completion processing. This situation occurs only if you explicitly direct the product to read log records within PIT ranges (by using the Process Through Point-In-Time Recoveries field of the Work ID Run Time Options panel or the PROCESS PITS keyword of the OPTION statement).

Influencing row completion processing

This section describes the ways in which you can influence how Log Master performs row completion processing.
Adapting row completion processing to your environment

Log Master attempts to perform row completion processing as quickly as possible. To estimate which source results in faster processing, Log Master uses default values.

The values represent the time it takes for such actions as opening a file, or mounting an image copy. You can change these values to adapt Log Master to your environment, but BMC recommends that you do not change the default values unless you have a specific reason; for example, if you know that all image copies in your environment are maintained on DASD instead of magnetic tape media.

To change the default values

1. Take one of the following actions:
   - Edit the SYSIN syntax of your job to use the FILECOST keyword of the OPTION statement.
   - Set the CSTFILE, CSTMOUNT, or CSTSEG installation options.

Restricting sources for row completion processing

You can restrict Log Master so that it uses only one source for row completion processing.

**Best practice**

BMC recommends that you do not restrict Log Master sources unless you have an important reason to do so (for example, if you know that the current table space contains invalid data).

To restrict the sources

1. Take one of the following actions:
   - Edit the SYSIN syntax of your job to use the IMAGESOURCE keyword of the OPTION statement.
   - Set the IMAGESRC installation option.
Reduction of row completion processing

Row completion processing is an intrinsic, critical feature of Log Master that requires additional amounts of time and system resources. This section describes actions you might take to reduce the amount of row completion processing.

Creation of image copies more frequently

During row completion processing, Log Master can use image copies as a source for complete row images.

After it reads an image copy, Log Master reads additional DB2 log files that cover the period of time between the image copy and the original time frame. The more frequently you create image copies, the shorter this period of time is likely to be. Consequently, Log Master reads fewer log files and takes less time to perform row completion processing.

For more information on the types of images copies that the product can use for row completion, see “Image copies and row completion processing” on page 285.

Consider running regular jobs to update the Log Master Repository with copies of compression dictionaries. This action does not reduce row completion processing, but it can improve overall performance by enabling Log Master to avoid mounting image copies to retrieve dictionaries to process log records of compressed table spaces. If you update the Repository regularly, BMC Software recommends that you also run regular jobs to delete old or unusable dictionaries from the Old Objects Table.

Definition of DB2 objects with DCC

When you define DB2 objects with the DCC attribute, DB2 creates update log records that contain a complete image of the table row. When the log records contain a complete image, Log Master does not perform row completion processing.

Using DCC might increase the size of your DB2 log files, depending on your environment. To learn if and how much your log files might increase, use the Log Master Data Capture Changes report. For an example, see “Data Capture Changes report” on page 341.

Maintenance of the SYSLGRNX table

Log Master uses the SYSIBM.SYSLGRNX table in the DB2 directory to determine which log files contain log records that it needs for row completion processing when:

- Log Master runs in a data sharing environment
The value of the CMPLGRNG installation option is YES

A value of YES normally improves Log Master performance. However, the product can experience degraded performance when reading the SYSIBM.SYSLGRNX table if that table is not maintained (with a DB2 Modify utility).

Use the elapsed time value provided by message BMC097168 to determine the performance of the product’s SYSLGRNX processing. To improve performance when SYSLGRNX is not well maintained, specify CMPLGRNG as NO.

**Getting SYSOBD information**

Log Master reconstructs log records of interest according to their version when they were logged.

When Log Master encounters a log record that reflects a version of a DB2 object that differs from the version of that object in the catalog, Log Master tries to retrieve the information about the definition of a previous version (SYSOBD information) from available sources.

Log Master first attempts to get SYSOBD information from the database description (DBD) and the table space. A LOAD REPLACE or a reorganization makes every row on the table the current version, making the SYSOBD information no longer necessary for DB2, and therefore, the information is not saved on the table space.

Log Master also processes SYSOBD pages that it finds in the log during the initial scan. After the initial scan, if Log Master still needs SYSOBD information, it attempts to get that information from available image copies. Log Master documents such an attempt by issuing the following message:

**BMC097017I IMAGE COPY ACCESS IS FOR SYSOBD INFORMATION**

If Log Master does not find the information on the available image copies, it then scans the area of the alter in the log for the SYSOBD pages.

**Working with changes resulting from referential integrity**

The following table summarizes key concepts related to referential integrity as it relates to the Log Master product:
Table 28: Summary of referential integrity considerations

<table>
<thead>
<tr>
<th>Category</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key concepts</td>
<td>▪ Any log record that reflects an insert, update, or delete action contains a bit that indicates whether the action occurred as a result of a referential integrity (RI) constraint.</td>
</tr>
<tr>
<td></td>
<td>▪ Log Master interprets the INCLUDE RI setting based only on the value of this RI bit. The product does not trace or discover RI relationships to determine which RI constraint caused the change.</td>
</tr>
<tr>
<td></td>
<td>▪ The INCLUDE RI setting applies only to SQL output. Other types of output contain all selected log records (as if INCLUDE RI was set to YES).</td>
</tr>
<tr>
<td></td>
<td>▪ When you generate UNDO SQL, the INCLUDE RI setting ensures that Log Master generates SQL statements in an order that accommodates RI constraints.</td>
</tr>
<tr>
<td>Impact</td>
<td>▪ To capture a set of changes to one table, and all of the resulting RI changes in other tables, you must define your filter carefully. For more information, see “INCLUDE RI example” on page 292.</td>
</tr>
<tr>
<td></td>
<td>▪ Set the INCLUDE RI value depending on how you intend to use with the selected changes. Adjust the setting depending on whether you are migrating data, backing out problem transactions, or performing other tasks. For more information, see “INCLUDE RI recommendations” on page 293.</td>
</tr>
</tbody>
</table>

What INCLUDE RI means within Log Master

Based on referential integrity (RI) constraints, changes in one column of a given table might cause DB2 to make changes in another column of a different table.

Usually these changes involve cascading delete actions, or setting the value of columns to null. When DB2 makes a change in a dependent table as a result of an RI constraint, it sets a bit in the log record of the dependent table’s change.

Log Master selects log records based on the filter that you define. When you generate SQL statements based on your selected log records, you direct Log Master to either generate or not generate SQL statements based on the RI-related bit within them. The action is determined by the value of the Include RI Recs field on the SQL Output panel, or the corresponding INCLUDE RI keyword of the LOGSCAN statement.
The RI-related bit is the only criteria that Log Master uses to honor your INCLUDE RI setting. Log Master looks at the value of the INCLUDE RI setting, looks at whether the log record resulted from any RI constraint, and either generates or does not generate an SQL statement for that log record. The INCLUDE RI setting defines an extra boolean test that the product performs only on SQL output files.

**INCLUDE RI example**

The following figure shows an example of how INCLUDE RI works. In this example, jobs A, B, and C are the only sources of changes to these tables (no other jobs or simultaneous online transactions).

- The primary key in EMPL_TB is a foreign key in PROJECT_TB (EMPL_TB is the parent).
- The primary key in RESOURCE_TB is a foreign key in PROJECT_TB (RESOURCE_TB is the parent).
- The delete rules for both RI constraints are defined as cascade.
- Job A deletes rows in EMPL_TB that cascade to PROJECT_TB.
- Job B deletes rows in RESOURCE_TB that cascade to PROJECT_TB.
- Job C updates PROJECT_TB directly.

**Figure 116: INCLUDE RI example environment**

Table 29 on page 293 shows the log records selected by different filters and different INCLUDE RI settings, based on this example.
### Table 29: INCLUDE RI / filter example results

<table>
<thead>
<tr>
<th>Filter</th>
<th>INCLUDE RI setting</th>
<th>SQL statements that Log Master generates</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE NAME = EMPL_TB</td>
<td>NO</td>
<td>All direct changes to EMPL_TB (Job A)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td>All direct changes to EMPL_TB (Job A)</td>
<td>Only Job A updates EMPL_TB. If any cascading deletes in EMPL_TB that resulted from RI relationships with other tables existed, those deletes would be selected because INCLUDE RI is YES.</td>
</tr>
<tr>
<td></td>
<td>NO</td>
<td>All direct changes to EMPL_TB (Job A)</td>
<td>Because INCLUDE RI is NO, the product selects only direct (non-RI-related) changes to both tables.</td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td>All direct changes to EMPL_TB (Job A)</td>
<td>When INCLUDE RI is YES, the product selects all direct and all RI-related changes to both tables. Log Master cannot distinguish between the cascading deletes from Job A and Job B without further criteria in the filter (see next entries).</td>
</tr>
<tr>
<td>TABLE NAME IN (EMPL_TB, PROJECT_TB) AND CORRID = JOBA</td>
<td>NO</td>
<td>All direct changes to EMPL_TB (Job A)</td>
<td>Job A updates only EMPL_TB. Had Job A updated PROJECT_TB directly, those deletes would be selected because PROJECT_TB is included in the filter.</td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td>All direct changes to EMPL_TB (Job A)</td>
<td>When INCLUDE RI is YES, the product selects all direct and all RI-related changes in both tables, and then selects only the changes made by Job A.</td>
</tr>
</tbody>
</table>

### INCLUDE RI recommendations

This section provides recommendations regarding INCLUDE RI for most situations.

**To back out transactions with UNDO SQL**

1. Include all of the referentially related tables in your filter.

2. Set INCLUDE RI to YES (to capture all of the RI-related changes).
3 Include additional logic in your filter that selects only the changes that you want to back out (often by excluding both the RI-related and nonRI-related changes that you do not want to capture).

To back out transactions with REDO SQL

1 To reapply a set of transactions, while leaving out unwanted transactions (REDO SQL), set INCLUDE RI to NO.

Normally, you reapply the transactions to the original DB2 objects, so the RI constraints cause the same RI-related changes.

To migrate data with MIGRATE SQL

1 Set INCLUDE RI based on how RI constraints are defined in your target environment:

- If the target environment defines the same RI constraints as the source environment, set INCLUDE RI to NO. (The RI constraints in the target environment duplicate the same RI-related changes.)

- If the target environment does not define RI constraints, set INCLUDE RI to YES.

Log Master includes the RI-related changes so that they are migrated to the target environment.

Statement order with INCLUDE RI

When an RI constraint causes a change to a dependent table (for example, a cascading delete action), DB2 logs the delete action in the parent table, and the delete action in the dependent (child) table.

When Log Master generates UNDO SQL, the delete actions become insert actions.

- When INCLUDE RI is YES, Log Master adjusts the order of the SQL statements so that the insert action to the parent table occurs before the insert to the dependent table.

- When INCLUDE RI is NO, Log Master does not capture the insert to the dependent table, nor does it adjust the order of the statements.

RI and the Quiet Point report

As Log Master scans the log to create a Quiet Point report, it selects only the log records defined by your filter. To find quiet ranges for a set of RI-related tables, include all of the tables in your filter.
SQL statements versus report output

The INCLUDE RI setting applies only to generated SQL statements.

If you generate SQL statements and other types of output from the same log scan (and INCLUDE RI is set to NO), the number of changes shown in the reports can be different from the number of SQL statements that Log Master generates.

Working with large volume columns

The following table summarizes key concepts for using Log Master with large volume columns (XML and LOB columns) and the impact on processing.

Table 30: Summary of considerations for large volume columns

<table>
<thead>
<tr>
<th>Category</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key concepts</td>
<td>▪ Large volume columns are DB2 columns that contain large volumes of data, such as XML columns or large object (LOB) columns.</td>
</tr>
<tr>
<td></td>
<td>▪ Use special syntax, or fields in the online interface, to include data from large volume columns in generated output.</td>
</tr>
<tr>
<td></td>
<td>▪ Log Master stores large volume column data in temporary VSAM files during processing.</td>
</tr>
<tr>
<td></td>
<td>▪ For output load files, you can store large volume column data in</td>
</tr>
<tr>
<td></td>
<td>— The load data file if the load data record, including the data, fits within the maximum record length supported by DB2</td>
</tr>
<tr>
<td></td>
<td>— External files that use the same format that the IBM Load utility uses</td>
</tr>
<tr>
<td></td>
<td>▪ Log Master uses different methods to include large volume column data in different forms of output. For more information, see “Large volume column data in Log Master output files” on page 299.</td>
</tr>
<tr>
<td></td>
<td>▪ For LOB columns, the log records of delete actions on LOB objects do not contain LOB column data. The log records of updates to LOB objects do not contain the &quot;before&quot; image of LOB column data.</td>
</tr>
<tr>
<td>Category</td>
<td>Information</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Impact</td>
<td>■ Log Master processes XML columns and LOB columns similarly, with a few limitations for LOB columns.</td>
</tr>
<tr>
<td></td>
<td>■ To process large volume column data in VSAM files, Log Master performs additional disk I/O that can slow the product’s performance.</td>
</tr>
<tr>
<td></td>
<td>■ For a job or job step that includes large volume column data, ensure that the disk space available is sufficient to store all data in the job’s selected log records.</td>
</tr>
<tr>
<td></td>
<td>■ For a job or job step that includes large volume column data, allocate enough memory so that Log Master can perform normal processing and store one row’s worth of data for the largest XML or LOB column in the job’s selected log records.</td>
</tr>
<tr>
<td></td>
<td>■ You can migrate data efficiently for tables with large volume columns by generating logical log output and then using the High-speed Apply Engine to apply the data to the target subsystem.</td>
</tr>
<tr>
<td></td>
<td>■ For LOB columns, if you process a logical log file that contains changes to a LOB column, Log Master can generate output to “undo” a delete action on the column and can generate output to undo an update action (depending on the presence of image copies or other log records that affect the LOB column).</td>
</tr>
</tbody>
</table>

### Specifying large volume column processing

Use the following information to include large volume columns in Log Master output. You can use either fields in the online interface or keywords in SYSIN syntax.

- Specify the values shown in “Specifying XML columns” on page 296 to include XML data.
- Specify the values shown in “Specifying LOB columns” on page 297 to include LOB data.

### Specifying XML columns

To process XML column data, specify only the tables that contain the XML columns in your filter, not the XML tables or table spaces. (Log Master automatically locates and obtains data from the XML objects.)
To specify XML columns

1 Define XML processing values.

The online interface fields are as follows:

- Run Time Options panel: XML Option field
- Work ID Run Time Options panel: XML Option field
- XML Options panel

The SYSIN syntax keyword is the XMLOPTS statement.

2 Include XML data in output files.

The online interface field is the Include XML field on the following panels. XML column data is not included in reports or in output DDL files.

- SQL Output panel
- Logical Log Output panel
- Load Output panel

The SYSIN syntax keyword is the INCLUDE XML keyword.

3 (optional) Define external files for XML data with output load files.

The online interface fields are as follows:

- Load Output panel: Include XML field
- External XML Column Definition List panel
- Auxiliary XML Column Name panel

The SYSIN syntax keyword is the TEMPLATE keyword of the load file definition.

Specifying LOB columns

To process LOB column data, specify only the base objects in your filter, not the auxiliary tables.

Log Master automatically locates and obtains data from the LOB objects.

To specify LOB columns

1 Define LOB processing values.

The online interface fields are as follows:
- Run Time Options panel: **LOB Option** field
- Work ID Run Time Options panel: **LOB Option** field
- LOB Options panel

The SYSIN syntax keyword is the LOBOPTS statement.

2. Include LOB data in output files.

The online interface field is the **Include LOBS** field on the following panels. LOB column data is not included in reports or in output DDL files.

- SQL Output panel
- Logical Log Output panel
- Load Output panel

The SYSIN syntax keyword is the INCLUDE LOBS keyword.

3. *(optional)* Define external files for LOB data with output load files.

The online interface fields are as follows:

- Load Output panel: **Include LOBS** field
- External LOB Column Definition List panel
- Auxiliary LOB Column Name panel

The SYSIN syntax keyword is the TEMPLATE keyword of the load file definition.

---

**Processing of large volume column data**

To process data from DB2 columns that contain large volumes of data, Log Master performs the following tasks:

- Allocates temporary VSAM files to store the large volume column data during processing
- Allocates a VSAM file for each large volume column (or each partition of a large volume column) that occurs in the set of selected log records
- Allocates additional VSAM files only when it fills the initial data set and all possible extents, but more data remains to be written
- Includes column data in the generated output as summarized in “Large volume column data in Log Master output files” on page 299
- **(optional)** Allocates external files to hold column data for output load files
  The column data can also be included within the load data file, depending on the size of the data.

- Deletes the VSAM files at the end of processing, unless:
  - The log scan specifies an output logical log file
  - An error occurs during allocation of a large volume column VSAM file, and the value of either the online interface field, batch syntax keyword, or installation option that defines duplicate data set handling is YES

To process data from large volume columns, your job or job step must have enough available memory to perform all normal processing, and to contain one row’s worth of column data for the largest XML or LOB column in your selected log records. As it processes the large volume VSAM files, Log Master performs additional disk I/O that can slow the product’s performance.

Before including data from large volume columns in your output, be aware of how much data your job or job step will encounter. Ensure that the job has enough disk space available to store all large volume data in your selected log records. To avoid allocating too much disk space at run time, adjust the maximum limit on the number of VSAM files for each large volume column, or partition of a large volume column, by changing the appropriate online interface field, batch syntax keyword, or installation option.

### Large volume column data in Log Master output files

The following table lists the types of Log Master output files, and summarizes how Log Master includes data from large volume columns in each.

