DB2 Server for VSE & VM

Control Center Operations Guide for VSE

Version 7 Release 1

GC09-2992-00

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Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 135.

First Edition (September 2000)

This edition applies to Version 7, Release 1, Modification 0 of the IBM® DATABASE 2™ Server for VSE & VM Program, (product number 5697-F42) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces GC09-2678-00.

Contents

About This Manual

Who Should Use This Manual

Control Center is a set of database administration and operation support tools for IBM DB2 Server for VSE & VM Version 7.1 databases. This manual is intended for people who want to learn about the product or who are involved in its evaluation, installation, maintenance, administration, or use in a VSE/ESA™ environment.

Conventions Used in This Manual

Throughout this document and in the Control Center screen interfaces, the terms *database*, *database manager*, and *database server*, are used to refer to a DB2 Server for VSE composed of a directory, log(s), and one or more dbextents.

Unless otherwise specified, the term *Control Center* refers to Control Center Version 7 Release 1 Modification 0.

Organization of This Manual

"Summary of Changes" on page ix summarizes the technical and libraray changes made to DB2 Server for VSE & VM Version 7 Release 1 product.

"Chapter 1. Introduction" on page 1 introduces the Control Center product and tool set.

"Chapter 2. Getting Started" on page 7 introduces you to the Control Center Main Menu.

"Chapter 3. Using the Operator Command Interface Tool" on page 9 describes how to use the Operator Command interface to issue SHOW and COUNTER commands to any connected DB2 Server in your VSE environment.

"Chapter 4. DBSPACE Reorganization Tool" on page 13 describes the automated Control Center tools for reorganizing DBSPACES within a database.

"Chapter 5. DBSPACE Analysis Tools" on page 27 describes the Control Center tools for analyzing database DBSPACEs and performing maintenance upon them to improve performance. Maintenance includes DBSPACE reorganization and UPDATE STATISTICS.

"Chapter 6. Work File Label Definition Tool" on page 39 describes the Work File Label Definition tools that help you define the reorganization tool's work files.

"Chapter 7. CICS Report Controller Interface Tool" on page 47 describes the Control Center interface to the CICS® Report Controller function.

"Chapter 8. Control Center Help Facility" on page 51 describes the Control Center Help Facility.

"Chapter 9. Package Utility" on page 53 describes how you can automate tasks associated with packages within a database.

"Chapter 10. Group Authorization Tool" on page 59 describes how this tool assists DBAs in managing the access to database objects, simplifies the process of authorization, and shortens the amount of time needed to grant or revoke privileges to individual users or groups of individuals.

"Chapter 11. The Monitor Maintenance Menu" on page 69 describes how the Database Monitoring tools are used to monitor database status and activities.

"Chapter 12. Table Utility" on page 81 describes how you can easily view a list of tables (and some of their attributes) stored in a DB2 Server for VSE database and do specific operations on it.

"Chapter 13. Installing Stored Procedures Support" on page 101 describes the stored procedures that are used to do local processing.

"Appendix A. Reorganization Job Streams" on page 105 gives examples of the job streams generated when a database or table reorganization is requested by the user.

"Appendix B. DBSPACE and Table Reorganization Tool Related Files" on page 127 lists the DBSPACE Reorganization Tool related files and explains their use.

Prerequisite IBM Publications

This manual assumes you have reviewed and understand the IBM manuals for the related products. You should be familiar with VSE systems, VSE job control language, VSE/VSAM, the CICS system and have a working technical knowledge of System Administration and Database Administration in a DB2 Server for VSE environment.

How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this book or any other DB2 Server for VSE & VM documentation:

- Visit our home page at:

  `http://www-4.ibm.com/software/data/db2/vse-vm/`
- A form for readers' comments is provided at the back of this publication. If the form has been removed, address your comments to:

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Be sure to include the name of the book, the form number (including the suffix), and the page, section title, or topic you are commenting on.

If you choose to respond through the Internet, please include either your entire Internet network address, or a postal address.

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Summary of Changes

This is a summary of the technical changes to the DB2 Server for VSE & VM database management system for this edition of the book. All manuals are affected by some or all of the changes discussed here. For your convenience, the changes made in this edition are identified in the text by a vertical bar (|) in the left margin. This edition may also include minor corrections and editorial changes that are not identified.

This summary does not list incompatibilities between releases of the DB2 Server for VSE & VM product; see either the *DB2 Server for VSE & VM SQL Reference*, *DB2 Server for VM System Administration*, or the *DB2 Server for VSE System Administration* manuals for a discussion of incompatibilities.

Summary of Changes for DB2 Version 7 Release 1

Version 7 Release 1 of the DB2 Server for VSE & VM database management system is intended to run on the Virtual Machine/Enterprise Systems Architecture (VM/ESA®) Version 2 Release 3 or later environment and on the Virtual Storage Extended/Enterprise Systems Architecture (VSE/ESA™) Version 2 Release 3 Modification 1 or later environment.

Enhancements, New Functions, and New Capabilities

TCP/IP Support for DB2 Server for VSE

TCP/IP support allows:

- VSE online and batch application programs to access remote application servers which support IBM's implementation of the DRDA architecture over TCP/IP.
- Remote application requesters which support IBM's implementation of the DRDA architecture to access the DB2 for VSE application server over TCP/IP.

For more information, see the following DB2 Server for VSE & VM documentation:

- *DB2 Server for VSE & VM Database Administration*
- *DB2 Server for VSE System Administration*
- *DB2 Server for VSE Program Directory*.

DRDA RUOW Application Requester for VSE (Batch)

DRDA Remote Unit of Work Application Requester provides read and update capability in one location in a single unit of work.

This support provides VSE batch application programs with the ability to execute SQL statements to access and manipulate data managed by any remote application server that supports IBM's implementation of the DRDA architecture.

VSE batch application programs can access only one remote application server per unit of work, and must use TCP/IP communications.

For more information, see the following DB2 Server for VSE & VM documentation:

- *DB2 Server for VSE System Administration*
- *DB2 Server for VSE & VM Database Administration*
- *DB2 Server for VSE & VM Application Programming*

- *DB2 Server for VSE Program Directory*.

Stored Procedures Application Requester

A stored procedure is a user-written application program compiled and stored at the server. Stored procedures allow logic to be encapsulated in a procedure that is local to the database manager. The ability to use stored procedures provides distributed solutions that let more people access data faster. SQL statements and replies flowing across the network are reduced and performance is improved.

This support provides VM and VSE (online and batch) application programs with the ability to invoke stored procedures from any remote application servers that support IBM's implementation of the DRDA architecture. It also allows processing of result sets if supported by the remote DRDA application server.

For more information, see the following DB2 Server for VSE & VM documentation:

- *DB2 Server for VSE & VM Application Programming*
- *DB2 Server for VSE & VM SQL Reference*.

Simplified DB2 Server for VSE Installation/Migration

A REXX procedure Job Manager is supplied to assist in the DB2 Server for VSE Installation/Migration process. It controls the overall job flow based on the contents of the job list control tables and the parameter table (supplied as Z-type members). The job manager selects the job control member from the job list file (a Z-type member), extracts the member from the Installation Library, modifies the JCL, submits the job, evaluates the execution, posts the results, and then repeats the process as required. The users are required to modify the parameter table, according to their environment.

This support simplifies the process of installation and migration by reducing user intervention - the Job Manager submits the prepared jobs.

See the *DB2 Server for VSE Program Directory* for further details.

New Code Page and Euro Symbol Code Page Support

The following CCSIDs are now supported:

- 1137: Hindi
- 1142: E-Danish/Norweigan
- 1143: E-Finnish/Swedish
- 1145: E-Spanish.

Additional support has been added for conversions from Unicode (UTF-8) to host CCSIDs.

For a complete list of CCSIDs supported, refer to the *DB2 Server for VM System Administration* and *DB2 Server for VSE System Administration* manuals.

Control Center for VM Enhancements

The following is a list of enhancements that have been made to the Control Center for VM:

- QMF™ Tools: allow the user to list QMF objects, view and unload QMF queries and PROCS, schedule QMF PROCS to execute, and run explain on QMF queries.
- Table Create Tool: allows the user to create new tables.
- Search List improvements.
- Referential Integrity Report tool: A referential integrity map report can now be generated directly from the CMS command interface.

- PL/I prerequisite removal.
- New and improved tape hopper support.
- High density tape drive support: support for high density (non-CMS density) tape drives.

Control Center for VSE Enhancements

The following enhancements have been provided for Control Center for VSE:

- Additional Operator Command Support
- Installation of IBM-provided Stored Procedures.

QMF for VSE & VM Optional Feature

The following enhancements have been provided for QMF for VSE & VM:

- Application Requester support for VSE QMF users
- Command enhancements to default to object type
- Fast path to the QMF home screen
- Cross-platform install capability
- DB2 for AS/400 database access.

QMF for Windows® Optional Feature

The following enhancements have been provided for QMF for Windows :

- Java-based Query
- Aggregating, grouping and formatting directly within query results and automatic Form creation
- Personal portal user interface that launches centrally shared queries and reports, and sends results to spreadsheets, desktop databases, and browsers
- Procedures with REXX.

Reliability, Availability, and Serviceability Improvements

DBNAME Directory Restructuring

ARISDIRD has been restructured to improve readability and flexibility. Each DBNAME entry is now defined explicitly by its type (Local, Remote or Host VM (Guest Sharing)). CICS AXE Transaction TPNs (Transaction Program Names) are still included in the directory as a type of 'LOCALAXE'. The DBNAME Directory Builder program, ARICBDID has been rewritten as a REXX/VSE procedure with extensive error and dependency checking. Support for TCP/IP information is added and 'alias' DBNAMEs are supported. **ALL** DBNAMEs **must** be specified in the new DBNAME Directory, including the Product Default DBNAME "SQLDS". A migration REXX/VSE procedure, ARICCDID, is provided to assist in migrating to the new format. See the *DB2 Server for VSE System Administration* and *DB2 Server for VSE Program Directory* for additional information.

Migration Considerations

Migration is supported from SQL/DS™ Version 3 and DB2 Server for VSE & VM Versions 5 and 6. Migration from SQL/DS Version 2 Release 2 or earlier releases is not supported. Refer to the *DB2 Server for VM System Administration* or *DB2 Server for VSE System Administration* manual for migration considerations.

Library Enhancements

Some general library enhancements include:

- The following books have been removed from the library:
  - *DB2 Server for VM Application Programming*
  - *DB2 Server for VSE Application Programming*

- *DB2 Server for VM Database Administration*
- *DB2 Server for VSE Database Administration*
- *DB2 Server for VSE Installation*
- *DB2 REXX SQL Interface Installation*
- *DB2 REXX SQL Reference*
- *DB2 Server for VM Diagnosis Guide and Reference*
- *DB2 Server for VSE Diagnosis Guide and Reference*
- *DB2 VM Data Spaces Support*

  Note: Information from this book can now be found in the *DB2 Server for VSE & VM Performance Tuning Handbook*
- *DB2 Server for VM Master Index and Glossary*
- *DB2 Server for VSE Master Index and Glossary*.

• The following books have been added to the library:
- *DB2 Server for VSE & VM Database Administration*
- *DB2 Server for VSE & VM Application Programming*
- *DB2 REXX SQL for VM/ESA Installation and Reference*
- *DB2 Server for VSE & VM Diagnosis Guide and Reference*
- *DB2 Server for VSE & VM Master Index and Glossary*.

Refer to the new *DB2 Server for VSE & VM Overivew* for a better understanding of the benefits DB2 Server for VSE & VM can provide.

Chapter 1. Introduction

Control Center is an IBM licensed program that works with the DB2 Server for VSE licensed program to automate many of the manual Database Administrator (DBA) functions required to support databases. It automates functions such as DBSPACE backup, migration, reorganization, and analysis. It generates the complete set of Data Definition Language (DDL) required to redefine any DBSPACE and its objects. It also keeps catalog statistics updated.

Through full support for VSE/POWER Job Scheduling, Control Center functions can be initiated immediately or scheduled to execute at any later date or time. Repetitive execution is also supported.

By automating the complex steps required to perform many DBA activities, Control Center simplifies the task of supporting databases. DBA functions can be scheduled and performed automatically during periods of low system use. This improves the operational productivity of the entire system and allows these functions to be performed in a consistent and repeatable manner with a high degree of security and control.

Control Center is easily installed into DB2 Server for VSE databases. Its automated control lessens the workload of managing many databases.

The product consists of a set of online and batch programs, VSAM and SAM files, and database tables. It does not directly attach to any of your operating system or database management system code. All interfaces used are standard and documented.

Control Center helps you manage your databases using conventional COBOL CICS and related programs. The Online Resource Adapter (ORA) provides the connection to the database servers on your VSE system, while the CICS Report Controller feature provides the interface to your VSE/POWER spool file. Using these interfaces, applications can CONNECT to your databases and build and submit batch jobstreams to maintain them.

Product Benefits

Access Control

Lets you control access to Control Center by assigning a special CICS transaction security key to its transactions. You must include it in the CICS signon table (SNT) entries for the users to whom you want to allow access. You can also control access to the product by granting or withholding RUN authority on its packages.

Single User Mode Parameters

Such as LOGMODE, NDIRBUF, and NPAGEBUF give you the flexibility to choose whether or not to LOG transactions. Using these parameters, for instance during reorganizations, can improve performance by allowing the database to use more buffers in single user mode than it would use in multiple user mode.

Multiple Database Support

Exploits CICS Database Switching to CONNECT to, and manage, all of the databases on a VSE/ESA system.

Database Operator Command Interface

Lets you issue SHOW and COUNTER operator commands easily without having to use ISQL. It displays operator command output in a user-friendly format with full scrolling and online help.

DBSPACE Reorganization

Offers four (4) main functions:

- DDL generation
- UNLOAD DBSPACE
- RELOAD DBSPACE
- Reorganize DBSPACE

Reorganizing at the DBSPACE level helps you improve performance and eliminate wasted space. The DROP DBSPACE command is used to reduce logging and return pages to the storage pool for use elsewhere in the database. TABLES are RELOADed individually in the sequence of their clustering index.

Execution options let you move a DBSPACE to a larger DBSPACE, a different storage pool, or a different database for migration or regeneration. You can store data externally on tape or disk. You can also choose to REBIND all PACKAGES that are dependent on an object in the DBSPACE and optionally UPDATE ALL STATISTICS.

The Generate DDL option captures all of the DDL necessary to recreate a DBSPACE. DDL is placed in the VSE/POWER punch queue. From there, you can copy it into your editor and make whatever changes you want to it.

DBSPACE Analysis

Evaluates your databases using built-in DBA expertise. The DBSPACE Analysis tools build a list of DBSPACES that require maintenance (reorganization or UPDATE STATISTICS) and allow you to view it online. From the list you can select what DBSPACEs you want to maintain. The DBSPACE Analysis tools then build and submit the appropriate batch job.

Group Authorization Tools

Simplify the management of access to database tables, views, and packages. The Group Authorization Tool allows DBAs to issue authorizations to groups of users on groups of objects rather than one by one. Control Center stores group information in database tables and provides reports designed to make authorization administration easier.

Monitor Tools

Record database activity such as locking or log percent full and provide notification when the threshold you define has been exceeded. Monitor information is stored in tables that you can view on-line or print in a batch report.