<table>
<thead>
<tr>
<th>Output file</th>
<th>Form of large volume column data in output file</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL output file</td>
<td>Includes large volume column data as part of the generated SQL statements</td>
</tr>
<tr>
<td></td>
<td>For LOB columns, Log Master uses hexadecimal format to include the data; for example, X'4CA794936E'.</td>
</tr>
<tr>
<td>Logical log output file</td>
<td>Includes column data in the XML or LOB VSAM files</td>
</tr>
<tr>
<td></td>
<td>For other forms of output, Log Master deletes the VSAM files at the end of processing. For logical log output files, Log Master stores the VSAM files permanently. If you move the logical log files to another subsystem, be sure to move the related VSAM files, and the XMLSTRING data set. (See “Considerations for large volume column data” on page 300.)</td>
</tr>
</tbody>
</table>
### Form of large volume column data in output file

<table>
<thead>
<tr>
<th>Output file</th>
<th>Form of large volume column data in output file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load output file, internal to record</td>
<td>Includes column data as part of the data record in the load data file. The length of the entire load record, including any column data, must be shorter than the maximum load record length defined by the current version of DB2. For LOB columns, Log Master uses hexadecimal format to include the data. For example, <code>X'4CA794936E'</code>.</td>
</tr>
<tr>
<td>Load output file, external files</td>
<td>Includes large volume column data in external files. Log Master defines the external files as partitioned data set extended (PDSE) data sets. Use the online interface or syntax keywords to define one PDSE for each large volume column in your selected log records. Log Master writes one PDSE for each column, and one member in the PDSE for each row’s data in that column. Log Master uses the same format for XML data and LOB data as the IBM Load utility.</td>
</tr>
<tr>
<td>Reports</td>
<td>Large volume column data not included in reports. Reports that include record information, such as Audit or Detail reports, show only the value of the XML indicator or the LOB indicator in the base table.</td>
</tr>
<tr>
<td>DDL output file</td>
<td>Large volume column data not included in DDL files. Log Master generates DDL statements that affect base objects and the related XML or LOB objects, but the statements do not, by definition, include large volume column data.</td>
</tr>
</tbody>
</table>

For recommendations on migrating data that contains large volume columns, see “Considerations for large volume column data” on page 300.

### Considerations for large volume column data

As you work with data from DB2 columns that contain large volumes of data (such as XML columns or LOB columns), be aware of the following considerations:

- Log Master generates one set of VSAM files for each large volume column in selected log records. Log Master allocates multiple VSAM files for a column when either of the following conditions exists:
  
  — The value of the applicable `xxxLIMIT` keyword or installation option is greater than one, and a column’s data is extensive enough to fill up the allocated VSAM file, including all extents to the file that Log Master automatically allocates.

  — The large volume column is part of a table that is stored in a partitioned table space. In this case, there will be one VSAM file for each partition of each large volume column in selected log records.

- For LOB columns, DB2 logs changes to LOB objects differently than other objects. The log records of a delete action that affects a LOB column do not include LOB
column data. Similarly, the log records of an update to a LOB column do not contain a "before image" of the LOB column data.

Despite these differences, Log Master can generate output to undo the effect of a delete action on a LOB column, and can generate output to undo the effect of an update to a LOB column (depending on the presence of image copies or other log records that affect the same row).

These limitations do not apply to XML columns.

■ The table spaces that correspond to a large volume column can be logged, or not logged, at the discretion of database administration personnel. When an XML or a LOB table space is not logged, Log Master cannot generate output for changes to that table space or the corresponding large volume column. Log Master generates output for changes to all other columns, but does not generate changes for either the unlogged large volume column or the corresponding table space.

For LOB columns, the status of logged or not logged can be specified for either a LOB column or for individual partitions of a LOB column.

■ For XML columns, when you migrate data to a different target system by using logical log files, ensure that you take the following actions:

— Specify the XMLSTRING keyword when you generate the logical log file. This keyword defines the logical log XMLSTRING control file where Log Master writes the string IDs and string values that DB2 uses to encode the data in XML columns.

— Transport the XMLSTRING control file, along with the logical log control file and logical log data file, to your target subsystem.

■ If your tables contain large volume columns, you can migrate data efficiently by generating logical log output files and applying the data with the High-speed Apply Engine. By using logical log output instead of SQL statements, the column data remains in the VSAM files until the logical log records are executed by High-speed Apply. This approach avoids the statement length limits of standard dynamic SQL processors (such as SPUFI or DSNTEP2). Consider specifying a value of Yes for the LargeStatementSupport parameter of High-speed Apply.

■ Consider using symbolic substitutions (such as &DATE. and &TIME.) in the prefix string that Log Master uses to generate the names of large volume VSAM files.

This is particularly important when you generate logical log output, or when you schedule repeated runs of the same job or job step. In this situation, if you do not use time-dependent values in your data set names, you can encounter duplicate data set error conditions that can cause your job to terminate.

■ You cannot define large volume VSAM files that are part of a generation data group (GDG). These VSAM files are KSDS VSAM format.
Tables that include XML columns include a DocID column. Tables that include LOB columns include a ROWID column. In some circumstances, generating SQL statements to migrate data from a table that includes an identifier column can require additional action or processing. For more information about special considerations for output files and SQL, see the section about Log Master for DB2 syntax in the *Log Master for DB2 Reference Manual*.

## Working with Log Master and memory

The following table summarizes key concepts for working with Log Master and memory, and the impact on processing.

### Table 32: Summary of considerations for Log Master memory

<table>
<thead>
<tr>
<th>Category</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key concepts</td>
<td>Log Master uses memory to:</td>
</tr>
<tr>
<td></td>
<td>— Process log records (including row completion processing)</td>
</tr>
<tr>
<td></td>
<td>— Process compression dictionaries</td>
</tr>
<tr>
<td></td>
<td>— Generate output files (including sort actions)</td>
</tr>
<tr>
<td></td>
<td>To process log records, Log Master uses the following types of memory:</td>
</tr>
<tr>
<td></td>
<td>— Key stores (temporary working storage areas, backed by DASD data sets as needed)</td>
</tr>
<tr>
<td></td>
<td>— Log record buffer (a separate, dynamic queue of working storage areas, each backed by a DASD data set, as needed)</td>
</tr>
<tr>
<td></td>
<td>Log Master performs less optimally when it cannot store all log record information in memory, and writes information to DASD data sets. This action is called <em>spilling to DASD</em>.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th>To improve performance, allocate enough memory so that Log Master does not spill to DASD.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>If you cannot obtain enough memory in your environment to avoid spilling, consider:</td>
</tr>
<tr>
<td></td>
<td>— Shortening your time frame, and running the job more frequently</td>
</tr>
<tr>
<td></td>
<td>— Changing your filter to select required log records more precisely</td>
</tr>
<tr>
<td></td>
<td>For problems related to key store memory, you can either increase the amount of memory or redistribute the memory between different key stores.</td>
</tr>
</tbody>
</table>
Considerations for Log Master memory use

This topic describes considerations that apply to product memory use and performance.

- As it runs, Log Master uses only the memory that it needs, so the limit parameters for memory use can be set to higher values without wasting memory. The REGION parameter in JCL (in conjunction with the MEMLIMIT parameter in SMS) establishes the maximum limit on the memory that a job can use. For more information, see “Estimating overall memory (REGION)” on page 304.

- Key stores are temporary working storage areas that Log Master backs with DASD data sets, as needed. Log Master uses the log record (LR), forward completion (FC), and backward completion (BC) key stores to process log records that require row completion processing.

- As it scans the log, Log Master stores log record information from a selected unit of recovery in the log record buffer until it encounters the end of the unit of recovery. The log record buffer is a separate, dynamic queue of working storage areas, each backed by a DASD data set, as needed. Log Master uses the log record buffer unless a log record requires row completion processing or is part of a rollback action.

- The most common performance problem related to Log Master and memory occurs when Log Master does not have enough resources to process log record information in memory, and spills to DASD (writes the information to overflow files). This action occurs most frequently for key store memory, but it can also affect the log record buffer.

- To avoid spilling key store memory to DASD, either allocate more memory or redistribute available memory to the key stores that need it most. For more information, see “Increasing key store memory (STOREOPTS MEMORY)” on page 308, or “Redistributing key store memory (MEMPERCENT)” on page 310.

- To avoid spilling the log record buffer to DASD, allocate additional memory. For more information, see “Changing the log record buffer (LOGRECORD BUFSIZE)” on page 314.

Controlling memory with Log Master syntax

The following table lists the actions that you can take to influence how Log Master allocates memory, and the syntax and installation options that you use to accomplish each action.

For more information about the options, see the Log Master for DB2 Reference Manual.
### Table 33: Log Master syntax to influence memory allocation

<table>
<thead>
<tr>
<th>Action</th>
<th>Log Master syntax</th>
<th>Installation option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change total key store memory</td>
<td>STOREOPTS statement, MEMORY keyword</td>
<td>KSMEMORY</td>
</tr>
<tr>
<td>Shift memory between individual key stores</td>
<td>STOREOPTS statement, MEMPCT keyword</td>
<td>xxPCT (ANPCT, BCPCT, FCPCT, LRPCT, or URPCT)</td>
</tr>
<tr>
<td>Change maximum limit on memory for log record buffer</td>
<td>OPTION statement, LOGRECORD BUFSIZE keyword</td>
<td>QBLRBUFF</td>
</tr>
<tr>
<td>Change maximum limit on memory for compression dictionaries</td>
<td>OPTION statement, DICTIONARYSPACE keyword</td>
<td>None</td>
</tr>
<tr>
<td>Change maximum limit on memory for sort actions</td>
<td>SORTOPTS statement, SMCORE keyword</td>
<td>SMCORE</td>
</tr>
<tr>
<td></td>
<td>In most cases, BMC recommends that you avoid using this capability, and instead use the default sort routine values in your environment.</td>
<td></td>
</tr>
</tbody>
</table>
| Change sort memory allocation to match requirements of sort actions | SORTOPTS statement, Sort File Size Parameters
LOGSCAN statement, Sort File Size Parameters | None                |

**Note**
The explanations in this section provide general information about Log Master performance and memory. Depending on your environment, the values that you use will be different than those in this explanation. For more information, or to adapt these procedures to your environment, contact BMC Customer Support.

---

### Estimating overall memory (REGION)

The REGION parameter (in conjunction with the MEMLIMIT parameter in SMS) establishes a maximum limit on the memory that a job can use.

BMC Software recommends that you specify the REGION parameter as 0M for Log Master jobs. This value allocates the maximum amount of memory allowed for a job in your environment. Log Master then uses only the memory that it needs.

However, in some environments, individual users are not permitted to set REGION to 0M, or entering a value of 0M results in an allocation that is too small for practical use. In this situation, you can estimate the value to use for the REGION parameter. For the purposes of this explanation, assume that a set of tables are stored in a compressed table space. A Log Master job...
Scans the log once, reading DB2 log files listed in the bootstrap data set (BSDS)
- Produces a load file for input to an application program
- Generates a summary report used to monitor data volume

To estimate a value for the REGION parameter, estimate maximum limits for each portion of memory that Log Master uses, and add the estimates. For convenience, convert all estimate values to kilobytes (K). Log Master allocates the following portions of memory:

- Key stores ("To obtain the key store value" on page 305)
- Log record buffer key stores ("To obtain the log record buffer maximum limit value" on page 305)
- Compression dictionary storage key stores ("To obtain the compression dictionary storage maximum limit value" on page 306)
- I/O buffers for different types of input and output key stores ("To obtain the I/O buffer value" on page 306)
- Sort actions for different types of output key stores ("To obtain the sort actions maximum limit value" on page 307)
- Basic memory required to run Log Master ("To estimate the optimal amount of key store memory" on page 308)

**To obtain the key store value**

1. Determine the value of the KSMEMORY installation option by examining the output messages of an existing Log Master job.

   The following is a sample BMC097799 message showing the KSMEMORY value:
   
   ```
   BMC097799I KSMEMORY = (40960K,10240K)  (IN MEMORY KEYED STORAGE SIZE)
   ```

2. Examine the SYSIN syntax of the job, checking for the MEMORY keyword on the STOREOPTS statement, as in the following sample:

   ```
   STOREOPTS MEMORY (80M, 10M)
   ```

3. If the syntax includes the STOREOPTS MEMORY keyword, use that value. Otherwise, use the value of the KSMEMORY installation option.

**To obtain the log record buffer maximum limit value**

1. Determine the value of the QBLRBUF installation option by examining the output messages of an existing Log Master job.
The following is a sample BMC097799 message showing the QBLRBUF value:

```
BMC0977991 QBLRBUF = (49152K)              (QUEUE BUFFER LOGREC SIZE)
```

2 Examine the SYSIN syntax of the job, checking for the LOGRECORD BUFSIZE keyword on the OPTION statement, as in the following sample:

```
OPTION
  FILTERREL AND EXECUTION MODE CURRENT
  LOGRECORD BUFSIZE 64M
```

3 If the syntax includes the OPTION LOGRECORD BUFSIZE keyword, use that value. Otherwise, use the value of the QBLRBUF installation option.

**To obtain the compression dictionary storage maximum limit value**

1 Examine the SYSIN syntax of the job, checking for the DICTIONARYSPACE keyword on the OPTION statement, as in the following sample:

```
OPTION
  FILTERREL AND EXECUTION MODE CURRENT
  DICTIONARYSPACE 8M
```

2 If the syntax includes a DICTIONARYSPACE value, delete it to allow Log Master to allocate the maximum amount of memory needed to load the compression dictionaries required for log processing.

**To obtain the I/O buffer value**

1 Determine the number of data sharing members in your environment.

   If you do not know this value, consult your DB2 systems personnel.

2 Examine the SYSIN syntax of an existing Log Master job, checking for the LOGTAPES keyword of the LOGOPTS statement, as in the following sample:

```
LOGOPTS LOGSORT WHENEVER LOGTAPES (2)
BMC0977991 LOGTAPES = 4               (MAX MOUNTS FOR PARALLEL Sorts)
```

3 If the syntax includes the LOGTAPES keyword, use that value. Otherwise, use the value of the LOGTAPES installation option.

4 Compare the number of data sharing members to the LOGTAPES value.
   - If the LOGTAPES value is zero, use the number of data sharing members.
   - If the LOGTAPES value is greater than zero, compare it to the number of data sharing members and use the lower value.

5 Determine the total number of log scans in the job by examining the SYSIN syntax and counting the number of LOGSCAN statements. This explanation contains one log scan.
6 Determine the total number of sort actions required by the job by examining the SYSIN syntax.

In general, count one sort action for each type of output file (SQL, logical log file and so forth), and one sort action for each report that each log scan produces. Logical log output files do not require a sort action. This explanation contains two types of output, so the value would be two. For more information about numbering sort work data sets, see the section about building and running Log Master jobs in the Log Master for DB2 Reference Manual.

7 Add the values from Step 4 on page 306 through Step 6 on page 307.

8 Multiply the total obtained in Step 7 on page 307 by 768 kilobytes.

To obtain the sort actions maximum limit value

1 Multiply the total number of sort actions required by your job (the value in Step 6 on page 307) by 6144 K.

To calculate the total estimate

1 Calculate your total estimate by adding the following values:

   ■ Key stores (Step 3 on page 305)
   ■ Log record buffer (Step 3 on page 306 in the procedure to obtain the log record buffer maximum limit value)
   ■ Compression dictionary storage (Step 2 on page 306 in the procedure to obtain the compression dictionary storage maximum limit value)
   ■ I/O buffers for different types of input and output (Step 8 on page 307)
   ■ Sort actions for different types of output (Step 1 on page 307)
   ■ Basic required memory (20480 K)

2 If necessary, divide the total estimate by 1024 to obtain the value in megabytes (M).

3 Use the total estimate as the minimum REGION value on the JOB or EXEC statement in the new job’s JCL, or provide the total estimate to DB2 systems personnel.
Increasing key store memory (STOREOPTS MEMORY)

The STOREOPTS MEMORY keyword and the KSMEMORY installation option determine how much memory Log Master allocates for internal temporary working storage areas called *key stores*.

You can adjust this amount of memory to respond to changing needs in your environment, as shown in the example in this section.

For this example, assume that:

- A daily Log Master ongoing job captures changes to a large table
- The table is not defined with the Data Capture Changes (DCC) attribute
- One user makes a global change that updates one million rows in the table

When it runs, the daily ongoing job appears to loop. The job’s output contains key store spill messages, such as the following:

```
BMC097324I KEYED STORAGE SPILLED TO CLUSTER USDB2.BK.CLUST.C05052.BC01
BMC097324I KEYED STORAGE SPILLED TO CLUSTER USDB2.BK.CLUST.C05052.LR01
```

The ongoing job completes, but performance is not acceptable. A job like this might also terminate with out-of-space messages, such as the following:

```
BMC097145S INTERNAL ERROR IN KEYSTOR COMPONENT: REASON=106, SOURCE=, MOD=keystor_
BMC097383S KEYSTOR CLUSTER NAME=USDB2.BK.CLUST.C05052.BC01, OPER=INSERT, LOG RBA=X'1322632EB371', KS ADDR=X'1BFA9A08'
```

Log Master performs row completion processing for the update log records. The job’s key store memory cannot store one million updates, so Log Master spills to DASD and performance degrades. Specifically, the job spills the backward completion (BC) and log record (LR) key stores.

Two characters in the last node of the data set names in message BMC097324 represent a specific key store, as follows:

- UR for URID
- BC for backward completion
- FC for forward completion
- LR for log record
- AN for anomaly

To estimate the optimal amount of key store memory

---

**Tip**

For convenience, convert all estimate values to kilobytes (K).
1 Determine the current key store memory allocation:

   a In the output of an existing Log Master job, locate the set of BMC097799 messages, and find the KSMEMORY installation option value, as in the following sample:

      BMC097799I KSMEMORY = (20480K,10240K) (IN MEMORY KEYED STORAGE SIZE)

   b Examine the SYSIN syntax of the job, checking for the MEMORY keyword on the STOREOPTS statement, as in the following sample:

      STOREOPTS MEMORY (40M, 10M)

   c If the syntax includes the STOREOPTS MEMORY keyword, use that value. Otherwise, use the value of the KSMEMORY installation option.

2 Locate the BMC097064 message, which lists the available "above the line" memory, as in the following sample:

   BMC097064I AVAILABLE REGION BELOW 16M=9700K, AVAILABLE REGION ABOVE 16M=1836004K

3 Locate the key store termination messages that begin with message BMC097396, as in the following sample:

   BMC097396I KEYSTOR TERM: NUMREC=3, HIGHNUMREC=124219
   BMC097397I GARCOLLCNT=0, SQUEEZECCNT=0, UNSQUEEZE=0
   BMC097398I INSCOUNT=124261, DELCOUNT=124258, RETCOUNT=0
   BMC097399I GTXNCOUNT=124216, POSCOUNT=269917, DUPINSCT=0
   BMC097400I PUTDASDCOUNT=72616, GETDASDCOUNT=71890
   BMC097401I BLKINITCOUNT=1255, PAGECINITOUNT=1255
   BMC097402I BLKINCOUNT=39133184, AVERECLEN=733
   BMC097404I TOTBYTES= 91083313,CURBYTES= 2199,TOTRECS= 124261
   BMC097405I NUMMAPS=1
   BMC097406I CLUSTNM=USDB2.BK.CLUST.C05052.BC
   BMC097407I TOTAL TIME IN KEYSTOR=00:39:05, I/O TIME=00:38:15

4 Multiply the HIGHNUMREC value by the AVERECLEN value (the values represent bytes).

   The result is an estimate of the memory required by one key store.