Package Tools

Allow you to unload, reload, rebind, or view any of the packages stored in your databases. You can also use the package tools to migrate packages from one application server to another.

Work File Label Definition

Allows you to define your tape and SAM work files easily. For compatibility with tape management systems, all TLBL parameters are supported. For SAM work files, you define a set of small, medium, and large files that are used for all the DBSPACEs in your database.

CICS Report Controller Interface

Provides quick and easy access to the jobs and reports you have submitted. Using the CICS Report Controller Interface, you can hold, or delete batch jobs, and browse, print, or delete reports. You can also view or change job and report characteristics.

Help Facility

Provides comprehensive Help and ″How-To″ information on all aspects of Control Center. A scrollable menu of Help topics is presented allowing you to select more specific Help information.

Job Scheduling Tool

Utilizes the full power and capabilities of VSE/POWER Time Event Scheduling as it builds batch jobs. For your jobs, you may specify the day or date and time a job is to be scheduled for processing. If you want to schedule a repetitive job, you can choose:

- Daily
- Weekly (for example, each Monday)
- Specific day of the month (for example, each first day)
- Specific day of specific months (for example, January 1, July 1).

Query Management Facility

Provides quick and easy access to QMF from the Control Center Main Menu.

Table Utility Tool

Provides quick and easy ways to list, reorganize (including unloading and reloading), create, drop, and update the statistics for tables stored in a DB2 Server for VSE database.

Prerequisite Programs

This section summarizes the required program products. Unless otherwise stated, Control Center works with all subsequent versions, releases, and modification levels of the products listed in this section as well as with equivalent non-IBM products.

These are prerequisite products:

- VSE/Enterprise Systems Architecture Version 2 Release 3 or later
- DB2 Server for VSE Version 7 Release 1 (5697-F42)

- VSE/REXX (part of VSE/Central Functions, Program Number 5686-066, and all subsequent releases)

  Control Center Version 7.1 can work with previous version databases of DB2 and SQLDS. However, since the Control Center Version 7.1 packages must reside in those databases, installing Version 7.1 will overlay any earlier packages and will thereby preclude using earlier versions of Control Center with those databases. What this means is that a database can be used with one and only one version of Control Center.
- LE for VSE/ESA Version 1 Release 4 (5686-094)

About Control Center

The product executes as a set of CICS transactions and VSE batch jobstreams. Its transactions share the same CICS partition as your other applications. Its batch jobs can be run in any open partition.

Control Center applications use static, pre-planned SQL. The database optimizer determines the most efficient access path at compile-time, and stores it in the database as a package. This results in better performance at run-time. Control Center programs are pseudo-conversational which allow more transactions to run concurrently.

The CICS Report Controller is utilized to submit batch jobs from CICS. This way, potentially long-running tasks such as DBSPACE reorganizations do not adversely affect online users. A menu interface is also provided to allow users to manage jobs and reports in the VSE/POWER spool file and browse reports online.

Additional capabilities include:

- Control Center takes advantage of CICS Database Switching; this lets online users dynamically connect to different servers.
- Its batch jobs are intelligent, using return codes and conditional JCL to alter execution in the event of failure; this gives the DBA application recovery capability.
- It temporarily stores unloaded data and DDL statements in SAM datasets. For permanent storage, you may select VSAM or tape (for data). This allows you to reload data and DDL from prior DBSU unload operations.

Control Center's DBA ID

Control Center does all database work under the "SQLMSTR" ID. This ID needs DBA authority in every database it manages. Be sure you have completed the installation step that grants DBA authority to SQLMSTR.

How to Invoke

Using the Screens

You can enter the transaction ID "**SQM**" from a blank CICS screen to access Control Center tools using the panel interface. From there, you can navigate through the product quickly and easily using ENTER and the function keys.

Using the Transaction ID (TRANSID)

If you know the transaction ID of the function you want to execute and if it supports direct invocation, you may simply enter its TRANSID. When you exit from that function, you return to a blank CICS screen. The functions that support direct invocation are:

Main Menu	(SQM)
Group Authorization Tool	(SQGA)
Operator Commands Menu	(SQOM)
DBSPACE Reorganization	(SQDR)
DBSPACE Analysis	(SQMM)
Package Utility Tool	(SQPM)
Work File Label Definition	(SQFM)
CICS Report Controller	(CEMS)
Help Facility	(SQHM)
Table Utility	(SQTU)

Before You Use Control Center

Distribution Library:

The default delivery library for Control Center is PRD2.CCF710. The installation procedures in the *DB2 Server for VSE Control Center Program Directory* describe how you can specify a different library. If you are using SQL/DS™ Version 3.5 or DB2 Server for VSE Version 5.1, change any LIBDEF statements to point to the correct library. The required installation library for SQL/DS Version 3 Release 5 is PRD2.SQL350. The required installation library for DB2 Server for VSE Version 5.1 is PRD2.DB2510. The standard, but not required, installation library for DB2 Server for VSE Version 6.1 is PRD2.DB2610.

Preventive Service Planning:

Read the *Control Center Program Directory* provided with the distribution tape and check for any program temporary fixes (PTFs) that you may need to install. If you obtained Control Center individually from IBM Software Distribution, you should contact the IBM Support Center, or use either Information/Access, or the IBMLink system (ServiceLink) for additional preventive service planning (PSP) information.

This program release will be maintained through the use of program temporary fixes (PTFs). An updated version or release replaces the entire program code. A PTF replaces the changed program code only.

Changing to a New Database

The Control Center installation process is defined in the *DB2 Server for VSE Control Center Program Directory*. Its instructions include intializing CICS and DB2 databases for use with Control Center. If you want to add a new database to those already initialized for Control Center, you must do the following steps.

STEP TITLE

- Grant DBA Authority to SQLMSTR
- Define and Load the Help Table
- Define the Maintenance Tracking Table
- Define the Monitor Tables
- Define the Group Authorization Tables
- Load Packages into Servers
- Installing Stored Procedure Support (Optional)

Introduction

Chapter 2. Getting Started

This chapter explains how to start using the Control Center feature and introduces you to the main menu. The following chapters describe how to use the Control Center tools.

Getting Started With Control Center

You can type **SQM** on a blank CICS screen to reach the main menu.

```
     mm/dd/yyyy                CONTROL CENTER V7.1                    hh:mm:ss
*------------------------------  MAIN MENU  -------------------------------*
| OPTION    => __  A                      USER ID: B                       |
| DATABASE  => _____________________  C   CICS ID: D                       |
|                                                                          |
|  E  *************************   DBA FUNCTIONS   *************************  |
|  1 OPERATOR COMMANDS                                                     |
|  2 DBSPACE REORGANIZATION                                                |
|  3 DBSPACE ANALYSIS                                                      |
|  4 WORK FILE LABEL DEFINITION                                            |
|  5 CICS REPORT CONTROLLER                                                |
|  6 HELP FACILITY                                                         |
|  7 PACKAGE UTILITY                                                       |
|  8 GROUP AUTHORIZATION                                                   |
|  9 MONITOR UTILITY                                                       |
| 10 TABLE UTILITY                                                         |
| 11 QMF                                                                   |
|                                                                          |
|                                                                          |
|                                                                          |
*------------------------------------------------------------------ SQC01 ----*
 F
 G PRESS ENTER TO SELECT FUNCTION
 H ENTER F1=HELP F3=EXIT
```

Figure 1. Control Center Main Menu

Some things you should know about typical Control Center menus are:

A **OPTION**—Selects the function you want to use. Enter the number of the tool you want to use in this field. The option number is the highlighted identifier displayed to the left of the option description.

B **USER ID**—The 8-character USER ID of the signed on user.

C **DATABASE**—Identifies the database you are working with. When you sign on, this field displays the name of the default database. To work with a different database you can type the name of the new database in this field.

D **CICS ID**—Shows the 8-character APPLID of the CICS system owning the transaction.

E **DBA FUNCTIONS**—Lists the functions available from the current menu.

F **Error Message Line**—Error messages, if any, are displayed on this line.

G **Instruction Line**—Instructions are displayed on this line.

H **Function (F) Key Line**—Displays active function keys and control keys.

Each of the DBA Functions shown in Figure 1 on page 7 is described in detail in the chapters that follow, except for the QMF function. Selecting option 11, QMF, directly invokes QMF. If it completes normally, control returns to Control Center, otherwise QMF handles the error.

Chapter 3. Using the Operator Command Interface Tool

The Operator Command Interface tool provides an interface between you and the database to perform operator SHOW and COUNTER commands. With this tool, you do not need to directly enter ISQL commands, nor do you need to issue the commands from the VSE Operator Console. Multiple screens are used to display the set of operator commands that you can select. You can scroll between them using the Forward and Backward function keys.

This tool can be invoked by selecting option 1 from the main menu or by using the CICS transaction ID "SQOM".

The Operator Commands menus use this syntactical notation:

- Words in uppercase must be typed exactly as shown
- Words in lowercase should be replaced by your particular values in uppercase or lowercase
- Sets of phrases or words from which you must choose one are enclosed in parentheses and separated by vertical bars
- Default values are shown in a non-green (usually turquoise) color and are underlined.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*---------------------------- OPERATOR COMMANDS ----------------------------*
| OPTION ===>                                                USER ID: MSTRSRV1 |
| PARMS ====> _____________________________________          CICS ID: SYSTVM1  |
| DATABASE => SQLDBA_____________                                              |
|                                                                              |
|  1 SHOW ACTIVE                                                               |
|  2 SHOW ADDRESS        module name                                           |
|  3 SHOW BUFFERS                                                              |
|  4 SHOW CONNECT        ( ALL | user-id | AGENT n | LUWID id                  |
|                          | ACTIVE | WAITING | INACTIVE )                     |
|  5 SHOW DBCONFIG                                                             |
|  6 SHOW DBEXTENT                                                             |
|  7 SHOW DBSPACE        dbspace number                                        |
|  8 SHOW INDOUBT                                                              |
|  9 SHOW INITPARM                                                             |
| 10 SHOW INVALID                                                              |
| 11 SHOW LOCK ACTIVE                                                          |
| 12 SHOW LOCK DBSPACE   ( ALL | dbspace number)                               |
|                                                                              |
*------------------------------------------------------------------ SQC11A ---*
Default values are shown in turquoise.
ENTER OPTION, PARMS, AND DATABASE NAME AND PRESS ENTER
ENTER F1=HELP F3=EXIT F8=FWD
```

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*-------------------------     OPERATOR COMMANDS     -------------------------*
| OPTION       => __                                         USER ID: MSTRSRV1 |
| PARMS        => _____________________________________      CICS ID: SYSTVM1  |
| DATABASE     => SQLDBA__________                                             |
|                                                                              |
| 13 SHOW LOCK GRAPH     ( auth-id | AGENT n )                                 |
| 14 SHOW LOCK MATRIX                                                          |
| 15 SHOW LOCK USER      ( ALL | auth-id | AGENT n )                         |
| 16 SHOW LOCK WANTLOCK  ( ALL | auth-id | AGENT n )                         |
| 17 SHOW LOG                                                                  |
| 18 SHOW LOGHIST        ( ALL | n ) ( SERVICE )                             |
| 19 SHOW POOL           ( ALL | SUMMARY | DELETED | n )                     |
| 20 SHOW PROC           ( proc-name | proc-name AUTHID auth-id              |
|                          | * | * AUTHID auth-id )                       |
| 21 SHOW PSERVER        ( * | procsvr-name | GROUP * | GROUP svr-group-name ) |
| 22 SHOW STORAGE                                                              |
| 23 SHOW SYSTEM                                                               |
| 30 COUNTER             ( * | counter-name )                                |
|                                                                              |
*------------------------------------------------------------------ SQC11B ---*
Default values are shown in turquoise.
ENTER OPTION, PARMS, AND DATABASE NAME AND PRESS ENTER
ENTER F1=HELP F3=EXIT F7=BWD
```

Figure 2. DBA Operator Commands Screens

The DBA Operator Commands menus are shown in Figure 2.

The database server you are currently working with is identified in the **DATABASE** field shown near the top of the screen.

To execute an operator command:

- Enter the 1 or 2 digit OPTION number that precedes each command. The option number can be entered even if the option and syntax information are not on the screen currently being shown.

- Enter any required parameters. (The parameters shown in uppercase are to be entered as shown. Those shown in lowercase are for you to supply.) Default values are shown in a different color (usually turquoise) and are underlined.
- Enter the database name in the DATABASE field.

For example, if you want to issue a SHOW LOCK USER on AGENT1 command against the DB2PROD database, enter:

```
OPTION ===> 16
PARMS ====> AGENT 1
DATABASE => DB2PROD
```

The result of the command will be displayed. For example, if you issued the following SHOW ACTIVE command against server SQLDBA:

```
OPTION ===> 1
PARMS ====>
DATABASE => SQLDBA
```

you would see:

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*---------------------- OPERATOR COMMAND DISPLAY SCREEN ----------------------*
| COMMAND  => SHOW ACTIVE                                                     |
| DATABASE => SQLDBA                                                          |
|                                                                             |
| Status of agents:                                                           |
|    Checkpoint agent is not active.                                          |
|    User Agent: 3 User ID: SVSCVSAX is NIW  SUBS                             |
|       Agent is not processing and is in communication  wait.                |
|    User Agent: 4 User ID: SQLMSTR  is R/O  SUBS  BDFF                       |
|       Agent is processing an operator command.                              |
|    User Agent: 5 User ID: SVSCVSAX is NIW  SUBS                             |
|       Agent is not processing and is in communication  wait.                |
|    2 agent(s) not connected to an APPL or SUBSYS.                           |
| ARI0065I Operator command processing is complete.                           |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
*------------------------------------------------------------------ SQC12 ----*


F1=HELP,F3=EXIT,F4=TOP,F5=BOT,F7=BWD,F8=FWD,F12=CANCEL
```

Figure 3. Show Active Command Display Screen

Note: When the Operator Command Selection Menu (Figure 2 on page 10) is being displayed, F1=HELP will display an explanation of the individual commands. When the Operator Command Display Screen (Figure 3) is being displayed, F1=HELP displays help information for the screen, not for the operator command results.

For a complete description of each operator command and appropriate parameters, refer to the *DB2 Server for VSE & VM Operation* manual.

Chapter 4. DBSPACE Reorganization Tool

The DBSPACE Reorganization Tool tool makes it easy to manage your database servers. Databases are composed of many DBSPACEs that are logical allocations of space. DBSPACEs can contain one or more tables and their indexes. DBSPACE reorganizations are critical for providing optimum database performance because when you DROP and re-ACQUIRE a DBSPACE, all unused DBSPACE pages are returned to the storage pool for use elsewhere.

Control Center's ability to backup, copy, move, and migrate DBSPACEs gives you control and flexibility in managing database growth. It also allows you to extract all of the Data Definition Language (DDL) statements needed to re-create a DBSPACE and everything in it. DBAs no longer have to manage huge libraries of DDL or struggle to produce "where-used" information because Control Center does it for them.

The DBSPACE Reorganization Tool tool operates in Multiple User Mode (MUM) or Single User Mode (SUM). You can choose the mode to run in. (MUM jobs run in one partition while the database is up and running in another, available for other users and applications. A SUM application starts the database. As soon as the database is up, the application program takes control, so both are running in the same partition. Other users cannot access the database until the SUM job ends and the database is restarted in MUM).

Reorganization jobs run in batch and consist of several job steps. Each job step is assigned a step number and description. DLBLs are generated for each step and are included in the JCL so that you know what files are being accessed.

The Control Center screen collects parameters needed by the batch programs. The DBSPACE Reorganization Submit screen, displayed when you press ENTER from the Reorganization screen, allows you to schedule jobs for execution immediately or at a later date and time, and on a one-time or repetitive basis.

When To Reorganize

Schedule DBSPACE reorganizations and RELOADS during non-peak hours to avoid locking contention with other database users. If you schedule these kinds of jobs during peak hours, against heavy multiple user sessions, you may encounter lock contention when the system catalogs are updated. Running more than one DBSPACE reorganization or RELOAD simultaneously against a single database can also result in catalog contention.

Schedule a DBSPACE reorganization whenever the database statistics indicate that the DBSPACE needs it. For example, when indexes are no longer clustered or when considerable delete activity has occurred, leaving holes of deleted data on DBSPACE pages.

You can also use the DBSPACE Reorganization tool when you need a larger DBSPACE due to growth in the volume of data in the DBSPACE. In addition, use the tool to move DBSPACEs to less heavily occupied storage pools. Spreading the distribution of DBSPACEs across storage pools helps improve performance. Moving a DBSPACE can solve a short-on-storage problem and also eliminate the need to add a new dbextent to the database.

DBSPACE Reorganization Tool

When you want to know the characteristics of the columns in a table, use the DBSPACE Reorganization tool's GENERATE DDL option. The generated DDL will show you how all of the objects in the DBSPACE are defined, what indexes exist, who has what authorizations, and what programs access what tables.

Features

The DBSPACE Reorganization tool allows you to:

- Extract and create all DDL required to re-create the DBSPACE and the objects it contains, including:
  - Tables
  - Data
  - Referential Integrity constraints
  - Unique column definitions
  - Indexes
  - Views
  - Grants
  - Table and Column Comments
  - Table and Column Labels
  - Packages (Access Modules)
- Unload DBSPACE data to tape or disk
- Free unused pages by dropping and re-acquiring the DBSPACE
- Load data in clustering index sequence
- Load data with freespace for future inserts
- Rebuild clustered indexes (where possible)
- Update Statistics
- Reprep invalidated access modules
- Reload a DBSPACE to a different database
- Reload a DBSPACE with a different owner
- Reload a DBSPACE with a different DBSPACE name
- Acquire a DBSPACE in a new storage pool
- Acquire a different size DBSPACE
- Change the number of DBSPACE header pages
- Change the free space percent
- Change the index percent
- Change the lock mode
- Run in Multiple or Single User Mode

How the DBSPACE Reorganization Tool Tool Works

When you choose full DBSPACE reorganization, Control Center generates and submits a job to:

1. Link and establish communication with the target server.
2. Connect as user SQLREORG.
3. Verify the availability of the new DBSPACE (if specified).
4. Gather system catalog information about the specified DBSPACE and create corresponding DDL statements in the Control Center Database Services Utility (DBSU) command file:
   a. Table create statements
   b. Table comments

c. Column comments
d. Table reload statements
e. Referential integrity constraints
f. Unique column definitions
g. Index create statements
h. Table column grants
i. Table grants
j. View creates/grants/comments/labels
k. Package rebind statements

5. Unload the DBSPACE data to the specified disk or tape.
6. Execute the SQLDBSU command file from the Database Services Utility to reorganize the DBSPACE and rebind any dependent packages.
7. Update the SQLMAINT table with the date, time, and duration of the reorganization (see "Chapter 5. DBSPACE Analysis Tools" on page 27).

In order to retain hierarchical dependencies, Control Center issues all grants in the same chronological order in which they were originally issued.

In order to grant authority to an object, the grantor must first connect as the user who originally issued the grant. Therefore, the program must gather database connect passwords for all grantors. If a grantor does not have a connect password, a temporary password is assigned and later removed.

The database server does not remove grant information from the system catalogs when a user is removed from the SYSTEM.SYSUSERAUTH table. Consequently, the REORG job may need to connect as a nonexistent user in order to re-establish a grant. If this situation occurs, Control Center temporarily grants connect authority to the user and later revokes it.

Operational Note: In some cases (such as a reload failure), temporarily granted IDs will not be revoked from the database. You should revoke these IDs at some point in time. The IDs are identified by the starting letters REO*nnnnn* (where *nnnnn* is a random number).

Using the DBSPACE Reorganization Utility Screen

To display the DBSPACE Reorganization Utility menu shown in Figure 4 on page 16, choose Option **2** on the Control Center Main Menu or enter the transaction ID **SQDR** on a CICS screen.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*----------------        DBSPACE REORGANIZATION UTILITY       ---------------*
| DATABASE  => SQLDBA_____________                                           |
| OWNER     => ________                                                      |
| DBSPACE   => ____________________                                          |
| FILE      => 1 (1-3)                                                       |
| OPTION    => 3 (1=GENERATE DDL              3=REORGANIZE DBSPACE        )  |
|               (2=UNLOAD DBSPACE            4=RELOAD DBSPACE            )  |
| ***********************     OPTIONAL PARAMETERS     ********************** |
| DATABASE => ____________________                                           |
| OWNER    => ________                                                       |
| DBSPACE  => ____________________                                           |
|                                                                            |
| PAGES    => _____________ NHEADER        => _ (1-8)      STORPOOL => ___   |
| PCTFREE  => __            ALTER PCTFREE  => __           PCTINDEX => __    |
| LOCK     => _______                                                        |
|                                                                            |
| REBIND PACKAGE => 1 (1=YES/2=NO)          UPDATE ALL STATISTICS => 2 (1/2) |
| COMMITCOUNT    => __________                                               |
| TLBL FILE-ID   => ____________________            DDL STATEMENTS => 1000__ |
*---------------------------------------------------------------------- SQC05 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 4. DBSPACE Reorganization Utility Screen

You must enter the first three fields (DATABASE, OWNER, DBSPACE name) to identify the DBSPACE that you want to reorganize. The database specified must be either the default CICS region database or one to which the program may CONNECT. The OWNER and DBSPACE name parameters must identify a valid DBSPACE in the target database.

When you installed Control Center, you defined three SAM DDL files to hold extracted DDL. Type the number of the file (1=small, 2=medium, 3=large) you want to use in the FILE field.) The FILE number determines what SAM data file to use if you do not enter a Tape File Name. You do not need to specify the file number if you choose Option **1**, because the DDL is written to the punch queue instead of to a file.

Enter the number of the option you want to execute in the Option field. You can choose to:

Option	Description
1 GENERATE DDL	This option extracts from the database all of the DDL required to re-create a DBSPACE and the objects it contains. The DDL is saved in the punch queue for inspection, alteration, or backup.
2 UNLOAD DBSPACE	This option extracts all DDL (as in Option **1**) and writes it to a VSAM file. Then, a DBSU UNLOAD DBSPACE step is executed that writes the DBSPACE data to a SAM or tape file. If SAM is selected, the file is REPRO'd to a VSAM file for more permanent retention. The unloaded data and extracted DDL can be used as the basis for a RELOAD DBSPACE (Option **4**) job. An example of an UNLOAD DBSPACE job created to do this is shown in Figure 55 on page 105.
3 REORGANIZE DBSPACE	This option results in a full DBSPACE

	reorganization. A jobstream is created that captures the DDL, unloads the DBSPACE, drops, acquires, recreates, and reloads the DBSPACE. Error recovery logic is also included. An example of a REORGANIZE DBSPACE job is shown in Figure 56 on page 107.
4 RELOAD DBSPACE	This option submits a job to recreate and reload a DBSPACE that has been unloaded by Option **2**. This is basically a DBSPACE recovery facility. An example of the job created to do this is shown in Figure 57 on page 110.

Each of the options is discussed in more detail below and is accompanied by a sample JCL stream created by the DBSPACE Reorganization tool.

Optional Parameters

All parameters below the ″Optional Parameters″ line on the screen do not require entry.

Parameter	Description
DATABASE	Reloads the DBSPACE to a different database. Lets you migrate a DBSPACE from one database to another. For example, you can migrate a DBSPACE from a development database to a production database. Before you migrate the DBSPACE, you may want to ensure that the two databases are compatible so that all reload statements execute successfully. When you use the DATABASE parameter, the DBSPACE in the old database remains unchanged.
OWNER/DBSPACE	Specifies a new owner and/or a new DBSPACEname for the reloaded DBSPACE. When the source DBSPACE and the target DBSPACE are both PRIVATE, the old DBSPACE remains unchanged. If either or both DBSPACEs are PUBLIC, the old DBSPACE is dropped prior to creation of the new DBSPACE.
PAGES	Defines a new DBSPACE page size for the reorganized DBSPACE. An empty (unacquired) DBSPACE of the indicated number of pages must be available in the database. If PAGES is not specified, a DBSPACE equal in size to the current DBSPACE is acquired.
NHEADER	Specifies the number of pages in a DBSPACE reserved for DBSPACE header information. The value entered must be a number between 1 and 8. If the number chosen is smaller than what is required for all header information the reload may fail. If you subscribe to the standard of one table per DBSPACE, one header page is sufficient.
STORPOOL	Specifies a new storage pool for the acquired DBSPACE. This allows you to balance database

	I/O by spreading the most actively used DBSPACEs over multiple DASD volumes.
PCTFREE	Indicates the percentage of each DBSPACE page to be reserved for INSERTS or UPDATES that increase a table's row length. PCTFREE defaults to 10 percent. After the data is reloaded into the DBSPACE, PCTFREE can be altered to zero to make the freespace available.
ALTER PCTFREE	Indicates the value to which PCTFREE is to be altered, once the data has been reloaded into the DBSPACE. This value must be lower than the PCTFREE parameter value to have any positive effect.
PCTINDEX	Specifies the ratio of index pages to total DBSPACE pages. Use this parameter to maintain a balance between the number of occupied data and index pages. If not specified, the same ratio as the original DBSPACE will be used.
LOCK	Changes the lock mode of a DBSPACE. Valid values for PUBLIC DBSPACEs are DBSPACE, PAGE, and ROW. Private DBSPACEs are always locked at the DBSPACE level.
REBIND PACKAGE	Once a DBSPACE has been reloaded, DBSPACE Reorganization rebinds all access modules that are dependent on objects in the DBSPACE. To bypass package rebind processing, specify NO (2). The default value is YES (1).
UPDATE ALL STATISTICS	By default, UPDATE STATISTICS is issued for a DBSPACE once it has been successfully reloaded. UPDATE STATISTICS updates catalog statistics only for columns that appear as the first column in an index. To update catalog statistics for all columns, specify YES (1) for the UPDATE ALL STATISTICS parameter.
COMMITCOUNT	Used to specify the frequency of COMMITS during reload processing. Enter a number in the range 1 through 2,147,483,647 (without the commas) to cause a COMMIT WORK to be executed after that number of input rows has been reloaded.
TLBL FILE-ID	Used to specify that data should be unloaded to tape instead of disk. The tape file must have been defined using the WORK FILE LABEL DEFINITION tool. This does not apply to DDL; DDL is ALWAYS unloaded to disk.
DDL STATEMENTS	Allows handling DBSPACEs that contain an unusually large amount of DDL (lots of tables, indexes, views, comments). This parameter defaults to 1,000 records; that should be sufficient to handle the vast majority of DBSPACEs.

After entering the desired REORG parameters, press ENTER to proceed to the DBSPACE Reorganization Submit screen.

Using the DBSPACE REORGANIZATION Tool

The DBSPACE Reorganization tool can be used in a variety of ways to achieve different goals. Each of the options is discussed, followed by a sample JCL stream produced by the program:

Option 1 - GENERATE DDL

By reading the catalogs, this option generates the DDL necessary to re-create a DBSPACE and all of its associated objects. DDL is written to the VSE/POWER punch queue in the form of DBSU commands and can be used, as is, to redefine the DBSPACE. This option:

- Relieves DBAs from having to maintain large libraries of DDL
- Saves library disk space
- Solves the problem of who owns the ″official″ DDL
- Provides an easy way to determine table and index characteristics
- Provides authorization and ″where-used″ information

Figure 5 is an example of the jobstream produced by Control Center to generate DDL for the PUBLIC.SAMPLE DBSPACE.

```
* $$ JOB JNM=GENDDL,CLASS=0,DISP=D,PRIO=3
* $$ LST PRI=3
* $$ PUN PRI=3
// JOB GENDDL MUM GENERATE DDL
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.SQLDS710.PUBLIC.SAMPLE',0,VSAM,                      X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS006,SYSPCH
// ASSGN SYS011,SYSLST
// EXEC SQB01,SIZE=AUTO
%%SQLDBA            PUBLIC  SAMPLE            1 N
/*
/&
```

Figure 5. DBSPACE Reorg Option 1 (Generate DDL) - Sample Jobstream

Option 2 - UNLOAD DBSPACE

This option writes the DDL necessary to recreate a DBSPACE to a VSAM file. It then unloads the DBSPACE to a SAM disk file (or a tape if that option was selected). The SAM disk data file is then REPRO'd to a VSAM-managed SAM file for more permanent retention. Data is unloaded in system-defined format; therefore, you must make sure that this data file is not altered prior to reloading the DBSPACE. This option is essentially a DBSPACE backup. Used in conjunction with a RELOAD DBSPACE (Option **4**), it provides the capability to recover from application errors.

Figure 55 on page 105 shows a jobstream that was generated by Control Center to unload the PUBLIC.SQMHELP DBSPACE. See “Appendix B. DBSPACE and Table Reorganization Tool Related Files” on page 127 for information about the file.

Option 3 - REORGANIZE DBSPACE

This option schedules a full DBSPACE reorganization, including capturing all related DDL (DROP DBSPACE, ACQUIRE DBSPACE, CREATE TABLE, RELOAD DBSPACE) and executing it. In addition, depending on the optional parameters chosen, a DBSPACE can be migrated to another storage pool or another owner. A DBSPACE may also be changed from private to public, or vice versa. The DBSPACE can be moved to another database, as well as have its characteristics, number of pages, percent free space, and percent index changed. This is the most comprehensive option of the reorganization tool.

Figure 56 on page 107 is an example of a jobstream that was generated by Control Center to reorganize the PUBLIC.SQMHELP DBSPACE.

Option 4 - RELOAD DBSPACE

This option submits a job to reload a DBSPACE previously UNLOADED or REORGANIZED using Control Center. The previously created DDL and data files are used to re-create the DBSPACE in its entirety. This option is the recovery counterpart to the UNLOAD DBSPACE option, (Option **2**) and is the method of recovering from an error during a reorganization RELOAD step.

Figure 57 on page 110 shows a sample jobstream that was generated by Control Center to reload the PUBLIC.SQMHELP DBSPACE.

DBSPACE Reorganization Submit Screen

Figure 6 shows the DBSPACE Reorganization Submit screen.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*-------------------------     DBSPACE REORG SUBMIT   --------------------------*
| ******************       VSE/POWER JOB PARAMETERS       ****************** |
|                                                                            |
| JOBNAME   => ________  CLASS ===> A   PRI => 3   DISP ====> D   (D,H,L,K)  |
|                                                                            |
| FROM      => ________  DUETIME => ____ (HHMM)    DUEDATE => ______ (AABBYY) |
|                                                                            |
| DUEDAY    => _____________________________________________ (DAY NAMES/NUMBERS) |
|                                                                            |
| OTHER     => ____________________________________________________________  |
|                                                                            |
|                                                                            |
|                                                                            |
| ----------------        SINGLE USER MODE PARAMETERS       ----------------- |
|                                                                            |
| SUM?    => 2 (1=YES/2=NO)            DATABASE DEFINITION PROC => ________    |
|                                                                            |
| LOGMODE => _ (L,A,Y,N)     NDIRBUF => ______          NPAGBUF => ______     |
|                                                                            |
*---------------------------------------------------------------- SQC06 ----*

PRESS ENTER TO SUBMIT
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 6. DBSPACE REORGANIZATION SUBMIT screen

To reach this screen, press ENTER from the Control Center DBSPACE REORGANIZATION screen.

The first parameter, JOBNAME, is the only one that is required.

VSE/POWER Parameters

Parameter	Description
JOBNAME	Specifies the name by which the DBSPACE REORGANIZATION job and its associated VSE/POWER queue entries is to be known.
CLASS	Specifies the class or partition in which you want this job to run. Class defaults to A.
PRI	Specifies the priority that is to be assigned to the job. Specify a number from 0 to 9 where 9 is the highest priority. Default priority is 3.
DISP	Specifies how the job is to be handled in the reader queue. Disposition may be specified as: • D - Delete after processing • H - Hold until released • K - Keep after processing • L - Leave in the queue Disposition defaults to D.
FROM	Specifies the ID of the user being allowed to manipulate or retrieve the job. Defaults to the CICS user ID.
DUETIME	Specifies the processing start time using hh for hour and mm for minute in 24-hour clock time (OPTIONAL). This can only be 0001 through 2359.
DUEDATE	Specifies the processing date using YY for year. Depending on the format defined for your system, AA is month and BB is day, or AA is day and BB is month (OPTIONAL). No check is made for invalid leap days nor passed dates.
DUEDAY	Specifies the day(s) the job is to be scheduled. You may enter a day name abbreviation such as MON for Monday, or a list separated by commas and enclosed in single quotes (apostrophes). You may also enter the day of the month or a list of day numbers separated by commas and enclosed in quotes. You may also specify DAILY to schedule the job every day of the year (OPTIONAL).
OTHER	The VSE/POWER * $$ JOB card offers many parameters that do not appear on the DBSPACE REORGANIZATION SUBMIT screen. Use this field to have Control Center include those parameters when the job is submitted (OPTIONAL).

After entering the desired submit parameters, press ENTER to submit the job to VSE/POWER. For more information on VSE/POWER jobs, refer to the *VSE/POWER Installation and Operations Guide*.

Figure 7 is a sample of the DBREORG Report.