5 Repeat Step 4 on page 309 for all key store memory areas.

   If the product does not use a key store for a given job, the HIGHNUMREC value is zero. Log Master displays key store termination messages for the anomaly (AN) key store only when your output includes a Backout Integrity report.

6 For a total estimate, add the required memory estimates for all key stores.

7 If necessary, divide the total estimate by 1024 to obtain the value in kilobytes.

8 Compare the total estimate (Step 7 on page 309) to the maximum amount of memory available to your job (Step 2 on page 309) and proceed as follows:
If the total estimate is less than the memory available, you can allocate more key store memory. Proceed to Step 9 on page 310.

If the total estimate is greater than the memory available, you can

— Increase the overall memory available
  For more information, see “Estimating overall memory (REGION)” on page 304.

— Reallocate key store memory to provide more memory to key stores that spill
  For more information, see “Redistributing key store memory (MEMPERCENT)” on page 310.

9 Edit the SYSIN syntax of the job to add the STOREOPTS statement, as shown in the following sample, using your total estimate from Step 7 on page 309.

```plaintext
OPTION FILTERREL AND EXECUTION MODE CURRENT
STOREOPTS MEMORY (200M,60M)
WORKID MIS.CLMEXTRACT
DESC "LOG EXTRACT FOR REPLICATION TO MIS"
```

This example uses the STOREOPTS MEMORY keyword because the poor performance results from a one-time circumstance. However, when many jobs experience performance difficulties that are related to key store memory, you can change the value of the KSMEMORY installation option and reassemble your installation options module. This action provides more key store memory to all jobs.

**Redistributing key store memory (MEMPERCENT)**

The STOREOPTS MEMPERCENT keyword and the xxPCT installation options determine how Log Master distributes memory among its individual key stores. You can adjust this distribution of memory to meet the needs of your environment, as shown in the example in this section.

BMC recommends that you change key store memory distribution only when you experience repeated performance problems related to key store usage.

For this example, assume that:

- An electric company stores data from monitoring devices in very large DB2 tables
- A typical transaction (unit of recovery) contains 2 to 3 insert actions, transactions rarely include update or delete actions
The company runs an ongoing job every two hours to capture transactions.

Transaction volume is heavy, a typical log scan selects millions of transactions.

The output from the ongoing job frequently contains key store spill messages, as in the following sample:

```
BMC097324I KEYED STORAGE SPILLED TO CLUSTER ZSTOPC.CLUSTER.C23782.UR01
```

When transactions volume is higher than normal, the job might also terminate with out-of-memory messages, as in the following samples:

```
IEA705I ERROR DURING GETMAIN SYS CODE = 878-10 Z16LMWAI LOGMSTR 00
BMC097739I THE PRODUCT ESTAE HAS BEEN INVOKED DUE TO ABEND S0878 DURING EXECUTION
```

As it scans the log, Log Master stores information about each selected unit of recovery in the URID (UR) key store. This job’s UR key store cannot hold information about millions of units of recovery, so the product spills to DASD and performance degrades.

The two characters in the last node of the data set name in the BMC097324 message indicate the UR key store. Log Master does not spill any other key stores. In this explanation, transactions typically contain only 2 to 3 log records, so the product does not use much of the memory allocated to the log record (LR) key store. Because transactions rarely include update actions, the product does not perform much row completion processing, and does not heavily use either the forward completion (FC) or backward completion (BC) key stores.

In this situation, you can avoid spilling to DASD by redistributing memory from the LR, FC and BC key stores to the UR key store.

**To determine how to reallocate a job’s key store memory**

**Tip**

For convenience, convert all estimate values to kilobytes (K).

1. Determine the current distribution of key store memory:

   a. Determine the value of the xxPCT installation options by examining the output messages of an existing Log Master job (where xx represents the two character abbreviation of each key store).

   The following is a sample set of BMC097799 messages displaying the percentage of key store memory allocated to each key store:

   ```
   BMC097799I URPERCENTAGE = 20    (UR KEYSTORE PERCENT)
   BMC097799I LRPERCENTAGE = 40    (LR KEYSTORE PERCENT)
   BMC097799I FCPERCENTAGE = 10    (FC KEYSTORE PERCENT)
   ```
Examine the SYSIN syntax of the job, checking for the MEMPERCENT keyword on the STOREOPTS statement, as in the following sample:

```
STOREOPTS MEMORY (40M, 10M)
MEMPERCENT (URID 20 LOGRECORD 40 FORWARDCOMPLETION 10 BACKWARDCOMPLETION 10 ANOMALY 20)
```

If the syntax includes the STOREOPTS MEMPERCENT keyword, use those percentage values. Otherwise, use the percentage values of the xxPCT installation options.

Determine the current usage of key store memory:

a. Locate the key store termination messages that begin with message BMC097396, as in the following samples. (These samples show only the pertinent messages in the larger set of messages.)

```
BMC097396I KEYSTOR TERM: NUMREC=827736, HIGHNUMREC=827736
BMC097403I   DATAMEM=141541376, AVERECLEN=1400
BMC097406I   CLUSTNM=ZSTOPO.CLUSTER.C23782.UR
BMC097396I KEYSTOR TERM: NUMREC=0, HIGHNUMREC=0
BMC097403I   DATAMEM=0, AVERECLEN=0
BMC097406I   CLUSTNM=ZSTOPO.CLUSTER.C23782.BC
BMC097396I KEYSTOR TERM: NUMREC=10, HIGHNUMREC=10
BMC097403I   DATAMEM=204800, AVERECLEN=111
BMC097406I   CLUSTNM=ZSTOPO.CLUSTER.C23782.FC
BMC097396I KEYSTOR TERM: NUMREC=1, HIGHNUMREC=8288
BMC097403I   DATAMEM=2637824, AVERECLEN=314
BMC097406I   CLUSTNM=ZSTOPO.CLUSTER.C23782.LR
```

b. Multiply the HIGHNUMREC value by the AVERECLEN value for all of the listed key stores.

The results are estimates of the memory used by the individual key stores. (The values represent bytes, remember to convert to kilobytes). If Log Master does not use a key store for a given job, the HIGHNUMREC value is zero. Log Master displays key store termination messages for the anomaly (AN) key store only when your output includes a Backout Integrity report.

c. Divide each memory estimate by the total of all estimates to convert the estimates into percentage values.

Compare the distribution percentages (Step 1.c on page 312) to the usage percentages (Step 2.c on page 312).

In general, if the distribution percentages vary from the usage percentages by more than fifteen to twenty percent, redistributing key store memory might
improve performance. Use this general rule as a guideline and adapt it to your environment.

In this explanation, the distribution percentage for the UR key store is 20, but the usage percentage is greater than 90, so redistribution can improve performance.

Proceed to Step 4 on page 313.

- If the distribution percentages vary from the usage percentages by less than fifteen to twenty percent, redistributing key store memory might not help performance. You can either:
  
  — Increase the total key store memory to prevent spilling.
  
  For more information, see “Increasing key store memory (STOREOPTS MEMORY)” on page 308.
  
  — Increase the overall memory available.
  
  For more information, see “Estimating overall memory (REGION)” on page 304.

4 Develop new percentage values based on the usage percentages.

In general, the new percentages should be close to the usage percentages, so that you distribute key store memory to where the product needs it. However, there is no exact calculation for the best percentages. The most important factors are the data that a job selects, such as the size of units of recovery and the number of update actions, and the circumstances in your environment. Use your judgement and knowledge of your data.

Observe the following guidelines:

- To improve accuracy, perform Step 1 on page 311 and Step 2 on page 312 for several runs of a job, and use the median or average percentage values.

- Monitor the performance of your job, and adjust your percentages over time.

- Limit the percentage for any single key store to less than 75 percent.

- Ensure that the percentage for each key stores is at least 5 percent.

For the situation in this example, BMC would recommend increasing the percentage for the UR key store to 70 percent, and reducing the percentage of the LR, FC, BC and AN key stores to 10, 5, 5, and 10 percent, respectively.

5 Determine whether to apply the percentages to a single job or to all jobs:
If the type of data selected by this job is unique, or is selected by only a small number of jobs, use the STOREOPTS MEMPERCENT keyword to specify the new percentages in the SYSIN syntax in your JCL.

If this job selects data that is similar to that selected by most jobs in your environment, change the value of the xxPCT installation options and reassemble your installation options module.

6 Monitor the next run of the job to observe performance.

Tip
Consider performing Step 1 on page 311 through Step 3 on page 312 again to determine if the distribution percentages match the usage percentages more closely.

---

Changing the log record buffer (LOGRECORD BUFSIZE)

The OPTIONS LOGRECORD BUFSIZE keyword and the QBLRBUF installation option determine how much memory Log Master allocates to the log record buffer. You can adjust this amount of memory to respond to changing needs in your environment, as shown in the example in this section.

BMC recommends that you change the size of the log record buffer only when you experience repeated performance problems related to memory usage.

For this example, assume that:

- A company runs a large enterprise resource planning (ERP) application on DB2
- A daily job generates a Summary report to show activity within the application
- The application’s tables are defined with DCC
- The application does not generate many rollback actions
- The "commit level" parameter within the application is set to the highest value, causing the application to run up to five hours between COMMIT statements
- Transactions (units of recovery) are very large, with millions of logical transactions within one DB2 unit of recovery

The output from the daily job frequently contains many data set allocation and deallocation messages like the following sample:
The daily job can also terminate with out-of-space messages, such as the following:


As Log Master scans the log, it stores log record information from a selected unit of recovery in the log record buffer until it encounters the end of the unit of recovery. Log Master uses the log record buffer dynamically and re-uses memory after it encounters the end of each unit of recovery. Log Master uses the log record buffer unless a log record requires row completion processing. In this example, the DCC attribute is set so that the product retains all information from each unit of recovery in the log record buffer.

The best solution to this memory usage problem is to change the "commit level" parameter within the application so that COMMIT statements occur more frequently. This example shows how to increase the size of the log record buffer, but standard practices of recoverable DB2 operation normally eliminate the need to take this action.

In this explanation, the log record buffer cannot hold all of the information in the large units of recovery, so Log Master spills to DASD, and performance degrades. The characters LQ in the last node of the data set name in the BMC097342 message indicate the log record buffer.

**To increase the size of the log record buffer**

*Tip*

For convenience, convert all estimate values to kilobytes (K).

1. Determine the current log record buffer size, as instructed in “To obtain the log record buffer maximum limit value” on page 305.

2. Locate the BMC097064 message, which lists the available "above the line" memory, as in the following sample:

   BMC0970641 AVAILABLE REGION BELOW 16M = 9752K, AVAILABLE REGION ABOVE 16M = 1633408K

3. Estimate a new log record buffer size.

   There is no exact calculation to determine the best log record buffer size. The most important factors are the size and number of log records in the units of recovery that are "open" simultaneously. Use your judgement and knowledge of your data, and observe the following guidelines:

   - The new value should be larger than the current value, but smaller than the amount of memory displayed in message BMC097064.
Because this is a maximum limit value, a high value does not impose a penalty. Log Master uses only the memory that it needs to hold log record information.

4 Determine whether to apply the new value to a single job, or to all jobs:

- If the units of recovery selected by most jobs in your environment are large enough to spill the log record buffer (as would be the case in this explanation), change the value of the QBLRBUF installation option and reassemble your installation options module.

- If only a small number of jobs select units of recovery large enough to spill the log record buffer, use the OPTION LOGRECORD BUFSIZE keyword to specify the new percentages in the SYSIN syntax in your JCL.

5 Monitor the next run of the job to observe performance.
Action codes in the Log Master online interface

This chapter explains action codes and how to use them to perform actions in the online interface.

Overview of action codes

Many panels in the Log Master for DB2 online interface display a list of items, and enable you to perform various actions on the items in the list (for example, to delete or edit an item) by using action codes.

To perform an action, enter an action code in the field labelled "ACT" or "Action."

Figure 117 on page 317 shows a sample online interface panel. The action codes that are available on this panel are shown in bold text.

In most cases, action codes perform the same action on all interface panels. However, in a few cases, Log Master uses the same single-letter code to represent two actions,
but never on the same interface panel. Table 34 on page 318 lists the general actions associated with the most common action codes.

**Table 34: Action codes in the Log Master online interface**

<table>
<thead>
<tr>
<th>Action code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>S=Select</td>
<td>Select one item from the list for further action. Use this action code to select one of the items to operate on or to add the selected item to another list that you are creating. Frequently, you can use this action code after you generate a list by using a wild card expression.</td>
</tr>
<tr>
<td>D=Delete</td>
<td>Delete one item from the current list.</td>
</tr>
<tr>
<td>I=Insert</td>
<td>Insert a new item into the current list. Frequently, Log Master displays additional panels where you can specify the attributes of the newly inserted item.</td>
</tr>
<tr>
<td>I=Information</td>
<td>Display another panel containing information about the selected item. Use this action code to obtain enough details about the item to decide whether you want to select it or delete it from the current list.</td>
</tr>
<tr>
<td>E=Edit</td>
<td>Display another panel where you can change or examine the attributes of the selected item. This action affects only the selected item; you cannot edit one item and then save it as another item. To create another item, use I=Insert or R=Repeat, if available.</td>
</tr>
<tr>
<td>R=Repeat</td>
<td>Create a copy of the selected item and add the newly created copy to the current list. Use this action code when you are inserting a new item that is similar to an existing item. You can repeat the existing item, and then edit it to make the required changes, instead of defining all of the attributes for the entire new item.</td>
</tr>
<tr>
<td>B=Browse</td>
<td>View the contents of the selected item. Usually, Log Master provides this action code when you are working with a list of files. When you type B and press Enter, Log Master initiates a TSO edit session of the selected file with read-only access. You can examine the file using TSO edit commands. When you exit the TSO session, Log Master redisplays the online interface panel.</td>
</tr>
<tr>
<td>L=Browse Load Data file</td>
<td>View the contents of the output load data file. Log Master initiates a TSO edit session of the selected file with read-only access. You can examine the file using TSO edit commands. When you exit the TSO session, Log Master redisplays the online interface panel.</td>
</tr>
<tr>
<td>L=List Associated Work IDs</td>
<td>Display another panel containing a list of all of the work IDs that use the selected item (filter). Log Master provides this action code only when you are working with a list of filters.</td>
</tr>
<tr>
<td>O=Logical OR</td>
<td>Insert a logical OR operator between two portions of a filter—called filter predicates. Log Master provides this action code only when you are defining a filter through the Structured interface.</td>
</tr>
<tr>
<td>Action code</td>
<td>Meaning</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>O=Options</td>
<td>Display another panel where you can specify optional values related to the selected DB2 object. Log Master provides this action code only when you are defining the DB2 objects as part of an automated drop recovery.</td>
</tr>
<tr>
<td>C=Browse Load Control file</td>
<td>View the contents of the output load control file. Log Master initiates a TSO edit session of the selected file with read-only access. You can examine the file using TSO edit commands. When you exit the TSO session, Log Master redisplays the online interface panel.</td>
</tr>
<tr>
<td>C=Catalog Search</td>
<td>Display the first in a set of panels that make up the Log Master Catalog Search facility. The Catalog Search facility is similar to the object search features of the BMC CATALOG MANAGER for DB2 product. Use this action code to select a DB2 object (such as a table or a column name) when you are not certain of the exact name. You can search the current DB2 catalog using parts of a name and wildcard expressions. You can also search based on object relationships. For example, if you know the table name, but not the column name, you can display a list of all columns in the table, and select from that list.</td>
</tr>
<tr>
<td>DB=Database</td>
<td>Display another panel that lists the name of the database that contains the selected DB2 object. This action code is part of the Log Master Catalog Search facility.</td>
</tr>
<tr>
<td>TS=Table Space</td>
<td>Display another panel that lists either ■ the name of the table space that contains the selected DB2 object ■ the names of all of the table spaces contained in the selected DB2 object This action code is part of the Log Master Catalog Search facility.</td>
</tr>
<tr>
<td>TB=Table</td>
<td>Display another panel that lists either ■ the name of the table that contains the selected DB2 object ■ the names of all of the tables contained in the selected DB2 object This action code is part of the Log Master Catalog Search facility.</td>
</tr>
<tr>
<td>CO=Column</td>
<td>Display another panel that lists the names of all of the columns that are contained in the selected DB2 object. This action code is part of the Log Master Catalog Search facility.</td>
</tr>
<tr>
<td>IX=Index</td>
<td>Display another panel that lists the names of all of the indexes that relate to the selected DB2 object. This action code is part of the Log Master Catalog Search facility.</td>
</tr>
<tr>
<td>PL=Plan</td>
<td>Display another panel that lists the names of all of the application plans that are dependent on the selected DB2 object. This action code is part of the Log Master Catalog Search facility.</td>
</tr>
</tbody>
</table>
Reference of default Log Master reports

This appendix describes each default Log Master report.

Audit report

The Audit report presents changes to critical data.

Log Master reports present only the data defined by your time frame and filter. The report is similar to the Detail report ("Detail report" on page 345) with the following exceptions:

- Both the Audit and Detail reports show data from data manipulation language (DML) log records, including update log records. When the Audit report shows data from an update log record, it shows only the changed data. When the Detail report shows an update log record, it shows all data.

- The Audit report shows primary key information (for an example, see the IX Value field in Figure 118 on page 322). The Detail report does not show information about primary keys.

Use Audit reports to determine:

- Who changed critical data
- When data was changed
- The volume of data changed

You can also use an Audit report to show information about changes to the DB2 catalog, including changes to DB2 security. For more information, see “Auditing DB2 catalog activity” on page 136.

When you use the Create Audit Report task dialog in the online interface, Log Master produces the Audit report by default. To request an Audit report, from any other task dialog (any option from 0 through 7 under the Actions category on the
Main Menu), select the **Define Report and File Outputs** option, and then on the Output Options panel, select **Audit**.

By default, the Audit report includes only the data associated with noncompensated log records. To include compensated log records (and override the default), enter **Y** in the **Include Rollback** field of the Report Output panel. For more information, see **Include Rollback** in the online Help (F1).

By default, the Audit report includes log records that satisfy your time frame and filter. To override the default, enter **Y** in the **Print REDO Information** field of the Report Output panel. When you enter **Y**, Log Master selects log records as if it were generating REDO SQL statements. For more information about the log records that the produce selects, see “Using REDO SQL” on page 162.

**Figure 118 on page 322** shows a sample Audit report. The example shows the longer names supported by DB2 Version 8.1 and later, and column data that contains untranslatable Unicode characters. For more information, see “Displaying long DB2 object names” on page 44 and “Displaying Unicode characters” on page 46.

**Figure 118: Example Audit report by table name and URID**

```
Date: 2013-01-18            LOG MASTER FOR DB2 - V11.01.00        Page:       1
Time: 16.42.50         Copyright BMC Software, Inc. 1995-2013
Audit Report, By Table Name, Urid
Compensated Log Records Included
--------------------------------------------------------------------------------
From: Date 2013-01-18 16.34.23.000000
To: Date 2013-01-18 16.34.49.000000
--------------------------------------------------------------------------------
Report Information:
Work ID    : DB2DBA.$$WORKID0014         Run Number:    2  Subsystem: DXW2
Description:   DB2DBA GENERATE MONTHLY REPORTS
--------------------------------------------------------------------------------
Table Name: DB2DBADB.DB2DBA_YEAR_END_FIN
NCIAL_DATA_AND_QUARTERLY_ESTIMATE
MASSES_CONSOLIDATION_TABLE DBID.OBID: (363.3)
Tablespace Name: DB2DBADB.DB2DBAT1        DBID.PSID: (363.2)
URID LRSN: x'C328A04BCABB' Data Sharing Member: DXW2
URID     : x'0010FFC0DA7E' Date   : 2013-01-18   Conn Type: BA
Status   : Committed       Time   : 16.34.23.877 Conn ID  : BATCH
Plan Name: DSNTEP4         Auth ID: DB2DBA2      Corr ID  : DB2DBAPR
---------------------------------------------------------------------------
Type: Insert At: x'C328A04BCAC8'     Time: 2013-01-18 16.34.23.877
Report Index: DB2DBADB.DBAIX1                     Type: Unique
RID     : 00000016/01                           Status: Committed
IX Value: TRANSACT_DATE     : 2013-13-21
Field Data: TRANSACT_DATE  UPDNUM  DESCRIPTION****  SHORT_DEPT_NAME
New: 2013-01-21     000021  LOAD REC        ACCTSPAYABLE
ACCT_REP_NAME**********  JOURNAL_CODE  COMMENTS*************
```
Audit report contents

The Audit report presents the following information for each log record:

- Information that identifies the DB2 object, such as table name, table OBID, database name, database DBID, table space name, table space DSNUM, and table space PSID

- Information that identifies the unit of recovery, such as unit of recovery identifier (URID), plan name, date and time of the start of the unit of recovery, authorization ID, connection type (for example, CICS, IMS, Batch, and so forth), connection ID, and correlation ID

- Information from the log record header, including record type (insert, update, delete, or exchange)

- Information that identifies the log record, including the record ID (RID) and the primary key field names and values

  Note

  A maximum of 255 bytes are printed for any field.

- Group member name (if you are reporting on a member of a group in a data sharing environment)

- Information about the data in individual columns, depending on the log record type, as follows:
— Update actions include old and new values for changed fields only
— Insert actions include new values for all columns
— Delete actions include old values for all columns

Tip
To control the column data that appears in this report, use the Include/Exclude Column field on the Report Output panel. If you need to show most of a table’s columns in the report, indicate which columns you want to exclude. Conversely, if you need to show only a few of a table’s columns in the report, indicate which columns you want to include. (For an example of including or excluding columns, see “Using the online interface to specify the log scan step” on page 213.)

For each report ordering field that you specify, the report presents a total line showing gross record counts by log record type (insert, update, delete, or exchange). The report presents final totals by log record type.

Audit report ordering

You can specify the order of the information in the report based on a combination of unit of recovery fields and object-identification fields.

Specify a maximum of three ordering fields in any combination. The default ordering for the Audit report is by table name and unit of recovery identifier (URID).

You can order this report by the following object-identification options:

- Table name
- Table OBID
- Database name
- Database DBID
- Table space name
- Table space DSNUM
- Table space PSID
- Create RBA

You can order this report by the following unit of recovery options:

- Unit of recovery identifier (URID)
- Plan name
- Authorization ID
- Connection type
- Connection ID
Backout Integrity report

Use the Backout Integrity report to determine the impact of performing an UNDO or a REDO operation, and to weigh the benefits of applying UNDO SQL versus REDO SQL.

Additionally, the report supplies information about the set of objects that are affected by the changes, and the volume of information affected. The report presents only the data defined by your time frame and filter, and only data associated with committed transactions.

The Backout Integrity report is a default output for the following choices under the Actions category on the Main Menu:

- Analyze Problem Transactions
- Create UNDO SQL
- Create REDO SQL

To request a Backout Integrity report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Backout Integrity.

Be aware of the following points as you define a Backout Integrity report:

- Log Master can produce the Backout Integrity report in two formats: Detail (including field data and all URID information), and Summary (omitting field data and some URID information).

- To generate a Backout Integrity report, Log Master scans the DB2 log up to the current time, even when you do not specify the end point of your time frame as CURRENT. Log Master takes this action because the log records that you select may be affected by subsequent transactions that occur after your time frame.

- Log Master defines the current time as the last relative byte address (RBA) or log record sequence number (LRSN) that DB2 has written to the log when the Log Master job begins executing.

- In general, Log Master uses more resources to generate a Backout Integrity report than it does to generate other reports. Log Master can use more CPU and I/O time
time, and scan more log to generate a Backout Integrity report than you might anticipate based on your filter and time frame.

- Log Master cannot produce either version of a Backout Integrity report when the input source of your log scan is individual DB2 log files (INPUT DB2LOG).
- The Backout Integrity report tracks subsequent changes that affect rows selected by your filter and time frame. Log Master tracks these changes using the record IDs (RIDs) and unique key values of the original selected rows. If the original row has a unique key, Log Master can track changes even when DB2 moves the row because of overflow, or when the row is deleted and then re-inserted with the same key value.

**Backout Integrity report (detail) contents**

The Backout Integrity report contains two sections:
- The first provides detailed anomaly information by row for selected objects.
- The second provides a summary by table space of the selected objects.

*Figure 119 on page 326* shows an example of a detailed Backout Integrity report.

*Figure 119: Example Backout Integrity report (detail)*

```
Date: 01/18/2013            LOG MASTER FOR DB2 - V11.01.00        Page:       1
Time: 16:10:55         Copyright BMC Software, Inc. 1995-2013

Backout Integrity Detail Report, By Tablespace Name, Table Name, Index Value
--------------------------------------------------------------------------------
From: 01/18/2013 15:27:14.000000
To: 01/18/2013 15:27:16.000000
--------------------------------------------------------------------------------
Report Information:
Work ID    : DB2DBA.$$WORKID0011         Run Number:    1  Subsystem: DXW2
Description: DB2DBA GENERATE MONTHLY REPORTS
--------------------------------------------------------------------------------
Table Name: DB2DBADB.DB2DBAB1             DBID.OBID: (363.3)
Space Name: DB2DBADB.DB2DBAT1             DBID.PSID: (363.2)
Report Index: DB2DBADB.DBAIX1                     Type: Unique
--------------------------------------------------------------------------------
RID     : 000016AA/06                             Status: Committed
IX Value: TRANSACT_DATE     : 2013-01-05
Selected Log Records:
URID LRSN: x'C328914A0796' Data Sharing Member: DXW2
URID     : x'0010FEE9CE47' Date   : 01/18/2013   Conn Type: BA
Status   : Committed       Time   : 15:27:15.497 Conn ID  : BATCH
Plan Name: DSNTEP4         Auth ID: DB2DBA2      Corr ID  : DB2DBAPR
Type: Update At: x'C328914A084B'     Time: 01/18/2013 15:27:15.500
Field Data: DESCRIPTION****
```
New: 05 HI CREDIT
Old: Account 2010-11

Anomaly Log Records:
1). Row subsequently updated.

URID LRSN: x'C32891542F18' Data Sharing Member: DXW2
URID : x'0010FFAB2AB0' Date : 01/18/2013 Conn Type: BA
Status : Committed Time : 15:27:26.144 Conn ID : BATCH
Plan Name: DSNTEP4 Auth ID: DB2DBA2 Corr ID : DB2DBAPR
Type: Update At: x'C32891542F19' Time: 01/18/2013 15:27:26.144
Field Data: DESCRIPTION****
New: 05 RETRACT
Old: 05 HI CREDIT

2). Row subsequently updated.

URID LRSN: x'C32891542F18' Data Sharing Member: DXW2
URID : x'0010FFAB2AB0' Date : 01/18/2013 Conn Type: BA
Status : Committed Time : 15:27:26.144 Conn ID : BATCH
Plan Name: DSNTEP4 Auth ID: DB2DBA2 Corr ID : DB2DBAPR
Type: Update At: x'C32891542F77' Time: 01/18/2013 15:27:26.146
Field Data: UPDNUM
New: UPD005
Old: 000005

Totals For:
Tablespace Name: DB2DBADB.DB2DBAT1 DBID: 363 PSID: 2
Selected Records:
Ins : 0 Del: 0 Upd : 1
Tot : 1 Del/RI: 0 Upd/RI: 0

Anomaly Records:
Ins : 0 Del : 0 Upd : 2
Tot : 2 Del/RI: 0 Upd/RI: 0

First section (anomaly information)

This section contains the following information for each row (by record ID) where anomalies are found:

- Object-identification information
- Record-identification information, including record ID (RID) and the primary key field names and values
- Status information that shows whether the log record is part of a committed or aborted transaction

For each selected log record that is affected by one or more anomaly log records, the report presents the following information after the object identification and record identification:

- Information from the log record header, including the record type (insert, update, delete, or exchange), the log RBA/LRSN, and approximate time frame
- Unit of recovery information
- Column data, depending on the log record type
— For update actions, old and new values for changed fields only
— For insert actions, new values for all columns
— For delete actions, old values for all columns

Tip
To control the column data that appears in this report, use the Include/Exclude Column field on the Report Output panel. If you need to show most of a table’s columns in the report, indicate which columns you want to exclude. Conversely, if you need to show only a few of a table’s columns in the report, indicate which columns you want to include. (For an example of including or excluding columns, see “To modify the output options” on page 214.)

The report presents the following information for each log record that is not within the selection that you specified, but that impacts the selected row:

■ A text description of the impact of the log record on the row
■ Information from the log record header, including the record type (insert, update, delete, or exchange), the log RBA/LRSN, and the approximate time frame
■ Unit of recovery information
■ Column data, depending on the log record type, including
  — For update actions, old and new values for changed fields only
  — For insert actions, new values for all columns
  — For delete actions, no additional column information

Second section (selected objects by table space)

This section of the report contains the following information for each selected table space:

■ Table space information, including database name, table space name, DBID, and PSID
■ Number of anomaly conditions encountered
■ Selected activity counts for the table space, including
  — Number of log records by update type (insert, update, delete, or exchange)
  — Number of update and delete actions due to referential integrity (RI)
  — Number of insert, update, and delete actions due to triggers
  — Total activity counts
The summarized Backout Integrity report lists the same selected and anomaly log records as the detailed report. It presents the log records in a more concise format, and omits individual fields data and some URID-related information.

Figure 120 on page 329 shows an example of a summarized Backout Integrity report.

Figure 120: Example Backout Integrity report (summary)

Date: 01/18/2013                      LOG MASTER FOR DB2 - V11.01.00       Page: 1
Time: 16:12:00                        Copyright BMC Software, Inc. 1995-2013

Backout Integrity Summary Report, By Tablespace Name, Table Name, Index Value

From: 01/18/2013 15:27:14.000000
To: 01/18/2013 15:27:16.000000

Report Information:
Work ID    : DB2DBA.$$WORKID0012      Run Number:    1  Subsystem: DXW2
Description: DB2DBA GENERATE MONTHLY REPORTS

Table Name: DB2DBADB.DB2DBAB1          DBID.OBID: (363.3)
Space Name: DB2DBADB.DB2DBAT1          DBID.PSID: (363.2)
Report Index: DB2DBADB.DBAIX1                    Type: Unique

IX Value: TRANSACT_DATE     : 2013-01-05

Selected Log Records:
Type      Logpoint    Auth ID  Corr ID      PlanName       Timestamp
Update    X'C328914A084B' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.15.500

Anomaly Log Records:
Update    X'C32891542F19' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.26.144
Update    X'C32891542F77' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.26.146
Update    X'C32891542F81' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.26.146
Update    X'C32891565FF2' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.443
Update    X'C3289156640F' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.459
Update    X'C32891566473' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.460
Update    X'C3289156647C' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.460
Update    X'C3289156685A' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.476

IX Value: TRANSACT_DATE     : 2013-01-09

Selected Log Records:
Type      Logpoint    Auth ID  Corr ID      PlanName       Timestamp
Update    X'C328914A0D19' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.15.519

Anomaly Log Records:
Update    X'C32891543064' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.26.150
Update    X'C32891566440' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.459
Update    X'C32891566473' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.460
Update    X'C3289156647C' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.460
Update    X'C3289156685A' DB2DBA2  DB2DBAPR     DSNTEP4  2013-01-18-15.27.28.476

IX Value: TRANSACT_DATE     : 2012-10-12

Selected Log Records:
The summarized Backout Integrity report lists all selected log records that are affected by one or more anomaly log records. The report presents:

- Object-identification information (to identify the DB2 object to which the selected log records relate)

- Selected record information, including:
  - The update type of the record (insert, update, delete, or exchange)
  - Logpoint (RBA or LRSN) and timestamp information
  - The authorization ID, correlation ID, and plan name of the program that made the change that the selected log record shows

  The wide format of the report includes additional record information. It presents the RBA or LRSN of the first record of the URID that contains the selected record and status of that URID (committed, aborted).

- Anomaly record information

  For each selected log record, the report shows all of the subsequent log records that affect the same row (or index key value), including:
  - The update type of the record (insert, update, delete, or exchange)
  - Logpoint (RBA or LRSN) and timestamp information
  - The authorization ID, correlation ID, and plan name of the program that made the change that the selected log record shows

**Backout Integrity report ordering**

Log Master sorts both the detail and summary versions of this report in the same manner. Log Master sorts the records in the Backout Integrity report by table space name, table name, and index value. You cannot adjust the ordering of a Backout Integrity report.
Catalog Activity report

The Catalog Activity report presents information about actions taken to change the structure (schema) of DB2 objects, including:

- The type of DB2 object that was changed
- The type of data definition language (DDL) statement that changed the object
- URID-related information about the process, program, or user that initiated the action (for example, authorization ID or correlation ID)

This report can show changes to a given type of DB2 object (for example, indexes), or changes made by a given type of DDL statement (for example, GRANT and REVOKE statements to show security changes). This report contains the same basic information that would be included when you generate a MIGRATE DDL output file and specify Y in the Include Comments field of the DDL Output panel.

To request a Catalog Activity report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Catalog Activity.

Be aware of the following points as you define a Catalog Activity report:

- To generate a Catalog Activity report, the value of the Process DB2 Catalog Records field on either the Work ID Run Time Options or Run Time Options panels must be Y.
- The Catalog Activity report uses a wide format for data. Specify a logical record length (LRECL) value of at least 132 bytes to support the data format.
- To define a filter for a Catalog Activity report, it can be helpful to use the Catalog Activity and Catalog Object options on the Selectable Fields panel.
- To sort a Catalog Activity report, it can be helpful to use the Activity Type or Object Type options on the Report Output panel. For more information, see “Catalog Activity report ordering” on page 333.
- When you generate a Catalog Activity report, Log Master can generate an output DDL file or update the Repository, but it cannot include any other forms of output in the same log scan, such as other reports or SQL. To generate other forms of output that you need in the same work ID, add an additional, separate log scan step.
Sample Catalog Activity report

The following figure shows an example of a Catalog Activity report.

Figure 121: Example Catalog Activity report by object type

<table>
<thead>
<tr>
<th>URID</th>
<th>Date: 2016-02-08</th>
<th>Conn Type: BA</th>
<th>Auth ID: RDAYML3</th>
<th>Plan Name: OSNESPCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Time: 17.01.07.953</td>
<td>Conn ID: TSO</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>TRANSFER DATABASE YMLDB1A</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>TRANSFER TABLESPACE YMLDB1A.YMLTMPS1</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>TRANSFER INDEX RDAML.YMLTRANSTIA_11</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>TRANSFER VIEW RDAML.YMLTRANSTIA_V1</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>TRANSFER TABLE RDAML.YMLTRANSTIA</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>CREATE DATABASE YMLDB1B</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>CREATE TABLESPACE YMLDB1B.YMLTMPS1</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>CREATE TABLE RDAML.YMLTRANST1B</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>CREATE VIEW RDAML.YMLTRANST1B_V1</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
<tr>
<td>Totals For: URID: x'000000000000273A27CD'</td>
<td>Date: 2016-02-08</td>
<td>Time: 17.01.07.953</td>
<td>Auth ID: RDAYML3</td>
<td>Corr ID: RDAYML3</td>
</tr>
</tbody>
</table>

Catalog Activity report contents

The information presented in the Catalog Activity report includes:

- URID-related information about the action taken to change a DB2 object, including:
  - The RBA/LRSN value when the action occurred
  - The date and time when action occurred
  - The authorization ID and correlation ID that initiated the action

- A summarized version of the DDL or command statement that initiated the action, including:
  - The type of DDL or command statement (for example, CREATE, DROP, ALTER, or BIND)
  - The name of the affected object (for example, table name or index name)
— Additional information depending on the type of DDL statement (for example, the number of columns included in a CREATE TABLE statement, or the attributes changed by an ALTER TABLE statement)

If you need more detail than the summary information in this report, use the same filter and time frame to generate a MIGRATE DDL or command file with comments included. For more information, see “Auditing DB2 catalog activity” on page 136.