```
SQB02                        CONTROL CENTER FOR VSE
hh:mm:ss                DBSPACE REORGANIZATION REPORT            mm/dd/yyyy
                   DBSPACE 1                    DBSPACE 2
                   ------------------           ------------------
DATABASE:          SQLDBA                       SQLDBA
OWNER:             PUBLIC                       PUBLIC
DBSPACENAME:       SQMHELP                      SQMHELP
            BEFORE REORG STATISTICS                  AFTER REORG STATISTICS
-----------------------------------     -----------------------------------
DBSPACENO:                          12                                    12
POOL:                                1                                     1
NPAGES:                            128                                   128
NRHEADER:                            1                                     1
PCTINDX:                            33                                    33
FREEPCT:                             0                                     0
LOCKMODE:                         PAGE                                  PAGE
NACTIVE:                            39                                    39
NTABS:                               1                                     1
            ELAPSED TIMES IN MINUTES
-----------------------------------
UNLOAD DBSPACE:              00:00:07
RELOAD DBSPACE:              00:00:08
TOTAL ELAPSED TIME:          00:00:15
SQLMAINT TABLE HAS BEEN SUCCESSFULLY UPDATED.
```

Figure 7. DBSPACE Reorganization Report

Single User Mode (SUM) DBSPACE Reorganization

You can choose to run a DBSPACE reorganization in Multiple User Mode (MUM) or in Single User Mode (SUM). In SUM, contention with other applications and users is eliminated. Storage used to support those users can be used to define additional directory or page buffers, resulting in better performance.

In SUM, you can bypass logging by specifying LOGMODE N. However, switching to logmode N will probably require an archive and a coldlog before the switch and another archive before switching back.

Before You Choose Single User Mode Execution

Review the *DB2 Server for VSE & VM Database Administration* manual to understand Single User Mode database execution. Also, review the topics on choosing a logmode and switching logmodes. Control Center Single User Mode parameters are listed below:

Single User Mode Parameters

Parameter	Description
SUM?	Specify ″1″ (YES) to cause a Single User Mode job to be submitted. This parameter defaults to ″2″ (Multiple User Mode).

DATABASE DEFINITION PROC
Specifies the name of the procedure that contains the job control statements (DLBLs) required to access the database. This parameter need not be entered if the job control statements have been loaded into standard labels.

LOGMODE
Specifies the logmode you want Control Center to use during Single User Mode processing. You must enter a value. Valid values are:

- A - All database changes are logged and regular database archives are maintained.
- L - All database changes are logged and regular log archives are maintained.
- N - No database changes are logged.
- Y - All database changes are logged but no archives are maintained.

NDIRBUF
The number of 512-byte directory pages to be kept in storage. The bigger this value is, the better your database will perform until you run out of storage or cause excessive paging. If specified, the value must be in the range 10—400000. This parameter is not required.

NPAGBUF
The number of 4096-byte data pages to be kept in storage. Again, bigger is better, within reason. If specified, the value must be in the range 10—400000. Entry of this parameter is not required.

SUM processing requires that the database be ended prior to execution. If you submit a SUM job for immediate execution, it will fail. This is because the database server must be stopped when a SUM job is run but has to be up when you run the Control Center function that creates the job. So, you must delay the execution of the job from the reader manually or by using the scheduling controls of DUETIME, DUEDATE, or DUEDAY.

When a job step requires access to a database, the database is started and the application program is executed. When the application program ends, control returns to the database server and the database is ended. The database remains down until it is restarted. Remember that changing the logmode will probably force some combination of coldlogs, and log or database archives.

Figure 58 on page 112 is an example of a Single User Mode REORGANIZE DBSPACE (Option **3**).These parameters were used when choosing the DBspace Reorganization utility's option 3 (REORGANIZE DBSPACE): owner = PUBLIC, DBspace = SAMPLE, REBIND PACKAGE = 1 (YES), UPDATE ALL STATISTICS = 1 (YES), DDL STATEMENTS = 500. On the submit screen, these options were used: SUM = 1 (YES), LOGMODE = N, NDIRBUF = 10, NPAGBUF = 10.

DBSPACE Reorganization Tape Support

Unloading to Tape

When you specify a TLBL FILE-ID on the DBSPACE REORGANIZATION UTILITY screen, tape is used as the data unload media. As a result, the jobstream that

Control Center builds and submits is quite different. Figure 59 on page 116 is an example of a REORGANIZE DBSPACE (Option **3**) using tape.

Special Considerations

Repetitive Scheduling

If a DBSPACE reorganization job is scheduled to be run on a repetitive basis (such as each week on Thursday night), be aware that an SQMPARM file record is created when the REORG job is scheduled. This record contains parameters used by the REORG process. The same record will be used each time the DBSPACE is reorganized. If an intervening REORG job for the same DBSPACE is scheduled from Control Center, a new SQMPARM record will be generated based upon the parameters chosen at that time. These may be different from the ones previously chosen for the scheduled job. This means that the new SQMPARM record will be used for all subsequent executions of the scheduled job. If this is not what you want, delete the scheduled job from the VSE/POWER reader queue and schedule a new one.

Failure Restart

The job listing from your Control Center jobs will indicate whether the job ended successfully. Return code checking and conditional JCL are used to support failure restart. If a DBSPACE reorganization fails prior to the reload step, the DBSPACE has not been changed and the job can be restarted from the beginning. If the failure occurs during the reload step, the function can be restarted using RELOAD DBSPACE (Option **4**).

In all cases, view the output job listing to determine the cause of the error and whether it requires fixing. In many cases, minor errors occur but the job is able to complete successfully.

Problem Analysis

During DDL generation, SQL statements are used to capture information from the database manager system catalogs. If a serious database error is encountered, a descriptive error message and all pertinent information from the SQL Communication Area is displayed on the job listing.

The DBSPACE REORGANIZATION tools use a DBSU command file to execute the UNLOAD DBSPACE portion of the job. Detailed output from the UNLOAD portion is displayed on the job listing. Examine the listing to determine the reason for failure.

During RELOAD processing, DBSPACE REORGANIZATION jobs invoke a DBSU RELOAD. Detailed output of this process is displayed in the job listing. If a failure occurs during the RELOAD, the listing can be examined to determine the cause of failure.

One common problem to be aware of is a possible LOG FULL condition that may occur during RELOAD processing. The DBSU RELOAD TABLE command executes as a single LUW, meaning that the entire RELOAD could be rolled back if an error occurs. The database server would then have to record the LUW in the LOG. If the target table is large, or the database LOG file was nearly full when the reload began, the possibility of a LOG FULL condition exists. Depending on logmode, the database server will attempt to perform a database archive, a log archive, or a

checkpoint in the LOG. If the RELOAD process continues until the LOG is completely full, the database server will begin to ROLLBACK the entire RELOAD.

Since the DROP DBSPACE has already been COMMITTED, the target DBSPACE will be in an incomplete state if this occurs. There are several possible solutions to this problem.

- If the RELOAD failed because the LOG was nearly full prior to the reload, you could perform a database archive, a log archive, or a coldlog (depending on whether you are using logmode A, L, or Y respectively). After this completes, you can complete the reload by initiating a RELOAD DBSPACE (Option **4**).
- If the RELOAD LUW exceeds the LOG size, even when empty, you have two options:
  1. Increase the size of the LOG file, then complete the reorganization.
  2. Run the RELOAD in SUM with logmode N (no logging).

DBSPACE Reorganization Tool

Chapter 5. DBSPACE Analysis Tools

About the DBSPACE Analysis Tools

When an application or user requests information from a database or server, the OPTIMIZER uses catalog statistics to choose the most efficient access path to the data. These statistics are not automatically updated every time a row is inserted, updated, or deleted because of the overhead that would be involved. However, the more accurate the statistics, the better able the optimizer is to choose an efficient method of retrieving data, thereby improving overall database performance. Every DBA needs to ensure that statistics are updated on a regular basis to maximize database performance.

Another common database problem that impacts performance is the gradual fragmentation and disorganization of data over time. After many inserts, updates, and deletes, the data in a database becomes fragmented - spread out over many physical pages, with many gaps and with a physical sequence much different than the logical sequence of data. Reorganization is required to reload the data into a minimum number of physical pages in a physical sequence that optimizes logical data retrieval.

The DBSPACE Analysis tools help you to analyze DBSPACEs and perform maintenance on them to improve performance. These tools are designed to allow you to specify all DBSPACEs or a subset of the DBSPACEs in the database. You can choose what criteria are to be used to identify candidates for maintenance.

There are two basic DBSPACE Analysis tools: one for Update Statistics analysis and another for DBSPACE Reorganization analysis.

Before You Begin

You can analyze DBSPACEs at any time since minimal calls are made to the database catalog. Based on the results of the analysis, the actual maintenance jobs can then be scheduled for off-hours, or as needed.

Whenever possible, schedule the actual maintenance during non-peak hours to prevent locking contention with other database users. Extensive updating of the database system catalogs occurs during UPDATE STATISTICS and DBSPACE reorganizations. During periods of high database usage, this can lead to lock contention.

How the DBSPACE Analysis Tools Work

The DBSPACE Analysis tools help keep DBSPACEs tuned by keeping track of the UPDATE STATISTICS and reorganization activities at the DBSPACE level and by executing these functions where and when required based on specified execution parameters. This data is stored in a database table (SQLMSTR.SQLMAINT) that is created during Control Center installation.

When you select Option **2** from the DBSPACE Analysis Utilties screen (Figure 9 on page 30) to list UPDATE STATISTICS candidates or Option **3** to list REORG candidates, a detailed analysis of each DBSPACE is conducted to determine the

degree of need for maintenance. The results of this analysis are displayed. The DBA can then choose what DBSPACEs to reorganize or to run UPDATE STATISTICS against.

The DBSPACE Analysis tool uses a database table (SQLMSTR.SQLMAINT) to maintain information about DBSPACEs in the database. During execution, each DBSPACE is considered for maintenance based on parameters you enter. After execution, the information in the SQLMAINT table is updated to reflect the changes that have occurred.

When you invoke the DBSPACE Analysis tool, it:

1. Displays an analysis selection screen.
2. Optionally refreshes the SQLMAINT table with data from SYSTEM.SYSDBSPACES.
3. Selects DBSPACEs that match the selection parameters for UPDATE STATISTICS or reorganization.
4. Displays a list of candidates chosen for maintenance.
5. Optionally submits maintenance jobs for the candidates you select.
6. Updates the SQLMAINT table for each DBSPACE that receives maintenance.

The selection process consists of one step for UPDATE STATISTICS analysis and two steps for the reorganization analysis. The steps are:

1. Select DBSPACES from the SQLMAINT table using a first set of selection parameters such as name, size, and time. (See “Selection Options” on page 31).
2. For reorganization, applies REORG CRITERIA to the list selected in step 1 above to produce a list of candidates that need reorganization. (See “DBSPACE Reorganization Criteria (CRITERIA)” on page 31).

SQLMAINT Table

The Control Center installation process creates SQLMAINT in a public DBSPACE in the target database as shown in Figure 8.

```
CREATE TABLE "SQLMSTR"."SQLMAINT"
( "OWNER"          CHAR(8),
  "DBSPACENAME"    CHAR(18),
  "DBSPACENO"      SMALLINT,
  "FREEPCT"        SMALLINT,
  "PCTINDX"        SMALLINT,
  "UPSTAT_DATE"    DATE,
  "UPSTAT_TIME"    TIME,
  "UPSTAT_ELAPSED" TIME,
  "REORG_DATE"     DATE,
  "REORG_TIME"     TIME,
  "REORG_ELAPSED"  TIME,
  "REORG_FREEPCT"  SMALLINT,
  "REORG_PCTINDX"  SMALLINT,
  "REORG_STATUS"   CHAR(2),
  "REORG_WEIGHT"   SMALLINT,
  "NPAGES"         INTEGER )
IN "PUBLIC"."SQLMAINT";
```

Figure 8. SQLMAINT Table Definition

SQLMAINT can be used as a basis for creating your own maintenance reports. You can also update it manually to further control the maintenance process (such as changing the reorganization date to prevent a large DBSPACE from being selected as a candidate for reorganization).

The columns that make up SQLMSTR.SQLMAINT are:

Column Name	Description
OWNER	Owner of the DBSPACE (from SYSTEM.SYSDBSPACES)
DBSPACENAME	Name of the DBSPACE (from SYSTEM.SYSDBSPACES)
DBSPACENO	DBSPACE number (from SYSTEM.SYSDBSPACES)
FREEPCT	FREEPCT value (from SYSTEM.SYSDBSPACES)
PCTINDX	PCTINDX value (from SYSTEM.SYSDBSPACES)
UPSTAT_DATE	Date of the most recent UPDATE STATISTICS
UPSTAT_TIME	Time of the most recent UPDATE STATISTICS
UPSTAT_ELAPSED	Elapsed time of the most recent UPDATE STATISTICS job for this DBSPACE
REORG_DATE	Date of the most recent reorganization
REORG_TIME	Time of the most recent reorganization
REORG_ELAPSED	Elapsed time of the most recent reorganization job
REORG_FREEPCT	FREEPCT value in the most recent reorganization
REORG_PCTINDX	PCTINDX value in the most recent reorganization
REORG_STATUS	A two-character reorganization status indicator
REORG_WEIGHT	An integer indicating the relative need for reorganization. This is derived using a formula based on other information.
NPAGES	Size of the DBSPACE

Function 1 of the DBSPACE Analysis Tool (Initialize Control Table) inserts rows for all private and non-system owned public DBSPACEs into the SQLMAINT table. All DATE columns are initialized to ″0001-01-01″. All TIME columns are set to ″00:00:00″. The table is then ready for use with the other DBSPACE Analysis tool functions.

DBSPACE Analysis Utility Screen

Figure 9 on page 30 shows the DBSPACE Analysis Utilities screen.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*----------------------  DBSPACE ANALYSIS UTILITIES -------------------------*
| DATABASE => SQLDBA                                                         |
| OPTION ===> 3                          REFRESH         => 1 (1=YES 2=NO)   |
|                                                                            |
| 1=INITIALIZE CONTROL TABLE             2=UPDATE STATISTICS CANDIDATES      |
| 3=LIST REORG CANDIDATES                                                    |
|                                                                            |
| *************************** SELECTION OPTIONS    ************************ |
|                                                                            |
| OWNER         ===> ALL                 DBSPACENAME     => _____________   |
|                                                                            |
| MIN(PAGES)     ==> 0                   MAX(PAGES)      => 9999999         |
|                                                                            |
| DAYS SINCE ======> 14                                                      |
|                                                                            |
| CRITERIA       ==> 1                                                       |
|                                                                            |
| 1=CLUSTERRATIO < 9999                  2=UNCLUSTERED INDEX                 |
| 3=NOVERFLOW    >  1 %                  4=APPLY ALL CRITERIA                |
*---------------------------------------------------------------------- SQC08-----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 9. DBSPACE Analysis Utilities Screen

Most fields are initialized to some value. The first two parameters (DATABASE and OPTION) are required. They identify the function you want to perform and what database the function will be performed upon. These fields are initialized to Option **3** (List REORG Candidates) and the database to which Control Center is currently connected.

Functions

The option field can have the following values:

Function	Description
1 INITIALIZE CONTROL TABLE	Rebuilds the SQLMAINT control table in real time; not as a scheduled job. All previous maintenance data will be erased and a row for each non-system owned DBSPACE will be inserted into the table.
2 UPDATE STATISTICS CANDIDATES	Lists the DBSPACEs that need their statistics updated. The candidate list is displayed based upon the other selection options chosen.
3 LIST REORG CANDIDATES	This function lists candidate DBSPACEs that require reorganization based on the specified criteria. It lists each candidate and advises the DBA of the need for reorganization. This is the default option when the screen is first displayed.

The REFRESH parameter (defaults to YES) updates the SQLMAINT table:

1. Adding rows for any DBSPACEs that are not in the SQLMAINT table.
2. Deleting rows for any DBSPACEs that are not in SYSTEM.SYSDBSPACES.

This is done in real time PRIOR to performing the analysis selected. Other DBSPACE entries are not affected and their maintenance data remains intact.

Selection Options

All parameters below the line labeled ″SELECTION OPTIONS″ allow you to control the maintenance activity by restricting the number and type of DBSPACEs that will be selected for analysis. In the case of the UPDATE STATISTICS tool, the selected DBSPACEs will all be candidates. In the REORG tool, candidates retrieved from the SQLMAINT table then have the reorganization CRITERIA applied against them and a final status is presented that states whether the DBSPACE is a REORG candidate.

Parameter	Description
OWNER	Is used to specify whether PUBLIC, PRIVATE, ALL, or specific DBSPACE owner(s) will be selected for analysis. The DB2 Server for VSE wildcard character (%) can be used at the beginning and/or end of a specified DBSPACE OWNER to select ″like″ DBSPACE OWNER names.
DBSPACENAME	Is used to specify a single DBSPACE name or a group of similar DBSPACE names that should be selected for analysis. The DB2 Server for VSE wildcard character (%) can be used at the beginning and/or end of the specified DBSPACE name to select ″like″ DBSPACE names. This parameter defaults to choosing all DBSPACEs owned by the specified DBSPACE OWNER.
PAGES	Is used to specify the MINIMUM and MAXIMUM DBSPACE sizes (expressed in pages) to be selected for analysis.
DAYS SINCE	Specifies the number of days that must have passed since the last UPDATE STATISTICS or reorganization before the DBSPACE can be considered for candidate analysis. **1 indicates yesterday.**

DBSPACE Reorganization Criteria (CRITERIA)

This parameter applies an additional test to selected DBSPACEs to determine whether they are candidates for reorganization. After the selection options above have been used to select DBSPACE names from the SQLMAINT table, the reorganization CRITERIA chosen are checked against those DBSPACEs and the results are displayed on a list screen (see Figure 11 on page 34). Those DBSPACEs meeting the criteria should be considered candidates for reorganization. You can select them from the REORG CANDIDATES LIST screen for job submission and scheduling.

You can select one of four different methods of analyzing the need for reorganization in the list of retrieved DBSPACEs. They are:

Criteria	Description
1 CLUSTERRATIO < nnnn	If the cluster ratio of any index in a DBSPACE is less than the stated value, the DBSPACE is considered a candidate for reorganization,

regardless of the value of the CLUSTER field. You may specify a value from 1 to 9999.

2 UNCLUSTERED INDEX If there are any unclustered indexes in the tables in the DBSPACE, the DBSPACE is identified as a candidate.

3 NOVERFLOW ROWS > n%
If the number of overflow rows for any of the tables in the DBSPACE exceeds the value you entered, the DBSPACE is selected as a candidate.

4 APPLY ALL CRITERIA If any of the above three criteria apply, the DBSPACE is chosen as a candidate for reorganization.

CLUSTER RATIO < 9999 is the default criterion.

Update Statistics Analysis Tool

The Update Statistics Analysis tool can be selected from the DBSPACE ANALYSIS UTILITIES screen by choosing Option **2** (Update Statistics Candidates).

The purpose of this tool is to list the DBSPACEs that need to have their statistics updated and to optionally submit batch jobs to update them.

An example of the list generated by the Update Statistics Analysis Tool is shown in Figure 10 on page 33. The list was created by specifying:

```
OPTION ===> 2

OWNER ===> PUBLIC

PAGES: MINIMUM ==> 0              MAXIMUM ========> 9999999

DAYS SINCE ======> 4
```

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-----------------------   UPDATE STATISTICS LIST --------------------------*
| DATABASE => SQLDBA                                                        |
|                                                                           |
|   OWNER    DBSPACENAME        LAST DATE   ELAPSED   NPAGES               |
|                                                                           |
| _ PUBLIC   ANDY               1996-11-19  00:01:00     128               |
| _ PUBLIC   CONNIE             1996-11-18  00:02:30     128               |
| _ PUBLIC   FRED               1996-10-30  00:01:05     128               |
| _ PUBLIC   MARTIN             1996-11-19  00:00:50     128               |
| _ PUBLIC   SMITH              1996-11-17  00:03:14     256               |
| _ PUBLIC   RAY                1996-11-17  00:02:45     512               |
| _ PUBLIC   TAYLOR             1996-11-18  00:01:30     512               |
| _ PUBLIC   SQLMSTR            1996-11-18  00:00:45     128               |
| _ PUBLIC   SQMHELP            1996-10-29  00:01:20     256               |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------- SQC09 ----*

USE 'X' TO SELECT DBSPACE(S); PRESS ENTER TO SUBMIT
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 10. Update Statistics Analysis List Screen

Note that on this screen the following are displayed:

1. The DBSPACE OWNER and NAME.
2. The DATE of the last Update Statistics for this DBSPACE.
3. The ELAPSED time (in hours:minutes:seconds) of the most recent Update Statistics job for this DBSPACE.
4. The size of the DBSPACE.

From this screen, you can enter an ″X″ next to the DBSPACE(s) for which an UPDATE STATISTICS job is desired. Then, by pressing ENTER, the DBSPACE ANALYSIS SUBMIT screen is displayed and a job can be scheduled for execution. When multiple DBSPACEs are selected, multiple jobs are submitted, each having the same job name and parameters. (See “DBSPACE Analysis Submit Screen” on page 35).

Pressing F12 will take you back to the previous screen (DBSPACE Analysis Utilities). Pressing F3 will take you back to the Control Center main menu.

DBSPACE Reorganization Analysis Tool

This function lists the DBSPACEs that need to be reorganized. The selection process is conducted by evaluating information in the database catalogs and comparing it to the criteria selected by you.

There are three criteria that are evaluated by the program, any of which may cause a DBSPACE to be selected for reorganization. You can choose any one or all three to be used by the Analyzer tool:

1. The existence of unclustered primary indexes on tables within the DBSPACE. This will typically occur when many inserts and deletes have been performed. It greatly reduces the performance of the database.

2. Overflow pages greater than n% for any table in the DBSPACE. This condition indicates a great deal of fragmentation, caused by updates that have increased the row length. The number of I/O operations required to return selected rows is greatly increased.
3. A CLUSTER RATIO value below the threshold specified by the user.
4. All of the criteria above.

An example of the list generated by the Reorganization Analysis Tool is shown in Figure 11. The list was created by specifying:

```
OPTION ===> 3

OWNER ===> PRIVATE

PAGES: MINIMUM ==> _______            MAXIMUM =========> 8192

DAYS SINCE ======> 14

REORG CRITERIA ==> 4
```

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*--------------------------- REORG CANDIDATES LIST ----------------------------*
| DATABASE => SQLDBA                                                          |
|                                                                             |
|   OWNER    DBSPACENAME        LAST DATE   ELAPSED   NPAGES STATUS           |
|                                                                             |
| _ ANDY     TAYLOR             0001-01-01  00:00:00     128                  |
| _ CONNIE   SMITH              1996-11-18  00:01:35     128 NO REORG NEEDED  |
| _ FRED     TAYLOR             1996-11-10  00:01:38     128 OVERFLOW ROWS    |
| _ MARTIN   MARTIN             1996-11-17  00:02:40     128 NO REORG NEEDED  |
| _ MASALI   MASALI             1996-11-17  00:03:00    5120 CLUSTER RATIO    |
| _ RAY      MARTIN             1996-11-17  00:02:15    1024 UNCLUSTERED      |
| _ TAYLORA  TAYLOR             1996-11-12  00:01:50     128 NO REORG NEEDED  |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
*------------------------------------------------------------------ SQC09 ----*

USE 'X' TO SELECT DBSPACE(S); PRESS ENTER TO SUBMIT
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 11. DBSPACE Reorganization Analysis List Screen

Figure 11 is an example of the Reorganization Analysis List created by the tool. Note that on this screen the following are displayed:

- the DBSPACE OWNER and NAME.
- the DATE of the last reorganization run for the DBSPACE.
- the ELAPSED time (in hours:minutes:seconds) of the most recent reorganization job for this DBSPACE.
- the size of the DBSPACE.
- the result of the analysis.

From this screen, you can place an "X" next to the DBSPACE(s) for which reorganization is desired. Then, by pressing ENTER, the DBSPACE ANALYSIS

SUBMIT screen is displayed and a reorganization job can be scheduled for execution. Only one DBSPACE is reorganized in a single batch job. (See Figure 6 on page 20 for details concerning the job submission screen).

If more than one DBSPACE is selected, the SUBMIT screen is displayed for the first DBSPACE selected. Once a job is submitted, the LIST screen is re-displayed, with that DBSPACE identified with an asterisk "*" in the select field. If ENTER is pressed again, the SUBMIT screen is displayed for the next DBSPACE with an "X" in the select field. This process is repeated until a reorganization job has been submitted for every DBSPACE selected (unless, of course, F3, F12, or a scroll function key is chosen by you).

In the sample display, seven DBSPACEs were analyzed and three were selected for reorganization. Four DBSPACEs were discounted because they did not meet the criteria selected. Note that one DBSPACE has never been reorganized. Its date and elapsed time fields have initial values. ANDY.TAYLOR is a new entry in the SQLMAINT table.

By pressing F12, you are returned to the previous screen (DBSPACE Analysis Utilities). F3 returns you to the main menu.

DBSPACE Analysis Submit Screen

Figure 12 shows the DBSPACE Analysis SUBMIT screen.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*-------------------------- DBSPACE ANALYSIS SUBMIT --------------------------*
|                                                                             |
| ********************      VSE/POWER JOB PARAMETERS      ******************* |
|                                                                             |
| JOBNAME   => ________  CLASS ===> A   PRI => 3   DISP ====> D   (D,H,L,K)   |
|                                                                             |
| FROM      => VS02     DUETIME => ____ (HHMM)    DUEDATE => ______ (AABBYY) |
|                                                                             |
| DUEDAY    => ___________________________________________                    |
|                                                                             |
| OTHER     => _____________________________________________________________ |
|                                                                             |
| *************************      JOB OPTIONS      ************************** |
|                                                                             |
| UPDATE ALL STATISTICS => 2 (1=YES/2=NO)         REBIND PACKAGES => 1 (1/2)  |
|                                                                             |
| COMMITCOUNT           => __________                                         |
|                                                                             |
| TLBL FILE-ID          => _________________      FILE #          => 2 (1-3) |
*-------------------------------------------------------------------- SQC10 ----*

PRESS ENTER TO SUBMIT
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 12. DBSPACE Analysis Submit Screen

Refer to the *IBM VSE/POWER Installation and Operations Guide* for use of the job submit parameters. The parameters in the JOB OPTIONS section are for use by the individual Update Statistics or reorganization jobs. These are explained below. Note that only the UPDATE ALL STATISTICS parameter is applicable to the Update Statistics function.

Parameter	Description
JOBNAME	Specifies the name by which the DBSPACE ANALYSIS job and its associated queue entries is to be known.
CLASS	Specifies the class or partition in which you want this job to run. Class defaults to A.
PRI	Specifies the priority that is to be assigned to the job. Specify a number from 0 to 9 where 9 is the highest priority. Default priority is 3.
DISP	Specifies how the job is to be handled in the reader queue. Disposition may be specified as: • D - Delete after processing • H - Hold until released • K - Keep after processing • L - Leave in the queue Disposition defaults to D.
FROM	Specifies the ID of the user being allowed to manipulate or retrieve the job. Defaults to the CICS user ID.
DUETIME	Specifies the processing start time using hh for hour and mm for minute in 24-hour clock time.
DUEDATE	Specifies the processing date using YY for year. Depending on the format defined for your system, AA is month and BB is day, or AA is day and BB is month.
DUEDAY	Specifies the day(s) the job is to be scheduled. You may enter a day name abbreviation such as MON for Monday, or a list separated by commas and enclosed in single quotes (apostrophes). You may also enter the day of the month or a list of day numbers separated by commas and enclosed in quotes. You may also specify DAILY to schedule the job every day of the year.
OTHER	The VSE/POWER * $$ JOB card offers many parameters that do not appear on the DBSPACE ANALYSIS SUBMIT screen. Use this field to have Control Center include those parameters when the job is submitted.

VSE/POWER Job Parameters

DBSPACE Analysis Job Options

Parameter	Description
UPDATE ALL STATISTICS	Specifies whether an UPDATE ALL STATISTICS command should be executed instead of merely an UPDATE STATISTICS. It applies to Update Statistics jobs as well as the reorganization jobs. The default value is 2 (NO).

REBIND PACKAGES	Specifies by 2 (NO) that the DBSPACE Reorganization tool should *not* rebind packages as part of a DBSPACE reorganization. The default is 1 (YES), which means rebinding will occur.
TAPE FILE NAME	Identifies a tape file name that is to receive the output of the UNLOAD, rather than a disk file. The file name should have been defined to Control Center using the Work File Label Definition function. See "Chapter 6. Work File Label Definition Tool" on page 39.
FILE #	Defines which of the previously defined data and DDL files (See "How the Work File Label Definition Tool Works" on page 39) is to be used for the unloaded data and DDL. Valid values are 1, 2, or 3.

Additional Topics

Initial Execution

Since the SQLMAINT table initially contains no maintenance history, all DBSPACEs will be selected when analysis is done the first time. If you want to limit the number of DBSPACEs returned in the Analysis Display List, the last date field for either Update Statistics or REORG (or both) can be modified to inhibit selection of those DBSPACEs for candidate processing. This can be done manually using ISQL or DBSU.

For example, the REORG_DATE and UPSTAT_DATE columns in the SQLMAINT table can initially be set to different values so that a single Analysis run will only consider a portion of the DBSPACEs. You can execute a database command such as:

```
UPDATE SQLMSTR.SQLMAINT SET UPSTAT_DATE = '2000-04-15', REORG_DATE

= '2000-04-15' WHERE OWNER < 'N'
```

This would change about half of the DBSPACEs to a different maintenance date. You could then use the List Reorg Candidates function (option 3) with an appropriate DAYS SINCE parameter so that only those DBSPACEs whose names start with N through Z would be selected.

Reorganization Work Space

The same considerations for TAPE FILE NAME and FILE the reorganization is accomplished using the DBSPACE Reorganization or the Analysis Tool.

Chapter 6. Work File Label Definition Tool

About the Work File Label Definition Tool

The Work File Label Definition tool is an easy-to-use interface for DBAs to use to set up the Job Control Language (JCL) label definition statements needed by Control Center for the DBSPACE Reorganization and Analysis utilities. The JCL is stored in the SQMWORK file and is used during job submission to create the JCL for the batch job.

Note that work files are not actually defined until the first time they are used in a Control Center job. If another application uses an area first, the Control Center job will be cancelled.

Work File Label Definition Screen

When Option **4** is chosen from the Control Center main menu, the screen shown in Figure 13 is displayed. This is also the screen that is presented when the CICS transaction SQFM is entered directly.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-----------------------  WORK FILE LABEL DEFINITION  -----------------------*
|                                                                            |
| OPTION            => 1 (DEFINE WORK FILE               )                   |
|                                                                            |
| ************************************************************************** |
|                                                                            |
| FILE TYPE         =>   (1=DATA                       2=DDL               ) |
|                        (3=PACKAGES                   4=MESSAGES          ) |
|                                                                            |
| FILE/PARTITION    =>             FILE TYPE 1 - 2 : FILE SIZE NUMBER        |
| NUMBER                           FILE TYPE 3     : PARTITION NUMBER        |
|                                  FILE TYPE 4     : NOT USED                |
|                                                                            |
| TLBL FILE-ID      =>                                                       |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*---------------------------------------------------------------- SQC03 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 13. Work File Label Definition Screen

This screen allows you to enter the parameters that identify the work file labels you want to define or update. There is one option available - Define Work File.

How the Work File Label Definition Tool Works

There are 2 types of work files that may be defined:

1. Data, and
2. DDL

Work File Label Definition Tool

Data work files are used by the DBSPACE Reorganization, DBSPACE Analysis, and Table Reorganization tools to hold data unloaded from the DBSPACE using the DBSU UNLOAD DBSPACE command. Data work files may be defined as either:

1. Disk, or
2. Tape

DDL work files are used by the DBSPACE Reorganization and DBSPACE Analysis tools to hold DDL generated from the database by SQB01, the Control Center batch DDL generation program. DDL work files are always stored on disk.

To define a tape work file label, leave FILE TYPE and FILE NUMBER BLANK and only enter a 1 to 17 character FILE ID and press ENTER. The TAPE WORK FILE LABEL DEFINITION will be displayed; see Figure 13 on page 39. Remember that tape may only be used for data work files.

Defining disk files is more involved. Because disks do not have the same capacity as tapes, file size becomes important. The FILE/PARTITION NUMBER field is used to identify small (1), medium (2), and large (3) DDL and DATA work files. If you define only one set of disk work files, we suggest you choose file number 2 because that is the default value on the screens.

When defining a package work file, the field is used to enter a partition number (job class) in which the View Package job stream will run; valid values are 0-9 and A-Z. These two types of values share the same inut field on the screen.

As an example, if the user wants to define a medium-size disk DATA work file, the FILE TYPE would be 1 (DATA) and the FILE NUMBER would be 2 (medium). The file name (and JCL) will be generated as file name SQMDAT2 with file identifier as SQLMSTR.DATA.FILE2. The actual size of the files defined is entered on the next screen and depends on the DBA's estimates of the needed space. (See "Chapter 4. DBSPACE Reorganization Tool" on page 13 for an explanation of how you can combine a disk dataset for the DDL and a tape dataset for the DATA.)

Disk Work File Label Definition Screen

Enter a FILE TYPE and FILE NUMBER and press ENTER to display the DISK WORK FILE LABEL DEFINITION screen as shown in Figure 14 on page 41.

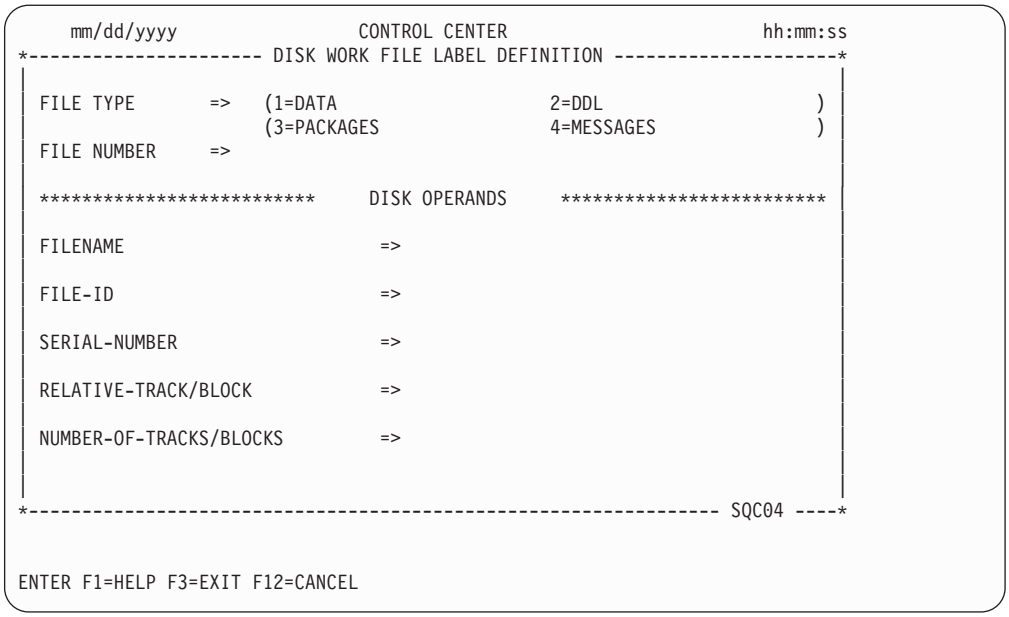

Figure 14. Disk Work File Label Definition Screen

This screen contains the parameters required to define the location and size of a disk work file. The values entered are used to create DLBL, ASSGN, and EXTENT cards that define the file. When you press ENTER, Control Center writes the JCL statements to the SQMWORK file, from which they are available for the job submission routines. Each of the parameters is discussed below.

Disk Work File Label Definition Fields

DISK FILE TYPE and DISK FILE NUMBER are displayed as they were entered on the previous screen. FILENAME and FILE-ID are displayed as generated by Control Center. The following required parameters are explained below. They are used in building the EXTENT JCL statement.

Parameter	Description
VOLUME SERIAL NUMBER	This is the serial number parameter on the EXTENT JCL card. It is a 1 to 6 character field indicating the serial number of the volume on which this file is to be located.
RELATIVE TRACK/BLOCK	This is the starting location of the file. For CKD (Count-Key-Data) devices, specify the 1 to 5 digit sequential track number where the file is to begin. For FBA devices, specify the physical block number, from 2 to 2,147,483,645 (without the commas), where the file is to begin.
NUMBER OF TRACKS/BLOCKS	This specifies the size of the work file. For CKD devices, specify the 1 to 5 digit number of tracks to be allocated to the file. For FBA devices, specify the number of physical blocks that should be allocated to the file. Valid values are 1 to 2,147,483,645 (without the commas).

The actual size of each file depends on the size of the DBSPACEs in your database. Refer to the *DB2 Server for VSE Control Center Program Directory* for sample allocations. Then, make sure the allocations you have made can accommodate your data and DDL.

After entering all parameters, press ENTER to complete processing. Control Center will write DLBL, ASSGN, and EXTENT statements to the SQMWORK file.

F12 will return you to the main WORK FILE LABEL DEFINITION screen. F3 will return you to the Control Center Main Menu.

Note that if the labels for the chosen file are already defined, the currently defined values stored in the SQMWORK file will be displayed on the DISK WORK FILE DEFINITION screen. When the ENTER key is pressed, the records in the SQMWORK file will be updated with any new values entered.

Tape Work File Definition Screen

When defining a tape file, the screen shown in Figure 15 is presented. This screen contains the parameters used to create TLBL and ASSGN statements for the specified file. When you press ENTER, Control Center writes the JCL to the SQMWORK file from which they are accessed by the job submission routines.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*---------------------- TAPE WORK FILE LABEL DEFINITION ----------------------*
|                                                                             |
| FILENAME     => SQMTAPE             FILE-ID      =>                       |
|                                                                             |
| *************************     TAPE OPERANDS     ************************* |
|                                                                             |
| FILE-SERIAL-NUMBER             =>                                           |
| VOLUME-SEQUENCE-NUMBER         =>                                           |
| FILE-SEQUENCE-NUMBER           =>                                           |
| GENERATION-NUMBER              =>                                           |
| VERSION-NUMBER                 =>                                           |
| DATE                           =>          (YYYY/DDD OR 0-9999)             |
| DEVICE-CLASS                   => 1        (1=CARTRIDGE/2=TAPE)             |
| MODE                           =>                                           |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
*------------------------------------------------------------------- SQC04 ----*


ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 15. Tape Work File Label Definition Screen

Each of the parameters is discussed in more detail below.

Tape Work File Label Definition Fields

FILENAME is pre-filled and is always set to ″SQMTAPE″. TAPE FILE-ID is displayed as it was entered on the WORK FILE LABEL DEFINITION screen.

These parameters are all optional except DEVICE CLASS. They are used in building the TLBL and ASSGN JCL statements that define the file.

Parameter **Description**

VOLUME SERIAL NUMBER This is the file serial number parameter on the TLBL statement. It is a 1 to 6 character field indicating the volume serial number of the first (or only) reel of the file.

VOLUME SEQUENCE NUMBER This is a 1 to 4-digit number specifying the volume of a multi-volume file at which you wish to start processing.

FILE SEQUENCE NUMBER This is a 1 to 4-digit number specifying the file of a multi-file volume at which you wish to start processing.

GENERATION NUMBER This is a 1 to 4-digit number specifying the generation number of the file to be processed.

VERSION NUMBER This is a 1 or 2-digit number specifying the version of the file to be processed.

DATE This is the expiration date of the output file expressed either in YYYY/DDD format (absolute expiration date as a Julian date) or as a retention period in days expressed as a 1 to 5-digit number from 0 to 99999.

DEVICE CLASS This is used in building the ASSGN statement. Valid values are ″1″ for CARTRIDGE or ″2″ for TAPE. This is the only required parameter on this screen.

MODE This specifies density when a device class supports more than 1.

After entering all required parameters, press ENTER to complete processing. Control Center will write a TLBL and an ASSGN card to the SQMWORK file.

F12 returns you to the main WORK FILE LABEL DEFINITION screen. F3 returns you to the Control Center Main Menu.

Note that if the file has already been defined, the current values from the SQMWORK file are displayed on the TAPE WORK FILE LABEL DEFINITION screen. When you press ENTER, the records in the SQMWORK file will be updated with any new values entered.

JCL Default Values

If any of the above optional parameters are not entered, default values in accordance with the *VSE/ESA System Control Statements* manual will be used.

Package Work File

The View Package Utility uses a SAM work file (SQLPKGx) to hold the unloaded package used to produce the Package Report. You must allocate a package work file for **each** partition that might use the View Package tool. (The partition number is used as the "x" in the name SQLPKGx.) Therefore, you may have to run this step more than once. Control Center unloads the package into a package work file and processes it to produce a package report. Note, only static partition numbers are allowed.

For example, if you want to run View Package jobs in the background partition (CLASS 0), you would specify FILE TYPE 3 (PACKAGES) and FILE/PARTITION NUMBER 0 (CLASS 0 = BG) as:

```
FILE TYPE            => 3 (1=DATA                    2=DDL               )
                          (3=PACKAGES                4=MESSAGES          )

FILE/PARTITION       => 0       FILE TYPE 1 - 2 : FILE SIZE NUMBER
NUMBER                          FILE TYPE 3     : PARTITION NUMBER
                                FILE TYPE 4     : NOT USED
```

Press ENTER to display the Disk Work File Label Definition screen. Then enter SERIAL-NUMBER, RELATIVE-TRACK/BLOCK, and NUMBER-OF-TRACKS/BLOCKS. Note that as of Control Center Version 7.1, the suggested size of the package work file is 10K bytes; this is adequate for a report on a very big package. If necessary, you can redefine the file's size at any later time. If your existing file is larger, you can redefine it with this step, making it smaller.

```
SERIAL-NUMBER                => SYSWK1
RELATIVE-TRACK/BLACK         => 03695_____
NUMBER-OF-TRACKS/BLOCKS      => 20________
```

Press ENTER to return to the Work File Label Definition Menu and look for the message WORKFILE UPDATED SUCCESSFULLY!

Repeat this process for each partition into which you want to submit batch View Package jobstreams.

Package Messages Work File

You must also define a single package messages file that is used by all partitions. The (batch) Package Report job obtains report headings from this file. To define the file, specify FILE TYPE 4 (MESSAGES). When the FILE TYPE is 4, the FILE/PARTITION NUMBER is not used.