- Subtotals of DB2 catalog activity for each major grouping included in the report (depending on the ordering fields that you define for the report).

- Report totals of all DB2 catalog activity included in the report.

The subtotals and totals in the report include only the types of activity and types of DB2 objects that show activity during the time frame of the log scan (the subtotals and totals do not include a line when all values on the line are zero).

**Catalog Activity report ordering**

You can specify the order of the information in the Catalog Activity report based on unit of recovery fields. Specify a maximum of three ordering fields in any combination. The default ordering for the Catalog Activity report is by unit of recovery identifier (URID).

You can order this report by the following unit of recovery (URID) options:

- Unit of recovery identifier (URID)
- Plan name
- Authorization ID
- Connection type
- Connection ID
- Correlation ID
- Data sharing member name
- Data sharing member ID
- Subsystem name (SSID)
- Activity type
- Object type

You cannot order this report by object-identification options (such as table name or DBID).
Column Update Frequency report

This report shows the update frequency of table columns, enabling you to determine whether placing an index on a column would have a negative impact.

This report summarizes activity (see “Summary report” on page 370) and adds column detail if the table was updated. Log Master maintains counts for each changed column and provides the total number of changed columns. You can request either narrow or wide format for the report.

Sample Column Update Frequency reports

The following figures illustrate the two formats for this report.

**Figure 122: Wide Column Update Frequency report**

**Figure 123: Narrow Column Update Frequency report**
Column Update Frequency report contents

The information presented in the Column Update Frequency report includes the following:

- Information recorded in the Summary report (see “Summary report” on page 370)
  - Number of insert, delete, update, and exchange actions
  - Number of delete and update actions due to referential integrity (RI)
  - Number of insert, delete, and update actions due to trigger activity
  - Total records

- Additional information specific to the Column Update Frequency report
  - Name
  - Number
  - Type
  - Length
  - Indexed Column (Y/N)
  - Frequency (# of times column was updated)

Column Update Frequency report ordering

You can order this report by the following options:

- Unit of Recovery
- Plane Name
- Author ID
- Connection Type
- Connection ID
- Correlation ID
- Database Name
- Table Name
- Dsnum
- DBID
- PSID
- OBID
- DS Member Name
The Commands report provides information about which users issued DB2 commands on a subsystem, when the commands were issued, and the command syntax.

DB2 logs the command text as an exact copy of the command when it was issued, including leading, trailing, or embedded spaces, and includes case sensitivity. Use the information in the report for problem diagnosis and security purposes.

To request a Commands report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Commands.

Be aware of the following points as you define a Commands report:

- This report is available when you are running Log Master on DB2 Version 9 or later.
- To define a filter for a Commands report, it can be helpful to use the Command option on the Selectable Fields panel.
- When you generate a Commands report, Log Master cannot include any other forms of output in the same log scan, such as other reports or SQL. To generate other forms of output that you need in the same work ID, add an additional, separate log scan step.

Figure 124 on page 336 shows an example of a Commands report.

Figure 124: Example Commands report by RBA

<table>
<thead>
<tr>
<th>Date: 2013-01-05</th>
<th>LOG MASTER FOR DB2 - V11.01.00</th>
<th>Page: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 13.42.54</td>
<td>Copyright BMC Software, Inc. 1995-2013</td>
<td>Command Report</td>
</tr>
<tr>
<td>From: Date 2013-01-05 12.00.00.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To: Current x'007CF6F93A1E'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report Information:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work ID: DB2DBA.$$WORKID0001</td>
<td>Run Number: 32</td>
<td>Subsystem: D</td>
</tr>
</tbody>
</table>
Description: LOGMASTER - DDLGEN TESTING
-----------------------------------------------------------------------
Plan Name: DSNTEP2              Conn ID: DB2CALL
Auth ID  : DB2DBA2                Corr ID: DB2DBAPR
Command Text : -DISPLAY DB(BMCUTIL )
--------------------------------------------------------------------
RBA      : x'007CF35D4000'     Time   : 2013-01-05 13.26.43.184
Plan Name: DSNTEP2              Conn ID: DB2CALL
Auth ID  : DB2DBA2                Corr ID: DB2DBAPR
Command Text : -DISPLAY DB(ALPDEV )
--------------------------------------------------------------------
RBA      : x'007CF49A4170'     Time   : 2013-01-05 13.31.03.696
Plan Name: DSNTEP2              Conn ID: DB2CALL
Auth ID  : DB2DBA2                Corr ID: DB2DBAPR
Command Text : -DISPLAY DB(BMCUTIL )
--------------------------------------------------------------------
RBA      : x'007CF49B34DA'     Time   : 2013-01-05 13.31.06.424
Plan Name: DSNTEP2              Conn ID: DB2CALL
Auth ID  : DB2DBA2                Corr ID: DB2DBAPR
Command Text : -DISPLAY DB(ALPDEV )
Report Totals:
Dis DB  :       4 Acc DB  :       0 Sta DB  :       0 Sto DB  :
TOTAL   :       4

Commands report contents

The information presented in the Commands report includes:
- The full syntax of the command
- DB2 member
- Network ID
- LRSN
- Connection type
- Correlation ID
- Plan name (if available)
- Authorization ID

Commands report ordering

You can order this report by the following unit of recovery (URID) options:
- Plan name
- Authorization ID
- Connection type
- Data sharing member name
- Data sharing member ID
- Subsystem name (SSID)
- DB2 command name
The default ordering for the Commands report is by RBA.

## Commit report

The Commit report supplies information about commit frequency for application tuning and system performance purposes.

Depending upon the report ordering, counts are maintained for each unit of recovery to indicate the activity volume between commit points. Log Master reports present only the data defined by your time frame and filter. The Commit report contains only committed transactions and cannot include aborted transactions.

Use the Commit report to determine whether

- batch jobs are not committing changes according to standards or performance recommendations
- online transactions are performing too many operations in a given unit of work

To request a Commit report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the **Define Report and File Outputs** option, and then, on the Output Options panel, select **Commit**.

Figure 125 on page 338 shows an example of a Commit report.

**Figure 125: Example Commit report by activity (descending)**

```plaintext
Date: 2013-01-18        LOG MASTER FOR DB2 - V11.01.00     Page: 1
Time: 16.45.35         Copyright BMC Software, Inc. 1995-2013
----------------------------------------
Commit Report, By Activity (Descending)
----------------------------------------
From: Mark DB2DBA.COMMROLL.ONE(0) (x'C32EEACF7C2A')
To: Mark DB2DBA.COMMROLL.FOUR(0) (x'C32EEB3FC683')

Report Information:
Work ID : DB2DBA.$$WORKID0003         Run Number:    2  Subsystem: DXW
Description:   DB2DBA GENERATE MONTHLY REPORTS

----------------------------------------
URID LRSN: x'C32EEAFD955E' End: x'C32EEAFDE868' Data Sharing Member: DXW2
URID : x'001126252A0E' Date: 2013-01-18     Time : 16.40.31.389
URID(End): x'001126252782' Date: 2013-01-18     Time : 16.40.32.393
Status   : Committed       Conn Type: BATCH     Conn ID  : BATCH
Plan Name: DSNTEP2         Auth ID  : DB2DBA2   Corr ID  : DB2DBAUJC
Ins   :             0  Del   :             0  Upd   :         1,559
```
The information presented in the Commit report depends on the report ordering fields that you request. If the unit of recovery identifier (URID) is the last report ordering field, or if you sort the report by Activity (Descending), the report presents full unit of recovery information.

That information includes:

- URID
- Status (always COMMITTED in this report)
- Plan name
- Date and time that the unit of recovery started
- Authorization ID
- Connection type (for example, Batch, CICS, IMS)
- Connection ID
- Correlation ID
- Number of log records by update type (insert, update, delete, or exchange)
- Number of delete and update actions due to referential integrity (RI)
- Number of insert, delete, and update actions due to trigger activity
- Total number of log records encountered

If you sort the report in a different order or use a different field as the last report ordering field, the Commit report includes the following summary information:

- Unique value of the report ordering field
- Number of URIDs encountered matching the report ordering field
- Total number of data management log records, along with the total activity for the report ordering field
- Average number of data management log records, along with the total activity for the report ordering field
- Largest number of DML log records, along with the total activity for a URID within the report ordering field

**Commit report ordering**

You can order this report by the following unit of recovery (URID) options:

- URID
- plan name
- authorization ID
- connection type
- connection ID
- correlation ID

Specify the URID field either by itself, or as the last ordering field (preceded by up to two of the listed fields).

You can also sort the Commit report in Activity (Descending) order, which is the default order. When you specify this option, you cannot specify other fields for report ordering.
# Data Capture Changes report

The Data Capture Changes report enables you to analyze the impact of creating or altering your DB2 tables that are defined with Data Capture Changes.

The report expresses the impact on the log as the number of bytes logged for updates, because insert and delete actions are always logged in their entirety. Log Master reports present only the data defined by your time frame and filter.

To request a Data Capture Changes report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Data Capture Analysis.

The Data Capture Changes report can include compensated log records, noncompensated log records, or both, depending on the value of the Include Rollback field of the Report Output panel. For more information, see Include Rollback in the online Help (F1).

Figure 126 on page 341 shows an example of a Data Capture Changes report.

**Figure 126: Example Data Capture Changes report by table name**

<table>
<thead>
<tr>
<th>Date: 2013-01-18</th>
<th>LOG MASTER FOR DB2 - V11.01.00</th>
<th>Page: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 16.07.40</td>
<td>Copyright BMC Software, Inc. 1995-2013</td>
<td></td>
</tr>
</tbody>
</table>

Data Capture Analysis Report, By Table Name

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>From: Date 2013-01-18 15.27.14.000000</td>
<td>To: Date 2013-01-18 15.27.40.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Report Information:

<table>
<thead>
<tr>
<th>Work ID</th>
<th>DB2DBA.$$WORKID0008</th>
<th>Run Number: 1</th>
<th>Subsystem: DXW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>DB2DBA GENERATE MONTHLY REPORTS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table Name: DB2DBADB.DB2DBAB1</th>
<th>DBID.OBID: (363.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablespace Name: DB2DBADB.DB2DBAT1</td>
<td>DBID.PSID: (363.2)</td>
</tr>
<tr>
<td>DATA CAPTURE NONE (DCN)</td>
<td>DATA CAPTURE CHANGES (DCC)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rcds</th>
<th>Bytes</th>
<th>Alter</th>
<th>Rcd% /</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found</td>
<td>Found</td>
<td>DCN</td>
<td>Byte%</td>
</tr>
<tr>
<td>Ins</td>
<td>5</td>
<td>1003</td>
<td>1003</td>
</tr>
<tr>
<td>Del</td>
<td>3</td>
<td>597</td>
<td>597</td>
</tr>
<tr>
<td>Upd</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Upd DCN</td>
<td>64</td>
<td>9440</td>
<td>13K</td>
</tr>
<tr>
<td>Exc</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(No Update Activity to Report)

| Tot | 72   | 11K | 14K |

DCC Would Use 0.00% More Bytes

Table Name: DB2DBADB.DB2DBAB2 | DBID.OBID: (363.9)
Data Capture Changes report contents

The Data Capture Changes report presents information about database changes logged with either Data Capture Changes (DCC) or Data Capture None (DCN) enabled.

The left set of columns shows non-zero values for DB2 objects with DCN. The right set of columns shows non-zero values for DB2 objects with DCC. The report presents the information actually found in the log and the information that DB2 would have logged if the DB2 object was defined with the alternate data capture attribute.

Data Capture Changes report details

For each DB2 object selected by your filter, Log Master presents:

- a block of five lines, each line showing the log activity for each type of database action (as shown in the following example):

<table>
<thead>
<tr>
<th>Action</th>
<th>Ins</th>
<th>Del</th>
<th>Upd</th>
<th>DCC</th>
<th>Exc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>64</td>
<td>0</td>
</tr>
<tr>
<td>Bytes</td>
<td>1003</td>
<td>597</td>
<td>0</td>
<td>9440</td>
<td>0</td>
</tr>
<tr>
<td>Alter</td>
<td>1003</td>
<td>597</td>
<td>0</td>
<td>13K</td>
<td>0</td>
</tr>
<tr>
<td>Rcd%</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>88</td>
<td>0</td>
</tr>
<tr>
<td>Byte%</td>
<td>9</td>
<td>5</td>
<td>0</td>
<td>85</td>
<td>0</td>
</tr>
</tbody>
</table>

- Insert actions (labeled Ins)

- Delete actions (labeled Del)

- Update actions for which logging would not change depending on the data capture attribute (labeled Upd)

For example, DB2 logs the same information (regardless of the data capture attribute) when an update changes a table row so that the row moves to a new
page in the table space. For many DB2 objects, the numbers on this line are zeroes.

— Update actions for which logging *would* change depending on the data capture attribute (labeled Upd DCC or Upd DCN)

— Exchange actions (labeled Exc)

Numbers describing the logging activity for a type of database action (as shown in the following example):

<table>
<thead>
<tr>
<th>Rcds</th>
<th>Bytes</th>
<th>Alter</th>
<th>Rcd% /</th>
</tr>
</thead>
<tbody>
<tr>
<td>Found</td>
<td>Found</td>
<td>DCC</td>
<td>Byte%</td>
</tr>
<tr>
<td>5</td>
<td>1003</td>
<td>1003</td>
<td>6 / 9</td>
</tr>
</tbody>
</table>

— The number of log records related to the type of database action (labeled Rcds Found)

— The number of bytes used by the log records related to the type of database action (labeled Bytes Found)

— The number of bytes that *would* have been used with the alternate data capture attribute (labeled Alter DCC or Alter DCN)

— The percentage of total log records that are related to the type of database action (labeled Rcd%)

— The percentage of total log bytes that are related to the type of database action (labeled Byte%)

Totals for the DB2 object, including the number of log records, the number of bytes used with the current data capture attribute, and the number of bytes used with the alternate data capture attribute (as shown in the following example):

| Tot | 72  | 11K  | 14K |

A percentage to indicate logging cost (or savings) for each DB2 object, if the object was defined with the alternate data capture attribute (as in the following example):

DCC Would Use 30.62% More Bytes

— For objects defined with DCN, the percentage shows that DCC Would Use *n*% More Bytes

— For objects defined with DCC, the percentage shows that DCN Would Use *n*% Fewer Bytes

**Interpreting the Data Capture Changes report**

Be aware of the following points as you interpret the Data Capture Changes report:
Log Master presents the lines labeled Ins, Del and Exc only to compare these types of activity with update activity. The amount of logging for these actions does not change depending on the data capture attribute of an object.

For many DB2 objects, the numbers on the line labeled Upd are zeroes. This result is not unusual. Many objects rarely experience update actions that are not affected by the data capture attribute.

For each DB2 object, the numbers in the column labeled Alter DCC or Alter DCN are always the same as the numbers in the column labeled Bytes Found except on the line labeled Upd DCC or Upd DCN.

**Data Capture Changes report ordering**

You can base the order of the information in the report on a combination of unit of recovery options and object-identification options.

Specify a maximum of three ordering options in any combination.

You can order this report by the following object-identification options:

- Table name
- Table OBID
- Database name
- Database DBID
- Table space name
- Table space DSNUM
- Table space PSID
- Create RBA

You can order this report by the following unit of recovery (URID) options:

- URID
- Plan name
- Authorization ID
- Connection type
- Connection ID
- Correlation ID

The default ordering for the Data Capture Change report is by table name.
Detail report

The Detail report presents information about log records.

Log Master reports present only the data defined by your time frame and filter. This report is similar to the Audit report, with the following exceptions. For more information about the Audit report, see “Audit report” on page 321.

- The Detail and Audit reports show data from data management log records. However, when the Detail report shows data from an update log record, it shows all data, whereas the Audit report shows only the changed data.
- The Detail report does not show primary key information; however, the Audit report does.

Use the Detail report to:

- Display log information to help determine application problems
- Show information from the log as an audit trail for applications
- Show information about changes to the DB2 catalog, including changes to DB2 security

For more information, see “Auditing DB2 catalog activity” on page 136.

To request a Detail report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Detail.

By default, the Detail report includes only the data associated with noncompensated log records. You can include compensated log records (and override the default) by entering Y in the Include Rollback field of the Report Output panel. For more information, see Include Rollback in the online Help (F1).

By default, the Detail report includes the log records that satisfy your filter and time frame. You can override the default by entering Y in the Print REDO Information field of the Report Output panel. When you enter Y, Log Master selects log records as if it were generating REDO SQL statements. For more information about the log records that Log Master selects, see “Using REDO SQL” on page 162.

Sample Detail report

Figure 127 on page 346 shows an example of a Detail report. The example shows the longer names supported by DB2 Version 8.1 and later, and column data that contains
untranslatable Unicode characters. For more information, see “Defining a default report” on page 137.