```
FILE TYPE            => 4 (1=DATA                    2=DDL               )
                          (3=PACKAGES                4=MESSAGES          )

FILE/PARTITION       => _       FILE TYPE 1 - 2 : FILE SIZE NUMBER
NUMBER                          FILE TYPE 3     : PARTITION NUMBER
                                FILE TYPE 4     : NOT USED
```

Press ENTER to display the Disk Work File Label Definition screen. Then enter SERIAL-NUMBER, RELATIVE-TRACK/BLOCK, and NUMBER-OF-TRACKS/BLOCKS. Note that as of Control Center Version 7.1, the suggested size of the package work file is 10K bytes; this is adequate for a report on a very big package. If necessary, you can redefine the file's size at any later time. If your existing file is larger, you can redefine it with this step, making it smaller. The new size value includes an allowance for expansion.

```
SERIAL-NUMBER                  => SYSWK1
RELATIVE-TRACK/BLACK           => 03683_____
NUMBER-OF-TRACKS/BLOCKS        => 12________
```

Press ENTER to return to the Work File Label Definition Menu and look for the message WORKFILE UPDATED SUCCESSFULLY!

Special Considerations

Size of Defined Files

Depending on the size and type of DBSPACEs in your database, definition of the DDL and DATA files need not follow the examples. For instance, a database may have some large DBSPACEs (many rows). This would mean a large DATA file would have to be defined. However, the corresponding DDL may in fact be rather small (say a PUBLIC DBSPACE with SELECT granted to all users, only one table, a few indexes, and no referential integrity). The DDL could fit in a small file. In this case, you might define the number 3 DATA file to be much larger and the associated number 3 DDL file to be much smaller.

Chapter 7. CICS Report Controller Interface Tool

About the CICS Report Controller Interface Tool

The CICS Report Controller Interface tool provides a means of transferring from Control Center to the CICS Report Controller so that you can manage the VSE/POWER queue entries associated with the Control Center jobs you have submitted. The CICS Report Controller allows you to release, delete, change, and browse queue entries. When you exit the CICS Report Controller facility, you are returned to the Control Center main menu.

Option **5** from the main menu causes Control Center to start the CEOS CICS transaction that displays the initial Report Controller screen. From there, you navigate through the screens and are presented with different options depending on whether you are working with report listings or jobs in the reader queue. To return to Control Center, repeatedly press F3 until the Control Center main menu is displayed.

A Sample CICS Report Controller Session

In this sample session, assume that you have submitted a Multiple User mode job to reorganize the PUBLIC.SQMHELP DBSPACE.

You enter Option **5** from the main menu and are presented with the CICS Report Controller main menu as shown in Figure 16.

```
CEMS:  1      CICS REPORT CONTROLLER

Select one of the following options:

               1  Report selection.
               2  Printer selection.
               3  JCL report (job) selection.
               4  Transient data queue selection.




               Selection ==>









PF1=Help PF3=End ENTER=Continue.
```

Figure 16. CICS Report Controller Main Menu Screen

You enter selection **1** (Report selection) and are presented with the Report Selection screen as shown in Figure 17 on page 48.

```
CEMS: 11                   REPORT SELECTION

      You may list all reports or only those reports that match
      your selection criteria.

      Type your selection criteria:
        Report number  ==>
        Report name    ==>  M*
        Destination    ==>
        Forms          ==>
        Class          ==>               A-Z / 0-9
        From date      ==>               mm/dd/yy
        To date        ==>               mm/dd/yy

      To select Status type a Y against one or more of the following:
        In use         ==>               Held (L)       ==>
        Resume         ==>               Held (H)       ==>
        Error creating ==>               Ready (K)      ==>
        Error printing ==>               Ready (D)      ==>



PF1=Help PF3=End ENTER=Continue.
```

Figure 17. CICS Report Controller Report Selection Screen

You tab down to the Report name field, enter "**M***" (show all reports whose name starts with "M"), and are presented with the Report List screen as shown in Figure 18.

```
CEMS: 111                  REPORT LIST                   1 TO     1 OF     1

 Enter Options (1=See/Change Characteristics 3=Print 5=Delete 6=Hold 8=Browse)
OPT  NAME     USERDATA         NUMBER STATUS   FORMS CLS PAGES CPY PRI DEST
     MUMREORG                   17471 READY(D)        A     16   1  3  SYSCICSA
```

Figure 18. CICS Report Controller Report List Screen

You enter Option **8** (Browse) and are presented with the Report Browse screen. By pressing F8 (Scr Fwd) and F11 (Page+1), you can view the output of the MUMREORG job, including the portion shown in Figure 19 on page 49.

```
CEMS: 1114        Browsing: MUMREORG                    PAGE 2     OF    16
Search for ==>                                                    More:   - +

09:14:50 Gathering table create DDL...
09:14:51 Gathering deactive primary key DDL...
09:14:51 Gathering inactive unique constraints ..
09:14:51 Gathering table comment DDL...
09:14:51 Gathering column comment DDL...
09:14:51 Gathering primary clustering keys DDL...
09:14:51 Gathering clustering unique constraints DDL...
09:14:51 Gathering index create DDL...
09:14:51 Gathering primary keys DDL...
09:14:51 Gathering foreign keys DDL...
09:14:51 Gathering active unique constraints DDL...
09:14:51 Gathering table grants DDL...
09:14:51 Gathering column grants DDL...
09:14:51 Gathering views and grants DDL...
09:14:51 Gathering package rebind/reload DDL...
09:14:51 Gathering temporary password revokes DDL...
DDL CREATE SUCCESSFUL!

PF1=Help      PF2=Scr Cursor  PF3=Quit   PF4=Scr Left PF5=Scr Right  PF6=Home
PF7=Scr Back  PF8=Scr Fwd     PF9=Repeat PF10=Page-1  PF11=Page+1    PF12=Scal
```

Figure 19. CICS Report Controller Browse Screen

For detailed instruction on using the CICS Report Controller, refer to the IBM *CICS/VSE® Report Controller User's Guide*.

Chapter 8. Control Center Help Facility

About the Help Facility

The Help Facility tool provides information on Control Center menus, functions, and other topics that you may find useful.

You can reach the Help Menu shown in Figure 20 by selecting Option **6** from Control Center's Main Menu.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*----------------------------    HELP FACILITY    -----------------------------*
| DATABASE    => SQLDBA                                                        |
| SUBJECT     =>                                                               |
| *************************    HELP SUBJECTS    ************************** |
|  1 APPLICATION GROUP OBJECTS MENU                                            |
|  2 APPLICATION GROUPS LIST                                                   |
|  3 CICS REPORT CONTROLLER                                                    |
|  4 DBSPACE ANALYSIS SUBMIT SCREEN                                            |
|  5 DBSPACE ANALYSIS UTILITY SCREEN                                           |
|  6 DBSPACE REORGANIZATION SCREEN                                             |
|  7 DBSPACE REORGANIZATION SUBMIT SCREEN                                      |
|  8 DISK WORK FILE LABEL DEFINITION SCREEN                                    |
|  9 GROUP AUTHORIZATION - USER GROUP FUNCTION SCREEN                          |
| 10 GROUP AUTHORIZATION ADD USERS SCREEN                                      |
| 11 GROUP AUTHORIZATION APPLICATION GROUP MENU                                |
| 12 GROUP AUTHORIZATION GRANT/REVOKE MENU                                     |
| 13 GROUP AUTHORIZATION LIST                                                  |
| 14 GROUP AUTHORIZATION OBJECT LIST                                           |
| 15 GROUP AUTHORIZATION USER LIST                                             |
*------------------------------------------------------------------- SQC07 ----*


ENTER F1=HELP F3=EXIT F5=BOT F8=FWD
```

Figure 20. Sample Control Center Help Menu

The name of the server you are currently working with is displayed in the DATABASE field in the upper left corner of the screen.

An alphabetically sorted scrollable list of Help Subjects available is displayed in the body of the screen. By typing the associated subject number in the TOPIC field and pressing ENTER, a display of information on that subject is presented for viewing. Backward and forward as well as top and bottom scrolling are available where applicable.

Text for the Help Facility is located in the database in the PUBLIC.SQMHELP DBSPACE in the SQLMSTR.SQMHELP table. The list of topics and their order may change from one release of Control Center to another due to the addition of new topics.

In most cases, the text provided is identical to that displayed when F1 (HELP) is entered from many of the Control Center screens.

Control Center Help Facility

You can find additional information about Control Center in the DB2 Server for VSE technical library on the World Wide Web at:
http://www.software.ibm.com/data/db2/vse-vm/.Click on ″More Info on DB Server ...″ and then on ″Control Center″.

Chapter 9. Package Utility

Introduction

The Control Center Package Utility assists DBAs by automating four tasks very often associated with managing database packages. A package is a control structure containing SQL statements in executable form. It is produced as part of the preparation process before a program is compiled. Packages are stored in a database.

When a program is migrated from test to production, very often it is not recompiled. Instead, the executable PHASE is simply copied from the test to the production library. If the program contains SQL statements, the associated package must also be copied to the production database.

The Control Center Package Utility helps in this effort by allowing you to unload a package from one database and reload it into another. The unload/reload utilities are also useful for migrating packages in a distributed processing environment.

Whenever an object such as a DBSPACE, table, or index is dropped, all packages dependent upon that object are marked invalid. Before an invalid package can be executed, the database must first rebind it. This can result in poor response time for the first person attempting to execute the program. The Control Center Package Utility allows DBAs to rebind packages ahead of time so that their users are not impacted.

Many times, DBAs are called upon to help application developers identify poor performing SQL statements in their programs and suggest ways the SQL can be recoded to improve performance. The Control Center Package Utility helps in this area by producing a package report which, among other things, lists every SQL statement in the program. The Control Center package report can be used to tune the SQL in the program and becomes an important part of the documentation about the program.

Package Utility Functions

The Package Utility offers four main functions:

- Unload Package
- Reload Package
- Rebind Package
- View Package

The Unload, Reload, Rebind, and View Package Utilities all use DBSU to accomplish the desired process. For each function, Control Center generates a batch job, the appropriate DBSU commands, and includes the JCL to manage their execution. The Unload and Reload functions use LIBR, the VSE librarian, for storage and retrieval of unloaded packages. The View Package Utility uses a REXX/VSE program to produce a printed package report.

For each of these functions, using information you supply on the Package Utility menu (Figure 21 on page 55), Control Center builds and submits a DBSU job.

Package Function Descriptions

Control Center stores packages for this tool in a Librarian library, SQLMSTR.PACKAGE. Periodically, you may want to delete packages no longer needed in this library. Ask your System Programmer to do the delete for you.

Unload Package

The job executes DBSU to unload the package to the VSE punch queue. It then catalogs the punch file containing the package into SQLMSTR.PACKAGE, where it can be accessed for reloading.

Reload Package

The job punches the package to the VSE reader queue from SQLMSTR.PACKAGE. It then executes DBSU to reload the package from the VSE reader queue. Options such as whether an existing package is to be replaced and whether to keep or revoke existing run privileges are supported. Optionally, you may specify a server name other than the one that is displayed.

Note: This function can only be used to reload packages that Control Center has unloaded.

Rebind Package

Optionally, you may specify that the package is only to be rebound if it is already marked as invalid. The job executes DBSU to rebind the package.

View Package

You identify the package to be viewed by specifying an owner and package name. You may specify a server name other than the one that is displayed.

In the job, the package messages are copied to a SAM file where they are accessible to the REXX/VSE package report program. Next, the package is unloaded to a SAM file, followed by the execution of a REXX/VSE program to produce the package report.

Package Migration

For package migration, both the Unload and Reload Package functions previously described are used. Be sure to specify the **Server** name field (Figure 21 on page 55) when invoking the Reload function. During the job submission step, the parameter **DEST** must be specified. See “Package Utility Parameters” on page 55 and “Package Utility Job Submit Parameters” on page 56.

Invocation

There are two ways to invoke the Package Utility:

- From the main menu, by selecting Option **7** (PACKAGE UTILITY), or
- Directly from CICS, by typing the Package Utility transaction ID, **SQPM**.

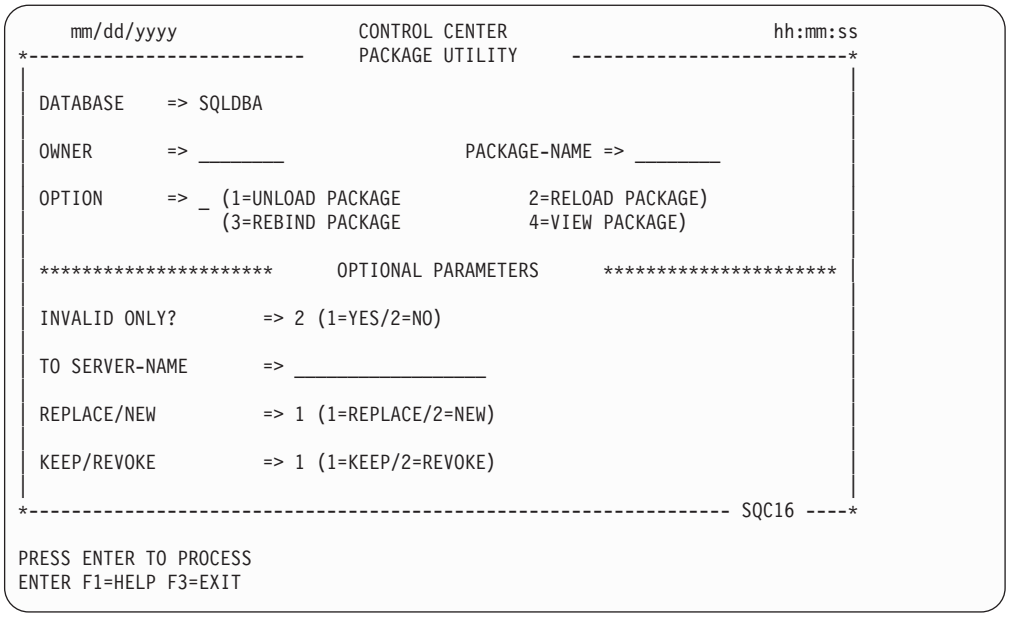

Figure 21. Package Utility Screen

Package Utility Parameters

The Package Utility parameters are:

Entry Field	Description
DATABASE	the name of the default or last used application server. If you enter the name of another server, you will be connected to it before proceeding.
OWNER	the ID of the person who created this package or preprocessed the program associated with it.
PACKAGE-NAME	the name of the package.
OPTION	specifies the function to be executed
INVALID ONLY?	You may want to not rebind a package that is already valid. If so, specify YES. The Package Utility will check to make sure the package is invalid before allowing a rebind job to be submitted. The default value is NO (2).
TO SERVER-NAME	Use this parameter to reload a package to a different application server. DBSU will connect to the application server and reload the package. This parameter applies only to RELOAD PACKAGE.
REPLACE/NEW	Specify REPLACE if an existing package is to be replaced by the reload. If the package does not exist, a new package will be created. NEW causes the reload to fail if a package already exists. REPLACE is the default.
KEEP/REVOKE	KEEP specifies that run authorizations are to remain in effect when the package is reloaded.

REVOKE causes all existing run authorizations to be revoked. KEEP/REVOKE are only allowed with REPLACE. KEEP is the default.

Using the Package Utility

The examples below illustrate how to use the Unload and View Package functions.