Figure 127: Example Detail report, with long names and untranslatable Unicode data

<table>
<thead>
<tr>
<th>Date: 2013-01-18</th>
<th>LOG MASTER FOR DB2 - V11.01.00</th>
<th>Page: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 16.43.58</td>
<td>Copyright BMC Software, Inc. 1995-2013</td>
<td></td>
</tr>
</tbody>
</table>

Detail Report, By Table Name, Urid

From: Date 2013-01-18 16.34.23.000000
To: Date 2013-01-18 16.34.49.000000

Report Information:

<table>
<thead>
<tr>
<th>Work ID</th>
<th>DB2DBA.$$WORKID0015</th>
<th>Run Number:</th>
<th>2</th>
<th>Subsystem: DXW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>DB2DBA GENERATE MONTHLY REPORTS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table Name: DB2DBADB.DB2DBA_YEAR_END_FINANCIAL_DATA_AND_QUARTERLY_ESTIMATES_CONsolidation_TABLE

DBID.OBID: (363.3)
Tablespace Name: DB2DBADB.DB2DBAT1

URID LRSN: x'C328A04BCABB' Data Sharing Member: DXW2

URID : x'0010FFC0DA7E' Date : 2013-01-18 Conn Type: BA
Status : Committed Time : 16.34.23.877 Conn ID : BATCH
Plan Name: DSNTEP4 Auth ID: DB2DBA2 Corr ID : DB2DBAPR

Type: Insert At: x'C328A04BCAC8' Time: 2013-01-18 16.34.23.877
Status: Committed

Field Data: TRANSACT_DATE UPDNUM DESCRIPTION**** SHORT_DEPT_NAME
New: 2012-10-21 000021 LOAD REC ACCTSPAYABLE

ACCT_REP_NAME************ JOURNAL_CODE COMMENTS*************
New: EL-ASSAAD, IMAD 2104-- REVISE ACCT. BALANCE

Predictable column data from new row:
<DESCRIPTION>: X'4C4F41442052454320E282AC202020'

Type: Update At: x'C328A04BCAC8' Time: 2013-01-18 16.34.23.885
Status: Committed

Field Data: TRANSACT_DATE UPDNUM DESCRIPTION** SHORT_DEPT_NAME
Old: 2012-10-21 000021 LOAD REC ACCTSPAYABLE
New: 2012-10-21 UPD021 LOAD REC ACCTSPAYABLE

ACCT_REP_NAME************ JOURNAL_CODE COMMENTS*************
Old: EL-ASSAAD, IMAD 2104-- REVISE ACCT. BALANCE
New: EL-ASSAAD, IMAD 2104-- REVISE ACCT. BALANCE

Predictable column data from new row:
<DESCRIPTION>: X'4C4F41442052454320E282AC202020'
Found untranslatable column data from old row:

<DESCRIPTION> : X'4C4F41442052454320E2B2AC202020'

Sample Detail report, wide format

Figure 128 on page 347 shows an example of a Detail report, and uses the report's wide format, which can be more convenient for tables with many columns.

Figure 128: Example Detail report, wide format

Detail report contents

The Detail report presents the following information for each log record that Log Master encounters:

- Information from the log record header, including record type (insert, update, delete, or exchange), log RBA/LRSN, and approximate time frame

- If the unit of recovery is not an ordering field, the report presents

  — Object-identification information, such as table authorization ID, table name, table OBID, database name, database DBID, table space name, and table space PSID
— Unit of recovery information, such as unit of recovery identifier (URID), plan
name, date and time of the start of the unit of recovery, authorization ID,
connection type (for example, CICS, IMS, Batch, and so forth), connection ID,
and correlation ID

■ Record identification, including record ID (RID)

Note
Reports contain a maximum of 255 bytes for any field.

■ Column data, depending on the log record type:

— For update actions, old and new values for all columns
— For insert actions, new values for all columns
— For delete actions, old values for all columns

Tip
To control the column data that appears in this report, use the include/Exclude
Column field on the Report Output panel. If you need to show most of a table’s
columns in the report, indicate which columns you want to exclude.
Conversely, if you need to show only a few of a table’s columns in the report,
indicate which columns you want to include. (For an example of including or
excluding columns, see “Using the online interface to specify the log scan step”
on page 213.)

For each report ordering field that you specify, the report presents a total line
showing gross record counts (for example, insert, delete, update, exchange, RI-
related changes, or trigger-related changes). The report also presents final totals by
log record type.

Detail report ordering

You can base the order of the information in the report on a combination of primary
key, unit of recovery options, and object-identification options.

Specify a maximum of three ordering options in any combination. The default report
ordering is table name, and then unit of recovery identifier (URID).

You can order this report by the following object-identification options:

■ Table name
■ Table OBID
■ Database name
You can order this report by the following unit of recovery (URID) options:

- URID
- Plan name
- Authorization ID
- Connection type
- Connection ID
- Correlation ID
- Data sharing member name
- Data sharing member ID
- Subsystem name (SSID)

The primary key value is valid only as the last report ordering field.

Image Copy report

The Image Copy report supplies information about the volume of table space activity between image copies.

For the table spaces selected (directly or indirectly) by your filter, the report shows data on all applicable image copies logged in the SYSIBM.SYSCOPY table of the DB2 catalog during your time frame. For each image copy listed, the report shows the activity, such as the number of insert, update, and delete actions, since the preceding image copy.

**Note**

To generate this report, ensure that your filter refers to at least one specific DB2 object (such as a table name or a column name). This action ensures that you define (either directly or indirectly) a set of table spaces for which Log Master can obtain image copy information.

Use the Image Copy report to find table spaces that:

- Have too many updates between copies, which can lead to excessive recovery times
- Are being copied more often than necessary based on the number of updates between copies

To request an Image Copy report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Image Copy.

By default, the report includes the activity associated with both committed and aborted transactions. To override the default, enter Y in the Include Rollback field of the Report Output panel.

Figure 129 on page 350 shows an example of an Image Copy report.

Figure 129: Example Image Copy report by activity (descending)

Date: 2013-01-18   LOG MASTER FOR DB2 - V11.01.00 Page: 1
Time: 09.54.57    Copyright BMC Software, Inc. 1995-2013

Image Copy Report, By Activity (Descending)
Compensated Log Records Included

From: Mark DB2DBA.IMGCPY.THREE(0) (x'C32FD18F9EB3')
To: Mark DB2DBA.IMGCPY.FOUR(0) (x'C32FD195D985')

Report Information:
Work ID : DB2DBA.$$WORKID0014   Run Number: 4  Subsystem: DXW
Description: DB2DBA GENERATE MONTHLY REPORTS

Tablespace Name: DB2DBADB.DB2DBAS3 Dsnum: 3     DBID: 363  PSID: 17
Full Copy  : RBA/LRSN: x'C32FD1938525' Timestamp: 2013-01-18 09.52.08.750885
  Shrlevel: Reference
  Type : Local Primary   Dsnum : 3
  File Seq: 1   DevType : 3390
  Dsn : DB2DBA.DB2DBAS3.P03.FCOPY4
  Ins : 0  Del : 0  Upd : 401
  Exc : 0
  Ins/Tr: 0  Del/Tr: 0  Upd/Tr: 0
  Tot : 401  Del/RI: 0  Upd/RI: 0

Tablespace Name: DB2DBADB.DB2DBAS3 Dsnum: 2     DBID: 363  PSID: 17
Full Copy  : RBA/LRSN: x'C32FD1935924' Timestamp: 2013-01-18 09.52.08.572990
  Shrlevel: Reference
  Type : Local Primary   Dsnum : 2
  File Seq: 1   DevType : 3390
  Dsn : DB2DBA.DB2DBAS3.P02.FCOPY4
  Ins : 3  Del : 0  Upd : 182
  Exc : 0
  Ins/Tr: 0  Del/Tr: 0  Upd/Tr: 0
  Tot : 185  Del/RI: 0  Upd/RI: 0

Tablespace Name: DB2DBADB.DB2DBAS2 Dsnum: 2     DBID: 363  PSID: 11
Full Copy  : RBA/LRSN: x'C32FD192f667' Timestamp: 2013-01-18 09.52.08.167781
  Shrlevel: Reference
  Type : Local Primary   Dsnum : 2
  File Seq: 1   DevType : 3390
Image Copy report

For each table space, the report presents the following information:

- Table space information, including database name, table space name, DBID, and PSID

  For partitioned table spaces, the report presents one set of information for each partition. The order of the partitions within the table space depends on the report ordering that you select.

- Image copy information

  Within each table space (or within each partition of a table space), the report presents information about all of the image copies pertaining to that table space or partition. The information includes the type of the image copy (full or incremental, primary or secondary, remote or local), RBA/LRSN, and other information.

- Activity count information

  Within each image copy, the report presents activity counts since the previous image copy in time sequence. Remember that the previous image copy in sequence is not necessarily the preceding image copy listed in the report. The activity counts include

  — Number of log records by update type (insert, update, delete, or exchange)
  — Number of deletes and updates due to referential integrity (RI)
  — Number of inserts, deletes and updates due to trigger activity
  — Total activity count
Image Copy report ordering

You can base the ordering of the Image Copy report on the following items:

- **Activity (Descending) order**
  The report lists table spaces in descending order, based on total activity count for the table space. For example, first the report lists the table space that experienced the most activity between its applicable image copies. Then it lists the table space with the next largest amount of activity, and so forth. For partitioned table spaces, the report lists the partitions within each table space in descending order by total activity count for the partition.

  Within each table space (or within each partition of a table space), the report lists image copies in ascending order, based on time sequence.

- **Table space name**
  The report lists table spaces in ascending order, based on table space name. For partitioned table spaces, the report lists the partitions within each table space in ascending order based on partition number.

  Within each table space (or within each partition of a table space), the report lists image copies in ascending order, based on time sequence.

The default report ordering is by Activity (Descending).

Log Bytes report

The Log Bytes report supplies information about the distribution of log records in the DB2 log. The Log Bytes report focuses on the type, size, and distribution of log records, and not on the actual data contained in the log records.

Filters that you specify in the log scan are not used for selecting records that Log Master reports in a Log Bytes report.

Use the Log Bytes report for tuning purposes, to help you reduce unnecessary overhead in the log. The Log Bytes report displays the following information about log records:

- Counts of log record types
- Total number of bytes used by the log records
- Percentage of space the log records use

To request a Log Bytes report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the **Define Report and File Outputs** option, and then, on the Output Options panel, select **Log Bytes**.
When you generate a Log Bytes report, Log Master cannot include any other forms of output in the same log scan, such as other reports or SQL. To generate other forms of output that you need in the same work ID, add an additional, separate log scan step.

Figure 130 on page 353 shows an example of a Log Bytes report.

**Figure 130: Example Log Bytes report**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Log Bytes Report, By Correlation ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-01-17</td>
<td>13.38.39</td>
<td></td>
</tr>
</tbody>
</table>

From: Date 2013-01-17 10.45.00.000000
To: Date 2013-01-17 11.00.00.000000
Total Bytes: 12459239

Report Information:
- Work ID: RDAXQZ.LGB00RPT
- Run Number: 1
- Subsystem: DXF3

**URID Records:**

### Correlation ID: '#URM001'

<table>
<thead>
<tr>
<th>Records</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urid</td>
<td>711</td>
<td>68176</td>
</tr>
<tr>
<td>Savepoint</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DM Committed</td>
<td>15064</td>
<td>4559807</td>
</tr>
<tr>
<td>DM Rolledback</td>
<td>13</td>
<td>9691</td>
</tr>
<tr>
<td>Compensation</td>
<td>29</td>
<td>3767</td>
</tr>
</tbody>
</table>

### Correlation ID: '#URM000U1'

<table>
<thead>
<tr>
<th>Records</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urid</td>
<td>132</td>
<td>12672</td>
</tr>
<tr>
<td>Savepoint</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DM Committed</td>
<td>3068</td>
<td>326294</td>
</tr>
<tr>
<td>DM Rolledback</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Compensation</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Correlation ID: '020.STRTDB04'

<table>
<thead>
<tr>
<th>Records</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urid</td>
<td>6</td>
<td>576</td>
</tr>
<tr>
<td>Savepoint</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DM Committed</td>
<td>270</td>
<td>31823</td>
</tr>
<tr>
<td>DM Rolledback</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Compensation</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Correlation ID: '021.CLSLGR00'

<table>
<thead>
<tr>
<th>Records</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urid</td>
<td>267</td>
<td>25632</td>
</tr>
<tr>
<td>Savepoint</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DM Committed</td>
<td>270</td>
<td>31823</td>
</tr>
<tr>
<td>DM Rolledback</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Compensation</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**URID Totals:**

<table>
<thead>
<tr>
<th>Records</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urid</td>
<td>1830</td>
<td>175600</td>
</tr>
<tr>
<td>Savepoint</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DM Committed</td>
<td>30166</td>
<td>11599904</td>
</tr>
<tr>
<td>DM Rolledback</td>
<td>13</td>
<td>9691</td>
</tr>
<tr>
<td>Compensation</td>
<td>29</td>
<td>3767</td>
</tr>
</tbody>
</table>

**Data Management Records:**
### Log Bytes report

#### Tablespace: DSNDB01.
**DBID:PSID: 0001:001F**

<table>
<thead>
<tr>
<th>Record Type</th>
<th>Count</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inserts</td>
<td>88</td>
<td>354376</td>
<td>2.84428</td>
</tr>
<tr>
<td>Updates</td>
<td>178</td>
<td>13172</td>
<td>0.10572</td>
</tr>
<tr>
<td>Deletes</td>
<td>83</td>
<td>337848</td>
<td>2.71163</td>
</tr>
<tr>
<td>Space Map Records</td>
<td>257</td>
<td>15677</td>
<td>0.12583</td>
</tr>
<tr>
<td>Pagedset Open</td>
<td>1</td>
<td>170</td>
<td>0.00136</td>
</tr>
</tbody>
</table>

#### Tablespace: DSNDB01.
**DBID:PSID: 0001:0044**

<table>
<thead>
<tr>
<th>Record Type</th>
<th>Count</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index Updates</td>
<td>385</td>
<td>132281</td>
<td>1.06171</td>
</tr>
<tr>
<td>Pagedset Open</td>
<td>1</td>
<td>170</td>
<td>0.00136</td>
</tr>
</tbody>
</table>

#### Tablespace: DSNDB01.
**DBID:PSID: 0001:00AF**

<table>
<thead>
<tr>
<th>Record Type</th>
<th>Count</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inserts</td>
<td>42</td>
<td>77198</td>
<td>0.61960</td>
</tr>
<tr>
<td>Updates</td>
<td>225</td>
<td>683610</td>
<td>5.48677</td>
</tr>
<tr>
<td>Deletes</td>
<td>37</td>
<td>94004</td>
<td>0.75449</td>
</tr>
<tr>
<td>Space Map Records</td>
<td>64</td>
<td>3904</td>
<td>0.03133</td>
</tr>
<tr>
<td>Pagedset Open</td>
<td>1</td>
<td>170</td>
<td>0.00136</td>
</tr>
</tbody>
</table>

#### Tablespace: DSNDB06.SYSDBASE
**DBID:PSID: 0006:0009**

<table>
<thead>
<tr>
<th>Miscellaneous Records: Type Subtype</th>
<th>Count</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0002  0009</td>
<td>12</td>
<td>1224</td>
<td>0.00982</td>
</tr>
<tr>
<td>0102  0005</td>
<td>41</td>
<td>6970</td>
<td>0.05594</td>
</tr>
<tr>
<td>0108  0002</td>
<td>1</td>
<td>134</td>
<td>0.00108</td>
</tr>
<tr>
<td>0200  0009</td>
<td>98</td>
<td>10437</td>
<td>0.08377</td>
</tr>
<tr>
<td>0400  000A</td>
<td>27</td>
<td>1674</td>
<td>0.01344</td>
</tr>
<tr>
<td>0600  0011</td>
<td>5</td>
<td>385</td>
<td>0.00309</td>
</tr>
<tr>
<td>1400  001E</td>
<td>292</td>
<td>26864</td>
<td>0.21562</td>
</tr>
<tr>
<td>2100  001D</td>
<td>582</td>
<td>73381</td>
<td>0.58897</td>
</tr>
<tr>
<td>2400  0015</td>
<td>36</td>
<td>91152</td>
<td>0.73160</td>
</tr>
<tr>
<td>2400  001D</td>
<td>779</td>
<td>98933</td>
<td>0.79405</td>
</tr>
<tr>
<td>2600  0015</td>
<td>38</td>
<td>96216</td>
<td>0.77225</td>
</tr>
<tr>
<td>2600  001D</td>
<td>201</td>
<td>33768</td>
<td>0.27103</td>
</tr>
<tr>
<td>4200  0019</td>
<td>2</td>
<td>1800</td>
<td>0.01445</td>
</tr>
</tbody>
</table>

#### Miscellaneous Record Totals:

<table>
<thead>
<tr>
<th>Count</th>
<th>Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2114</td>
<td>442938</td>
<td>3.56510</td>
</tr>
</tbody>
</table>

#### Page Overhead and Free Bytes:

<table>
<thead>
<tr>
<th>Page Count</th>
<th>CI Overhead</th>
<th>Free Bytes</th>
<th>Log Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>3154</td>
<td>66234</td>
<td>89741</td>
<td>1.25188</td>
</tr>
</tbody>
</table>
Log Bytes report contents

The information presented in the Log Bytes report is grouped into the following sections:

- URID records
- Data management records, reported by table space (DBID and PSID), and divided into the following record subtypes:
  - Inserts, updates, and deletes (This section includes XML records.)
  - Compensation
  - Index
  - Space map
  - Page format
  - Pointer update
  - Page compaction
  - Pageset (open, close, and write)
  - Locking
  - LOB
  - Database exception (DBE) table update
  - DBE table with piece data
- Checkpoint records
- Diagnostic records
- SYSCOPY records
- System event records
- Miscellaneous records
- DB2 page overhead information, including totals for:
  - Number of pages
  - Amount of CI bytes on those pages
  - Amount of free space on the pages

Log Bytes report ordering

Log Master orders most sections of the Log Bytes report by DB2 record type and subtype. Log Master orders records in the diagnostic records section by member ID, and includes information about each member.
You can order this report by the following unit of recovery (URID) options:

- Plan name
- Authorization ID
- Connection type
- Connection ID
- Correlation ID

**Object Activity Summary report**

The Object Activity Summary report supplies information about the data management activity (insert, update, delete, and exchange actions) related to the set of DB2 objects that you select with your time frame and filter.

This report presents a raw count of all data management (DM) log records in the DB2 log that relate to the objects that you specify.

Use this report to obtain a summary of all of the data management activity related to a given set of DB2 objects, including the following:

- Log records from committed transactions, records from aborted transactions, and any compensation records regardless of transaction status
- Log records regardless of whether the DB2 objects are defined in the DB2 catalog at the time when the report is created
- Log records from transactions that are not complete within your specified time frame (transactions that are not yet committed or aborted)

To request an Object Activity Summary report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the **Define Report and File Outputs** option, and then, on the Output Options panel, select **Object Activity Summary**.

Be aware of the following points as you define an Object Activity Summary report:

- You cannot generate an Object Activity Summary report if your filter selects log records based on a column’s value (for example, WHERE TABLE01.QUANTITY > 500).
- You cannot generate this report if Log Master is reading log records from a logical log file previously created by Log Master or an application program.
- To help you detect URIDs containing an extremely large number of uncommitted transactions, Log Master does not honor the value of the URIDTHR installation
option when it generates an Object Activity Summary report. For more information about the URIDTHR option, see the chapter about operational considerations and installation in the Log Master for DB2 Reference Manual.

By default, Log Master formats the Object Activity Summary report for printed output. You can override the default to include only data (no report headings, column headings, or blank lines) by using the **Format** field on the Report Output panel. Log Master provides two formats, both of which use character representation to make data easier to move to other platforms.

— Enter **C** in the **Format** field to obtain data in the Comma Separated Value (CSV) format available in some database software. Individual items of data are separated by commas. For an example, see Figure 132 on page 358.

— Enter **S** in the **Format** field to obtain data in the Standard Definition Format (SDF) available in some database software. Individual columns of data are filled so that each column has the same position and length on all lines of the output. For an example, see the Example Summary report (SDF format) in “Summary report” on page 370.

— Enter **Y** in the **Format CSV/SDF Include Total** field on the Report Output panel to include subtotal lines and report total lines in the output. By default, the output does not include total lines.

Figure 131 on page 357 shows an example of an Object Activity Summary report. Figure 132 on page 358 shows the same report produced with the CSV format, without subtotals or report totals. For an example of the SDF report output, see “Summary report” on page 370.

**Figure 131: Example Object Activity Summary report**

<table>
<thead>
<tr>
<th>Date: 2013-01-18</th>
<th>LOG MASTER FOR DB2 - V11.01.00</th>
<th>Page: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 16.05.25</td>
<td>Copyright BMC Software, Inc. 1995-2013</td>
<td></td>
</tr>
</tbody>
</table>

Object Activity Summary Report, By Table Name

From: Date 2013-01-18 15.27.14.000000
To: Date 2013-01-18 15.27.40.000000

Report Information:

<table>
<thead>
<tr>
<th>Work ID</th>
<th>DB2DBA.$$WORKID0006</th>
<th>Run Number: 1</th>
<th>Subsystem: DXW2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>DB2DBA GENERATE MONTHLY REPORTS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table Name: DB2DBADB.DB2DBAB1          DBID.OBID: (363.3)
Tablespace Name: DB2DBADB.DB2DBAT1     DBID.PSID: (363.2)

<table>
<thead>
<tr>
<th>Ins</th>
<th>Del</th>
<th>Upd</th>
<th>Tot</th>
<th>Del/Tr</th>
<th>Upd/Tr</th>
<th>Del/RI</th>
<th>Upd/RI</th>
<th>Compensation Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td></td>
<td>4</td>
<td>91</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix B Reference of default Log Master reports 357
Object Activity Summary report contents

Based on the report ordering options that you specify, Log Master presents the following counts of data management (DM) log records in the Object Activity Summary report:

- Number of insert, delete, update, and exchange actions (standard log records)
- Number of delete and update actions due to RI (standard log records)
- Number of insert, delete, and update actions due to trigger activity (standard log records)
- Total standard log records
- Number of insert, delete, update, and exchange actions (compensation log records)
- Number of delete and update actions due to RI (compensation log records)
- Number of insert, delete, and update actions due to trigger activity (compensation log records)
- Total compensation records

The printed report presents a line for each report ordering field along with the associated record counts. For each report ordering field other than the last one, the first occurrence of a unique value displays as the header. Final totals are presented by update type (insert, delete, update, and exchange).

Figure 132: Example Object Activity Summary report (CSV format)

```
"DB2DBADB","DB2DBAB1",8,4,59,0,0,0,0,0,20,91,1,3,12,0,0,0,0,0,3.19
"DB2DBADB","DB2DBAB2",3,1,22,1,0,0,0,0,0,27,0,2,7,0,0,0,0,0,0.9
```
The SDF or CSV format reports present a line for each report ordering field that contains (from left to right): your report ordering options, followed by log record counts in the same order as the preceding list. In SDF format reports, the length of report ordering options varies depending on the options; the record count columns are 10 bytes long.

**Object Activity Summary report ordering**

Specify a maximum of three ordering options in any combination. You can order this report based on a combination of unit of recovery options and object-information options.

You can order this report by the following object-identification options:

- Table name
- Table OBID
- Database name
- Database DBID
- Table space name
- Table space DSNUM
- Table space PSID
- Create RBA

You can order this report by the following unit of recovery (URID) options:

- Unit of recovery identifier (URID)
- Plan name
- Authorization ID
- Connection type
- Connection ID
- Correlation ID
- Data sharing member name
- Data sharing member ID
- Subsystem name (SSID)

The default ordering for the report is by table name.
Open Transaction report

The Open Transaction report lists the transactions (units of recovery) on the DB2 subsystem that are not committed or aborted at the end point of your log scan, including any transactions that begin before the start point of your log scan.

Use an Open Transaction report to identify the work that might not be represented on other reports.

To request an Open Transaction report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Open Transaction.

Be aware of the following points as you define an Open Transaction report:

- Log Master reads DB2 checkpoint records before the start point of your log scan to obtain information about any transactions that were open when the checkpoint record was created.

- The report can include open transactions that do not affect the DB2 objects selected (directly or indirectly) by your filter. Log Master includes these transactions because an open transaction might include activity affecting your selected objects past the end point of your log scan.

- The transactions included in the report can vary depending on whether your filter selects log records based on criteria that relate to the unit of recovery (for example, by plan name or authorization ID).
  
  — If your filter selects based on only criteria that relate to the unit of recovery, the report includes only the open transactions selected by your filter.
  
  — If your filter includes at least one criteria that does not relate to the unit of recovery (such as table name or column name), the report includes all open transactions on the current DB2 subsystem.

- The activity counts in the report are based on the log records selected by your filter and the range of your log scan. Treat the counts as estimates of the activity associated with open transactions; do not use them as definitive data.

Figure 133 on page 360 shows an example of an Open Transaction report.

Figure 133: Example Open Transaction report by correlation ID

<table>
<thead>
<tr>
<th>Date: 2013-01-18</th>
<th>LOG MASTER FOR DB2 - V11.01.00</th>
<th>Page: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 16.21.31</td>
<td>Copyright BMC Software, Inc. 1995-2013</td>
<td></td>
</tr>
</tbody>
</table>

Open Transaction Report, By Correlation ID
From: Mark DB2DBA.START.RBA(0) (x'C32EE60188A4')
To: Current x'C32EE606BFBF'

Report Information:
Work ID    : DB2DBA.$$WORKID0012         Run Number:    2  Subsystem: DXW2
Description:   DB2DBA GENERATE MONTHLY REPORTS

URID LRSN: x'C32EE603D105' Data Sharing Member: DXW2
URID     : x'001125202C60' Date   : 2013-01-18   Conn Type: BATCH
Status   : Open            Time   : 16.18.15.747 Conn ID  : DB2CALL
Plan Name: DB2SQLG8        Auth ID: DB2DBA2      Corr ID  : DB2DBAO0
Ins   :            25  Del   :             4  Upd   :            16
Exc   :             0
Ins/Tr:             0  Del/Tr:             0  Upd/Tr:             0
Tot   :            45  Del/RI:             0  Upd/RI:             0

URID LRSN: x'C32EE6034EE8' Data Sharing Member: DXW2
URID     : x'001125200616' Date   : 2013-01-18   Conn Type: BATCH
Status   : Open            Time   : 16.18.15.214 Conn ID  : DB2CALL
Plan Name: DB2SQLG8        Auth ID: DB2DBA2      Corr ID  : DB2DBAO1
Ins   :             1  Del   :             0  Upd   :             0
Exc   :             0
Ins/Tr:             0  Del/Tr:             0  Upd/Tr:             0
Tot   :             1  Del/RI:             0  Upd/RI:             0

URID LRSN: x'C32EE6034DD3' Data Sharing Member: DXW2
URID     : x'001125200000' Date   : 2013-01-18   Conn Type: BATCH
Status   : Open            Time   : 16.18.15.210 Conn ID  : DB2CALL
Plan Name: DB2SQLG8        Auth ID: DB2DBA2      Corr ID  : DB2DBAO2
Ins   :            25  Del   :             2  Upd   :             6
Exc   :             0
Ins/Tr:             0  Del/Tr:             0  Upd/Tr:             0
Tot   :            33  Del/RI:             0  Upd/RI:             0

URID LRSN: x'C32EE603DDDD' Data Sharing Member: DXW2
URID     : x'001125202997' Date   : 2013-01-18   Conn Type: BATCH
Status   : Open            Time   : 16.18.15.747 Conn ID  : DB2CALL
Plan Name: DB2SQLG8        Auth ID: DB2DBA2      Corr ID  : DB2DBAO4
Ins   :           105  Del   :            43  Upd   :            69
Exc   :             0
Ins/Tr:             0  Del/Tr:             0  Upd/Tr:             0
Tot   :           217  Del/RI:             0  Upd/RI:             0

URID LRSN: x'C32EE6046917' Data Sharing Member: DXW2
URID     : x'00112521954D' Date   : 2013-01-18   Conn Type: BATCH
Status   : Open            Time   : 16.18.16.370 Conn ID  : DB2CALL
Plan Name: DB2SQLG8        Auth ID: DB2DBA2      Corr ID  : DB2DBAO5
Ins   :            99  Del   :            37  Upd   :            66
Exc   :             0
Ins/Tr:             0  Del/Tr:             0  Upd/Tr:             0
Tot   :           202  Del/RI:             0  Upd/RI:             0

Total URID's Encountered: 5
The report presents the following information for each unit of recovery open at the end of the log scan:

- Unit of recovery identifier (URID)
- Status (always OPEN in this report)
- Plan name
- Date and time that the unit of recovery started
- Authorization ID
- Connection type (Batch, CICS, IMS)
- Connection ID
- Correlation ID
- Number of log records by update type (insert, update, delete, or exchange)
- Number of delete and update actions due to referential integrity (RI)
- Number of insert, delete and update actions due to trigger activity
- Total number of log records in the unit of recovery
- Text to indicate whether the unit of recovery is being committed or aborted

The numbers of log records in this report are based on your time frame and your filter. By definition, a transaction that is open at the end of your time frame can contain more log records. In addition, if a filter selects only some of the DB2 objects included in a transaction, Log Master counts only the log records for the selected objects.

The default report ordering is by URID. Specify one of the following unit of recovery options:

- URID
- Plan name
- Authorization ID
- Connection type (for example, Batch, CICS, IMS)
- Connection ID
- Correlation ID
Quiet Point report

The Quiet Point report provides information about the ranges within your time frame when the DB2 log shows no activity for a set of table spaces specified by your filter.

The report lists only quiet ranges in common for all table spaces specified in the filter. Use the Quiet Point report to identify common ranges of consistency between multiple table spaces for use in recovery planning and redo operations.

Note

To generate this report, ensure that your filter refers to at least one specific DB2 object (such as a table name or a column name). This action causes you to define (either directly or indirectly) a set of table spaces that Log Master can search for quiet ranges.

To request a Quiet Point report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Quiet Point.

Be aware of the following points as you define a Quiet Point report:

- By default, the Quiet Point report includes all quiet ranges for the specified DB2 objects (no minimum). However, you can exclude shorter quiet ranges from the report by specifying a minimum duration for quiet ranges by using the Duration field of the Report Output panel. Log Master suppresses any quiet ranges that are shorter than the duration that you specify. Consider excluding shorter quiet ranges that represent momentary pauses between parts of an ongoing "logical" transaction. Doing so enables you to concentrate on times when there is truly no activity for your table spaces. If you use a report template, you can sort quiet ranges based on duration or number of open transactions.

- By default, the Quiet Point report includes only completely quiet ranges. However, you can include almost-quiet ranges in the Quiet Point report by specifying a maximum number of transactions (units of recovery) to allow in the MaxUrids field of the Report Output panel. Log Master includes a quiet range in the report when the number of open transactions that affect your specified DB2 objects during the range is less than or equal to the number that you specify. Consider using this option to report on periods of high activity for your specified objects, when completely quiet ranges might not exist. For each quiet range, the report lists the number of open transactions that are present during the range.

- The Quiet Point report lists date and time values for the start point and end point of each quiet range. (For examples, see Figure 134 on page 365.) If a Quiet Point report is generated in a non-data-sharing environment and a quiet range ends when a DB2 Load or Reorg utility starts running, Log Master prints "n/a" for the
date and time value of the end point. Log Master takes this action because of the way that DB2 records the execution of these utilities.

- You can insert a quiesce record in SYSIBM.SYSCOPY at the same time that you generate the Quiet Point report by entering Y in the **Quiesce at Last Quiet Point** field of the Report Output panel.

  Log Master inserts DB2 quiesce records into the SYSIBM.SYSCOPY table (using the RBA/LRSN of the latest quiet range included in the report). The quiesce records define quiet points for each table space defined or implied in your filter. The quiesce record corresponds to the first or last completely quiet range included in the report, depending on your sort order, first for descending, last for ascending.

  Log Master also inserts index quiesce records into SYSIBM.SYSCOPY for any COPY YES indexes associated with the table spaces. Log Master records the correct quiet point registration so all recoverable objects have the proper QUIESCE entry in SYSCOPY.

  Do not use **Quiesce at Last Quiet Point** if Log Master is performing dynamic filter processing (if the value of either the FILTER METHOD keyword or the FLTRMTHD installation option is DYNAMIC.)

  Log Master does not insert a quiesce record if

  — Log Master finds no quiet ranges that meet your criteria

  — The report includes only almost-quiet ranges

- When generating a Quiet Point report, you can add a non-invasive quiet point (an IBM QUIESCE-free quiesce point) by defining a log mark. From the Report Output panel, you define this log mark by specifying a log mark name in the **Log Mark at Last Quiet Point** field and providing a description in the **Log Mark Desc** field.

  When you define a log mark, Log Master stores this information in the ALPMARK table in the Log Master Repository. You can use this log mark in place of the RBA or LRSN value in subsequent Log Master jobs. Note the following restrictions:

  — Log Master does not insert a log mark if no quiet ranges meet the specified criteria, or if the report includes only almost-quiet ranges.

  — Do not use **Log Mark at Last Quiet Point** if Log Master is performing dynamic filtering processing (that is, if the value of either the FILTER METHOD keyword or the FLTRMTHD installation option is DYNAMIC).

- If you use a report template to customize the Quiet Point report, you can direct Log Master to sort the quiet ranges based on duration. If you sort in ascending order, Log Master uses the longest quiet range in your report as the point to insert a quiesce record in SYSIBM.SYSCOPY.
When it does not find a quiet point, Log Master normally issues message BMC097547W and completes with return code 4. However, when generating a Quiet Point report, you can specify the return code or message severity code that you want Log Master to use. Specifying the message severity code or return code in the **No Quiet Point RC** field enables you to include subsequent conditional job steps based on the issued message or return code.

Note the following additional information about the values that you specify for this field:

— If you specify a return code rather than a message severity code, the resulting message severity code is as follows:

<table>
<thead>
<tr>
<th>Specified return code</th>
<th>Message severity code</th>
<th>Severity code description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>I</td>
<td>Information</td>
</tr>
<tr>
<td>&gt;0 and &lt;=4</td>
<td>W</td>
<td>Warning</td>
</tr>
<tr>
<td>&gt;4 and &lt;=8</td>
<td>E</td>
<td>Error</td>
</tr>
<tr>
<td>&gt;8 and &lt;=12</td>
<td>S</td>
<td>Severe error</td>
</tr>
<tr>
<td>&gt;12</td>
<td>U</td>
<td>Unrecoverable error</td>
</tr>
</tbody>
</table>

— Log Master completes with the highest return code set during processing. Therefore, for example, if you specify a value of 5 for **No Quiet Point RC** but Log Master encounters an unrecoverable error, the job ends with return code 16, not 5.

Log Master cannot produce a Quiet Point report when the input source for your work ID is either individual DB2 log files or a logical log file generated by Log Master or another program.

The following figure shows an example of a Quiet Point report. If you request the insertion of a quiesce record or log mark, the Quiet Point report includes a message to document your request as shown towards the end of the following example:

**Figure 134: Example Quiet Point report by log RBA**
Quiet Point report contents

For each table space specified, the report presents table space information, including database name, table space name, DSNUM, DBID, and PSID. For each quiet point found, the report presents the following quiet point information:

- Starting and ending RBA/LRSNs for the range of the quiet point
- End time of the last unit of recovery identifier (URID) using the table space
- Start time of the next log page referencing the table space

For each COPY YES index, the report includes information similar to that for table spaces, as well as the index name, DBID, and ISOBID.

Quiet Point report ordering

Log Master sorts the quiet ranges in a standard default Quiet Point report by RBA/LRSN value. The quiet ranges in the report are common to all of the table spaces selected (directly or indirectly) by your filter.
If you use a report template to customize the Quiet Point report, you can direct Log Master to sort the quiet ranges based on duration or number of open transactions. If you sort by duration in ascending order, Log Master uses the longest quiet range in your report as the point to insert a quiesce record in SYSIBM.SYSCOPY.

**Rollback report**

The Rollback report provides information about all rollback actions performed over a specified period of time, including the frequency and cost (number of associated transactions).

Depending on the report ordering options that you request, counts are maintained for each unit of recovery to indicate the activity volume associated with rollback actions. Log Master reports present only the data defined by your time frame and filter. The Rollback report contains only aborted transactions and cannot include committed transactions.

Use Rollback reports to display information that:

- Indicates the size, and thus the cost, of rollback actions
- Enables you to pinpoint plans, jobs, and transactions that are frequently rolled back

To request a Rollback report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the **Define Report and File Outputs** option, and then, on the Output Options panel, select **Rollback**.

**Figure 135 on page 367** shows an example of a Rollback report.

**Figure 135: Example Rollback report by activity (descending)**

```
Date: 2013-01-18            LOG MASTER FOR DB2 - V11.01.00       Page: 1
Time: 16.08.40         Copyright BMC Software, Inc. 1995-2013

Rollback Report, By Activity (Descending)
Only Compensated Log Records Included

From: Date 03/18/2011 15:27:14.000000
To: Date 03/18/2011 15:27:40.000000

Report Information:
Work ID    : DB2DBA.$$WORKID0009         Run Number:    1  Subsystem: DXW2
Description:   DB2DBA GENERATE MONTHLY REPORTS

URID LRSN: x'C3289156610A' End: x'C328915662C1' Data Sharing Member: DXW2
```
Rollback report contents

Log Master presents different information in the Rollback report depending on the report ordering options that you request. If the unit of recovery identifier (URID) is the last report ordering field, or if you request ordering by Activity (Descending), the report presents full unit of recovery information as follows:

- **URID**
- **Status** (always ABORTED for this report)
- **Plan name**
- **Date and time that the unit of recovery started**
- **Authorization ID**
- **Connection type** (Batch, CICS, IMS)
- Connection ID
- Correlation ID
- Number of log records by update type (insert, update, delete, or exchange)
- Number of update and delete actions due to referential integrity (RI)
- Number of insert, update, and delete actions due to trigger activity
- Total number of log records encountered

In all other cases, the report presents the following summary information:

- Unique value of the report ordering field
- Number of URIDs encountered that match the report ordering field
- Total number of data manipulation language (DML) log records, along with the total activity for the report ordering field
- Average number of DML log records, along with the total activity for the report ordering field
- Largest number of DML log records, along with the total activity for a URID within the report ordering field

**Rollback report ordering**

Specify a maximum of three ordering options in any combination.

You can order the report using one or more of the following unit of recovery options:

- Unit of recovery identifier (URID)
- Plan name
- Authorization ID
- Connection type (Batch, CICS, IMS)
- Connection ID
- Correlation ID

Specify the URID field either by itself, or as the last ordering field (preceded by up to two of the listed options).

You can also order the report by Activity (Descending). If you do, you cannot request any other report ordering field.

The default report ordering is by Activity (Descending).
Summary report

The Summary report provides summarized transaction count information such as the number of insert, update, and delete actions that are related to the log records that you select with your time frame and filter.

Use Summary reports to provide information about

- Transaction volumes processed by various sort keys
- The quantity of SQL generated for a table space for UNDO and REDO operations

To request a Summary report, from any task dialog (any option from 0 through 7 under the Actions category on the Main Menu), select the Define Report and File Outputs option, and then, on the Output Options panel, select Summary. Log Master includes the Summary report as a default form of output for several task dialogs.

This report has some similarities to the Object Activity Summary report, but do not confuse the two reports. For more information about the Object Activity Summary report, see “Object Activity Summary report” on page 356.

Be aware that, by default, the Summary report includes the following information, which you can modify by using options on the Report Output panel. For more information about the fields on this panel, from the panel, press F1 to access the online Help.

- The Summary report includes only the data associated with noncompensated log records. To override the default to include compensated log records, enter Y in the Include Rollback field.

- The Summary report includes the log records that satisfy your filter. To override the default, enter Y in the Print REDO Information field. Log Master then selects log records as if it were generating REDO SQL statements. For more information about the log records that Log Master selects, see “Using REDO SQL” on page 162.

- Log Master formats the Summary report for printed output. To override the default to include only data (no report headings, column headings, or blank lines), use the Format field, as follows:
  
  - To obtain data in the Comma Separated Value (CSV) format, enter C. Individual items of data are separated by commas. For an example, see the figure showing example Object Activity Summary report (CSV format) in “Object Activity Summary report” on page 356.
To obtain data in the Standard Definition Format (SDF), enter S. Individual columns of data are filled so that each column has the same position and length on all lines of the output. For an example, see Figure 137 on page 372.

The output does not include total lines. To include subtotal lines and report total lines in the output, enter Y in the **Format CSV/SDF Include Total** field.

**Sample Summary reports**

Figure 136 on page 371 shows a sample Summary report. Figure 137 on page 372 shows the same report produced as standard definition format (SDF) output, including report totals. For an example of Comma Separated Value (CSV) output, see the example Object Activity Summary report (CSV format) in “Object Activity Summary report” on page 356.

**Figure 136: Example Summary report by table name**

<table>
<thead>
<tr>
<th>Date: 2013-01-18</th>
<th>LOG MASTER FOR DB2 - V11.01.00</th>
<th>Page: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 16.02.23</td>
<td>Copyright BMC Software, Inc. 1995-2013</td>
<td></td>
</tr>
</tbody>
</table>

**Summary Report, By Table Name**

---

**From:** Date 2013-01-18 15.27.14.000000  
**To:** Date 2013-01-18 15.27.40.000000

---

**Report Information:**

**Work ID:** DB2DBA.$$WORKID0004  
**Run Number:** 1  
**Subsystem:** DXW2  
**Description:** DB2DBA GENERATE MONTHLY REPORTS

---

**Table Name:** DB2DBADB.DB2DBAB1  
**DBID.OBID:** (363.3)  
**Tablespace Name:** DB2DBADB.DB2DBAT1  
**DBID.PSID:** (363.2)  
**Ins:** 5  
**Del:** 3  
**Upd:** 47

**Exc:** 0

**Ins/Tr:** 0  
**Del/Tr:** 0  
**Upd/Tr:** 17

**Tot:** 72  
**Del/RI:** 0  
**Upd/RI:** 0

---

**Table Name:** DB2DBADB.DB2DBAB2  
**DBID.OBID:** (363.9)  
**Tablespace Name:** DB2DBADB.DB2DBAT2  
**DBID.PSID:** (363.8)  
**Ins:** 1  
**Del:** 1  
**Upd:** 15

**Exc:** 1

**Ins/Tr:** 0  
**Del/Tr:** 0  
**Upd/Tr:** 0

**Tot:** 18  
**Del/RI:** 0  
**Upd/RI:** 0

---

**Report Totals:**

**Ins:** 6  
**Del:** 4  
**Upd:** 62

**Exc:** 1

**Ins/Tr:** 0  
**Del/Tr:** 0  
**Upd/Tr:** 17

**Tot:** 90  
**Del/RI:** 0  
**Upd/RI:** 0

---

Appendix B  Reference of default Log Master reports 371
Summary report contents

Based on the report ordering options that you specify, Log Master presents the following log record counts in the Summary report:

- Number of insert, delete, update, and exchange actions
- Number of delete and update actions due to referential integrity (RI)
- Number of insert, delete, and update actions due to trigger activity
- Total records

The printed report presents a line for each report ordering field, along with the associated record counts. For each report ordering field other than the last one, the first occurrence of a unique value displays as the header. Final totals are presented by log record type (insert, delete, update, and exchange).

The SDF or CSV format reports present a line for each report ordering field that contains (from left to right): report ordering options, followed by log record counts in the same order as the preceding list. In SDF reports, the length of report ordering options depends on each field; the record count columns are 10 bytes long.

Summary report ordering

Specify a maximum of three ordering options in any combination. You can order the Summary report based on a combination of unit of recovery options and object information options.

Valid object identification options include the following:

- Table name
- Table OBID
- Database name
- Database DBID
- Table space name
- Table space DSNUM
- Table space PSID
- Create RBA

You can order this report by the following unit of recovery (URID) options:
- Unit of recovery identifier (URID)
- Plan name
- Authorization ID
- Connection type
- Connection ID
- Correlation ID
- Data sharing member name
- Data sharing member ID
- Subsystem name (SSID)

The default ordering for the report is by table name and URID.
Glossary

A

alternativeTerm

See “work ID.”

anomaly

An update transaction that was not in error and needs to be preserved even though it affects the same rows as a problem transaction that was in error. The Log Master for DB2 product provides backout integrity checking features to detect anomalies and enable customers to take appropriate action.

audit

A search for log records that indicate data that has changed within DB2 tables. In Log Master, you can narrow the search for changed data to, for example, specific users, tables, or plans.

B

backout integrity checking

A process that compares changes of interest to subsequent updates and allows you to determine the impact of correcting a problem transaction on other activity.

base table

When used in the context of LOBs (large objects) and LOB table spaces, a base table is a DB2 table containing a LOB column definition. The actual LOB column data is not stored with the base table. The base table contains a row identifier for each row and an indicator column for each of its LOB columns.
BLOB (Binary Large Object)

A sequence of bytes within DB2 where the size of the sequence ranges from 0 bytes to 2 GB minus one byte. Such a string does not have an associated CCSID.

BSDS (Bootstrap Data Set)

A VSAM data set that administers the DB2 log data sets. The BSDS is a component of DB2 that controls the log data sets and manages an inventory of the logs.

C

CLOB (Character Large Object)

A sequence of bytes within DB2 representing single-byte characters or a mixture of single and double-byte characters where the size can be up to 2 GB minus one byte. Although the size of CLOB values can be anywhere up to 2 GB minus one byte, in general, they are used whenever a character string might exceed the limits of the VARCHAR type.

commit

The operation that ends a unit of work so that the database changes made during that unit of work can be used by other processes. Contrast with rollback.

compensated log record

A record in the DB2 log that reflects a database change that DB2 subsequently “reverses” or “compensates for.” DB2 reverses changes in response to several situations, including ROLLBACK statements, ROLLBACK TO SAVEPOINT statements, or some negative SQL return codes. Contrast with compensation log record and noncompensated log record.

compensation log record

A record in the DB2 log that reflects a database change made by DB2 to “reverse” or “compensate for” a previous change. DB2 creates compensation log records in response to several situations, including ROLLBACK statements, ROLLBACK TO SAVEPOINT statements, or some negative SQL return codes. Contrast with compensated log record and noncompensated log record.

completion processing

See row completion processing.
**Data Capture Changes (DCC)**

An attribute of a DB2 table that determines how much data DB2 logs when a row in the table is changed using an UPDATE statement. If the DCC attribute is set, and a table row is changed, the DB2 log contains at least one image of the entire row. If a table is defined with the DCC attribute, Log Master does not need to perform row completion processing on the log records related to that table. *Contrast with* Data Capture None (DCN).

**Data Capture None (DCN)**

An attribute of a DB2 table that determines how much data DB2 logs when a row in the table is changed using an UPDATE statement. If the DCN attribute is set, and a table row is changed, DB2 logs the changed portion of that row (from the first changed byte to either the last changed byte or to the end of the row). If a table is defined with the DCN attribute, Log Master performs row completion processing on the log records related to that table (to attempt to obtain the entire table row). *Contrast with* Data Capture Changes (DCC).

**DBCLOB (Double-Byte Character Large Object)**

A sequence of bytes representing double-byte characters where the size can be up to 2 GB minus one byte. Although the size of DBCLOB values can be anywhere up to 2 GB minus one byte, in general, they are used whenever a double-byte character string might exceed the limits of the VARGRAPHIC type.

**filter**

The definition of selection criteria used to extract information from the logical log. Filters may include unit of recovery fields (for example, plan name or authorization ID), log record header fields (for example, DBID or PSID), and the contents of the columns within the data rows. A filter is used in conjunction with a time frame. Filters may be created through the Structured interface or through the Free Form interface in Log Master. *See also* Structured filter and Free Form filter.

**filter association**

The relationship of a filter to one or several work IDs.
filter predicate

Search criteria of a filter definition. To define a predicate, you must define the field, conditional operator, and value. You can specify multiple predicates by using the online interface.

Free Form filter

A filter created through the Free Form interface in Log Master. You create the filter by using a format similar to an SQL WHERE clause with the predicates restricted to those supported by Log Master.

G

GDG (Generation Data Group)

A group of data sets with the same base name and a qualifier that contains an integer value. Each time the system generates a GDG data set, the integer value increases by one, which keeps the data sets in chronological order.

I

independent filter

A Log Master filter created and saved as a Log Master object outside of a work ID.

K

key stores

Internal temporary working storage areas that Log Master backs with DASD data sets, as needed. Log Master uses the log record (LR), forward completion (FC), and backward completion (BC) key stores to process log records that require row completion processing.

L

LOB (Large Object)

A sequence of bytes within DB2, representing bit data, single-byte characters, double-byte characters, or a mixture of single- and double-byte characters. A LOB can be up to 2GB minus one byte in length. See also BLOB, CLOB, and DBCLOB.
LOB table space

Analogous to table space, a LOB table space contains all data for a particular LOB column in the related base table.

log mark

A name that you assign to a designated point on the log by using Log Master. When you specify a log mark, you can later refer to that point on the log using a name or term; you do not have to know the hexadecimal value for a particular relative byte address (RBA).

log scan

A process whereby information from DB2 logs is extracted based on your criteria and converted into a logical log.

logical log

A human readable representation of the DB2 log containing a before image and an after image of specific changes based on your selection criteria. The logical log has two components: a control file that describes the format of the logical log and a data file that includes the actual data. (The logical log is platform independent.)

logical log control file

One of the two files that compose a logical log. This file contains information about the format and contents of the logical log.

logical log data file

One of the two files that compose a logical log. This file contains the actual data for each transaction (the update, delete, insert, and exchange actions).

LRSN (Log Record Sequence Number)

A number that DB2 generates and associates with each log record. LRSNs are generated in DB2 data sharing environments. You can refer to log records with an LRSN in the same way that you use an RBA.
migration

The application of data changes to another DB2 table. Log Master accomplishes migration by processing log records to produce SQL statements or load files and control cards to bring shadow tables up to date.

noncompensated log record

A record in the DB2 log that reflects a database change that DB2 does not “reverse” or “compensate for.” In normal processing, most log records are noncompensated log records. Contrast with compensated log record and compensation log record.

ongoing processing

A type of processing defined within Log Master that is designed to be run repeatedly. The start point of each run of an ongoing log scan depends on the end of the previous run. This type of processing enables you to repeatedly scan the DB2 logs for data without changing the SYSIN syntax of a job. With ongoing processing, the product ensures that

- any transactions that are open at the end of the current log scan will be included in the next log scan (during the next run of the job)

- any transactions that were completed within the previous log scan are not processed twice, even though the product might scan part of the same log range again.

overtime mode

A mode of processing within Log Master that allows you to read log records associated with DB2 objects that are no longer defined in the DB2 catalog (called old objects). In overtime mode, the product obtains structure definitions for the previous instances of DB2 objects and uses the definitions to read log records related to those instances. The product can use any of several sources for the old object structure definitions.
P

performance analysis

Displays of statistics on log activity, information about the frequency of checkpoints, conditional restart records, and log command histories, as well as information about commit, rollback, and image copy frequency.

physical log

The DB2 log.

point of consistency

A time when all recoverable data that an application program accesses is consistent with other data.

point of discovery

The point at which you realize that a problem exists in the database. You might want to perform a redo or undo action relative to this point.

pre-filtering

The process of filtering out unneeded log records at an earlier point in processing to improve overall Log Master performance. The product automatically performs pre-filtering, but you can increase the number of pre-filtered records (and improve performance) by including URID-level predicates in your filter (like authorization ID or plan name).

predicate

A conditional clause that Log Master uses to select log records (part of a filter).

Q

Quiesce

A DB2 utility program that establishes a quiesce point for a set of table spaces and records that point in the SYSIBM.SYSCOPY table of the DB2 catalog. The quiet point can be established for
a table space, a partition, a table space set, a list of table spaces, or a list of table space sets. DB2
also inserts a SYSCOPY row for any indexes (defined with the COPY YES attribute) over a table
space that is being quiesced.

quiet point

A point on the log during which no transactions were in flight for a set of table spaces. This
information can be used to assist in recovering from problem transactions with a conventional
recovery (and possibly in generation of REDO SQL). These points can also be used as targets
for data migration.

R

RBA (Relative Byte Address)

The position of a byte in the DB2 log, expressed as an offset from the beginning of the log. A
log record is identifiable by the RBA of the first byte of its header. That RBA is called the
relative byte address of the record. The log record’s RBA is like a timestamp because it
uniquely identifies a record that starts at a particular point on the continuing log.

Repository

A set of DB2 tables that defines the content and format of information extracted from the DB2
log. The Repository retains the work ID definitions and, after a run, the work ID execution
history data. The Repository is specifically created to be used by Log Master.

rollback

The process of restoring data within a database (that has been changed by SQL statements)
back to the state that the data was in at its last commit point. Contrast with commit.

row completion processing

The additional processing that Log Master performs to obtain a complete image of the table
row reflected in the log record of an update action. The log records of insert and delete actions
contain a complete image of the table row involved in the action, but the log records of update
actions might not contain a complete image of the table row unless the table is defined with
Data Capture Changes (DCC). Log Master uses additional sources to obtain a complete image,
including the current table space, available image copies, or other log records. Jobs that
perform row completion processing require extra time and system resources.
scan range

The set of log records that will be read by Log Master, including the selection range and any other log information required for reporting purposes (such as backout integrity checking).

selection range

The set of log records (defined by the time frame or RBA) that will be output to the logical log.

shadow tables

A copy of tables.

SQL Generator

The part of Log Master that generates UNDO, REDO, and MIGRATE SQL with WHERE clauses based on available index information. Another part of the product (called the SQL Processor) executes the SQL statements to undo or redo specific transactions, or to migrate data to another location in a database.

SQL output data set

The data set containing SQL generated by Log Master. This data set can be reviewed and then executed in batch.

SQL processor

The part of Log Master that processes the UNDO, REDO, or MIGRATE SQL generated by the SQL Generator. Log Master currently uses the High-speed Apply Engine to execute SQL statements.

SQL template data set

A data set that contains descriptions of all distinct types of SQL statements that are contained in the SQL output data set. The SQL template information is optional, but recommended because it improves performance when the High-speed Apply Engine executes the generated SQL.
Structured filter

A filter created through the Structured interface in Log Master. You are prompted to select a field, conditional operator, and a value through a set of linked panels to create a predicate.

T

time frame

A period of time that determines from which specific log files (or sections of log files) the product extracts log records. Time frames are defined by specifying a start and end point and by specifying the source of the log records to be scanned.

U

unit of recovery

A transaction (such as an insert, update, or delete action) that might need to be recovered. (A sequence of operations within a unit of work between commit points.)

W

work ID

The definition of a unit of work that you want Log Master to perform. A work ID is an entity defined within Log Master that groups together the specifications of one Log Master job. Work IDs define the input source, time frame, filter (or WHERE clause), and the various types of job output (along with some additional items).
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