How to Unload a Package

To Unload a package, select Option **1** on the Package Utility screen (Figure 21 on page 55). Identify the package to be unloaded by specifying the owner and package name. Optionally, you may specify a server name other than the one that is displayed. If the package does not exist, you will receive a message in the lower left hand corner of menu.

After you press ENTER while viewing the Package Utility screen, the Package Job Submit screen, Figure 22, is displayed. This is where you specify the parameters for job submission to the VSE/POWER queue.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*------------------------- PACKAGE JOB SUBMIT SCREEN -------------------------*
|                                                                             |
|  JOBNAME   => ________                CLASS   => A                          |
|                                                                             |
|  PRI       => 3                       DISP    => D (D,H,L,K)                |
|                                                                             |
|  FROM      => ________                                                      |
|                                                                             |
|  DUETIME   => ____ (HHMM)             DUEDATE => ______ (AABBYY)            |
|                                                                             |
|  DUEDAY    => ____________________________________________                  |
|                                                                             |
|                                                                             |
|  OTHER     => ____________________________________________________________  |
|                                                                             |
|  LST CLASS => A                                                             |
|                                                                             |
|  DEST      => ________                                                      |
|                                                                             |
|                                                                             |
*------------------------------------------------------------------- SQC17 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 22. Package Job Submit Screen

Package Utility Job Submit Parameters

The job submission parameters are:

Parameter	Description
JOBNAME	Specifies the name by which the DBSPACE REORGANIZATION job and its associated queue entries is to be known.
CLASS	Specifies the class or partition in which you want this job to run. Class defaults to A.
PRI	Specifies the priority that is to be assigned to the job. Specify a number from 0 to 9 where 9 is the highest priority. Default priority is 3.

DISP	Specifies how the job is to be handled in the reader queue. Disposition may be specified as: • D - Delete after processing • H - Hold until released • K - Keep after processing • L - Leave in the queue Disposition defaults to D.
FROM	Specifies the ID of the user being allowed to manipulate or retrieve the job. Defaults to the CICS user ID.
DUETIME	Specifies the processing start time using hh for hour and mm for minute in 24-hour clock time (OPTIONAL).
DUEDATE	Specifies the processing date using YY for year. Depending on the format defined for your system, AA is month and BB is day, or AA is day and BB is month (OPTIONAL).
DUEDAY	Specifies the day(s) the job is to be scheduled. You may enter a day name abbreviation such as MON for Monday, or a list separated by commas and enclosed in single quotes (apostrophes). You may also enter the day of the month or a list of day numbers separated by commas and enclosed in quotes. You may also specify DAILY to schedule the job every day of the year (OPTIONAL).
OTHER	The VSE/POWER * $$ JOB card offers many parameters that do not appear on the DBSPACE REORGANIZATION SUBMIT screen. Use this field to have Control Center include those parameters when the job is submitted (OPTIONAL).
LST CLASS	defines the class to be assigned to printed output. Specify any letter of the alphabet, or any number 0 through 9.
DEST	specifies the node-id where VSE/POWER is to route the RELOAD PACKAGE job for processing. Specify the name of an applicable node as defined to VSE/POWER with the PNODE macro. This parameter allows you to migrate a package from a local application server to an application server running on a remote system.

How to View a Package

To view a package, specify the OWNER and PACKAGE_NAME fields on the Package Utility screen (Figure 21 on page 55), and select Option **4**. Provide appropriate parameters on the Package Job Submit screen. The View Package tool executes DBSU to unload the desired package to a SAM file. It then generates a package report that lets you view the package contents which include:

- Preprocessing Information
- Each SQL statement used in the associated program
- Information about its corresponding host variables

This data is quite helpful and can be used to analyze performance problems.

Figure 23 shows a report generated from the View Package option.

```
Date: dd Mmm yyyy                                                    Page: 1
                        Control Center Package Report
                        _____________________________

 Package: SQLMSTR.SQC05
 Database: SQLDBA

 First Create Release: 7.1
 Last Create Release: 7.1
 Charname: INTERNATIONAL
 Sections: 6

 Preprocessing Characteristics:
 ______________________________

     NOGRAPHIC, BLOCK, NOMODIFY, NODESCRIBE

 Options Specified at Prep time:
 _______________________________

     BLock
     ISOLation(RR)

 DEFAULT Options at Prep time:
 _____________________________

     RELease(COMMIT), EXPLAIN(NO), KEEP, REPLACE, NOEXIST
     NOCHECK, PERiod, APOST
     PREPname=SQC05, CTOKEN(NO), LABEL( )

 Static SQL Statements in Package:
 _________________________________

 SELECT NPAGES, POOL INTO :H, :H FROM SYSTEM.SYSDBSPACES WHERE OWNER
 :H AND DBSPACENAME = :H

 SELECT OWNER FROM SYSTEM.SYSDBSPACES WHERE OWNER = :H AND DBSPACETYPE =
 :H AND NPAGES = :H AND POOL IN (:H,:H)

 SELECT OWNER INTO :H FROM SYSTEM.SYSDBSPACES WHERE OWNER = :H AND
 DBSPACENAME = :H

 SELECT VALUE INTO :H FROM SYSTEM.SYSOPTIONS WHERE SQLOPTION = 'RELEASE'


 SELECT CURRENT SERVER INTO :H FROM SYSTEM.SYSOPTIONS WHERE SQLOPTION =
 'RELEASE'
```

Figure 23. Example Output from View Package Option

Chapter 10. Group Authorization Tool

The Group Authorization tool helps DBAs manage access to database objects, simplifies the authorization process, and shortens the time needed to grant or revoke privileges. It lets DBAs issue authorizations to groups of users on groups of objects rather than one by one. You can associate individual users with defined User Groups, and you can associate database objects (such as tables, views, and packages) with defined Application Groups. Then you can use the Group Authorization menus to issue GRANTs and REVOKEs specifying a User Group (grantee) and an Application Group (on objects).

About the Group Authorization Tool

The Group Authorization Tool is a series of CICS transactions that operate under the SQM main transaction. The ″SQLMSTR″ ID grants all authorizations. The tool records and maintains all authorizations.

You can use the “LIST Functions” on page 61 to view the various reports that are available to help manage database access. These reports show Application Groups and the objects they contain, such as tables, views and packages; User Groups and user IDs associated with specific User Groups; and authorities granted to User Groups.

The Group Authorization tool keeps all data about User and Application Groups, as well as authorization information, in database tables. You can query these tables to obtain authorization information. See “Special Considerations” on page 67 for an example.

The ″SQLMSTR″ ID owns five authorization tables that contain its information about User, Application Groups and authorizations. These tables are:

USERID_GROUP_TAB	User Group Table. This table is used to hold the name, internal ID, and description of a User group.
USERID_TAB	User ID Table. This table has one row for each unique combination of Userid and User Group ID.
APPL_GROUP_TAB	Application Group Table. This table is used to hold the name, internal ID, and description of an Application Group.
OBJECT_TAB	Object ID Table. This table has an entry for each unique combination of object (object owner, object name) and Application Group ID.
GROUP_AUTH_TAB	Group Authorization Table. This table records each group authorization made by SQLMSTR. It records the User Group ID, the Application Group ID and the specific privileges granted using the Group Authorization tool.

Users can belong to more than one User Group and can have the same privilege granted to an object through multiple User Groups. If you drop the user from one User Group, the user does **not** automatically lose the privilege to the object since the user still has authority through the second User Group.

The same is true of an object that is in more than one Application Group: if that object is dropped from one group, but privileges on it exist through another application group, those privileges will **not** be automatically revoked from users who have authority on it through the second group.

You can choose to:

- ADD a group
- DROP a group
- Manage group objects and users
- Manage privileges
- Manage privileges
- LIST privileges

Functions

ADD a Group

Lets you create both User and Application Groups. The data created will be stored in the USER_GROUP_TAB and APPL_GROUP_TAB tables respectively.

DROP a Group

Deletes a group entry from the applicable tables. In addition, if any privileges have been granted to a User Group which is being dropped, all privileges will be revoked from all users in that group. If an Application Group is dropped, all privileges that were granted on that group will be revoked from all users who were granted those privileges. There are two exceptions to this rule:

1. When dropping a User Group to which some group authorizations have been made, a check is made before revoking each user's privileges to determine if the user has been granted the same privileges through another group. If they do belong to a User Group with the same privileges, the users will not lose their privileges.
2. When dropping an Application Group that has had privileges granted on it, a check is made before revoking the privileges from each user to whom they were granted. If the privileges on the object have been granted to that user through another Application Group, the users will not lose their privileges.

Manage Group Objects and Users

Permits the DBA to populate a group with user IDs (in the case of User Groups) or, tables and views, or packages (in the case of Application Groups). Application Groups are defined as either a table group (consisting of tables and views only) or a package group (consisting of package names only).

A user can belong to more than one User Group. An object can belong to more than one Application Group. Each group type must have at least one member.

When you add an object to an Application Group, any privileges of existing User Groups will be GRANTED on the newly added object to all users in the User Groups authorized to that Application Group. When an object is dropped from an Application Group, all privileges to that object will be REVOKED for all users unless the user is a member of another group with similar privileges. (See the exceptions in "DROP a Group".)

When you add a user to a User Group, the user is granted all authorities that the group currently holds. When you drop a user from a group, the user loses all authorities which the group has unless the user is a member of another group with the same authorities. (See exceptions in "DROP a Group" on page 60.)

Manage Privileges

Lets you grant and revoke privileges to User Groups on individual database objects or on Application Groups (that is, on all objects defined in the group). You cannot grant column update privileges; however, you can create a view with the column updates and then grant update privilege on the view.

Use the Authorizations Menu to enter an individual object or a group of objects on which you want to grant or revoke privileges. An individual object is identified by its owner and object name. A group object is identified by its Application Group name. You use the SQLMSTR connect ID authorizations.

For example, in the SYSTEM.SYSTABAUTH table, SQLMSTR is always the grantor for group authorizations. An extra grant is done for the User Group name to facilitate the implementation of the tool. If you give SELECT privilege to User Group UGROUP1 on Application Group AGROUP1, the Group Authorization tool generates one extra GRANT SELECT to UGROUP1 on each object in AGROUP1. Likewise, when you use the REVOKE function, the SELECT privilege is revoked from the User Group.

LIST Functions

The Group Authorization tool provides the following on-line reports:

- All User Groups
- All Application Groups
- All Users/Objects within a specific group
- All Application Groups on which a given User Group has been granted privileges, and what those privileges are
- All User Groups to which privileges have been granted on a given Application Group, and what those privileges are

Using the Group Authorization Tool

To use the Group Authorization tool, you need to:

1. Define Application Groups
2. Add (or Drop) objects to the Application Groups
3. Define User Groups
4. Add Users to the User Groups
5. Grant Authorities to the User Groups

In addition, you need to be able to:

6. Drop a User
7. Drop a Group

To reach the Group Authorization Menu shown in Figure 24:

- Select Option **8** from the Control Center main menu, or
- Enter the **SQGA** transaction ID from a CICS screen.

```
    mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*--------------------      GROUP AUTHORIZATION MENU      --------------------*
| DATABASE  => SQLDBA                                                       |
| OPTION    =>                                                              |
|                                                                           |
|  1 USER GROUP FUNCTION                                                    |
|  2 USER FUNCTION                                                          |
|  3 APPLICATION GROUP FUNCTION                                             |
|  4 GROUP AUTHORIZATIONS                                                   |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------- SQC19 ----*
PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 24. Control Center Group Authorization Menu

Before using the Group Authorization tool, you need to analyze your current database authorization structure. Start by grouping tables and views according to some common function or element(s). For instance, perhaps you want all payroll, personnel, or accounting tables in their own specific groups. Once you have decided this, you can define Application Groups for these various functions.

Let's say you have 5 tables and 3 views that belong in the personnel organization and you want to define three Application Groups for this organization. The Application Groups will contain the tables and views from the personnel organization.

The following steps show how to use the tool to define the application groups. Before starting, decide what tables will be in which group as shown in Application Group Definitions:

Application Group Definitions

```
AGROUP1 contains PERSTAB1, PERSTAB2, PERSTAB3, PERSVIEW1
AGROUP2 contains PERSTAB1, PERSTAB4, PERSTAB5, PERSVIEW2
AGROUP3 contains PERSVIEW3
```

Note: **PERSTAB1** is common to both AGROUP1 and AGROUP2, and AGROUP3 has only one view defined to it (PERSVIEW3).

Step 1: Define Application Groups

To define an Application Group, enter Option **3** from the Group Authorization Menu to get to the Application Group Menu.

```
    mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*------------------------- APPLICATION GROUP MENU ---------------------------*
| DATABASE   => SQLDBA                                                       |
| GROUP      => AGROUP1                                                      |
| OPTION     => 1                                                            |
|                                                                            |
|  1 ADD  GROUP                                                              |
|  2 DROP GROUP                                                              |
|  3 ADD/DROP OBJECTS IN A GROUP                                             |
|  4 LIST GROUPS                                                             |
|  5 LIST OBJECTS IN A GROUP                                                 |
|  6 LIST GROUP AUTHORIZATIONS                                               |
|                                                                            |
| ************************************************************************** |
|                                                                            |
| DESCRIPTION       => Personnel tables                                      |
| GROUP TYPE        => T           (T=TABLES AND VIEWS, P=PACKAGES)          |
|                                                                            |
|                                                                            |
|                                                                            |
*---------------------------------------------------------------- SQC26 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=RETURN
```

Figure 25. Control Center Application Group Menu

Enter the name of the Application Group you are adding in the Group field, choose Option **1**, Add Group, and enter the Group Type (use **T** for tables or views or **P** for packages). You can also choose to add a description of the group in the Group Description field. If you enter a Group Description, it is stored in the database record and you can view it in the Application Group list report. The database you are working with is shown at the top of the screen in the Database field. If you want to work with a different database, enter the name of the new database in the DATABASE field.

The example shown in Figure 25 shows how to add the group AGROUP1. The Application Group type is **T** for tables or views, and "Personnel tables" has been added as the Group DESCRIPTION.

Step 2: Add (or Drop) Objects to the Application Group

Once you have defined the Application Group, you add the objects (that is, tables and views, or packages) to the group. On the Application Group Menu Figure 25, choose Option **3** to add the objects to the Application Group. You add tables and views, or packages to the Application Group on the Object Functions menu. Figure 26 on page 64 shows how to add the three personnel tables and a view to the AGROUP1 Application Group.

If you later want to delete an object from an application group, use this function (accessed by Group Authorization, main menu option **3**) to delete the object.

```
    mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    OBJECT FUNCTIONS    --------------------------*
| DATABASE => SQLDBA                                                       |
| GROUP    => AGROUP1                                                      |
| OPTION ===> 1                                                            |
|                                                                          |
| 1= ADD OBJECTS          2= DROP OBJECTS                                  |
|                                                                          |
|       OWNER      OBJECT NAME                                             |
|       PERS       PERSTAB1                                                |
|       PERS       PERSTAB2                                                |
|       PERS       PERSTAB3                                                |
|       PERS       PERSVIEW1                                               |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
*------------------------------------------------------------------ SQC28 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=RETURN
```

Figure 26. Adding Objects to Your Application Group

Step 3: Define User Groups

After you have established the Application Groups, you define the users of your database to whom you want to grant privileges. For example, let's assume you have ten users whose IDs are USER1, USER2, and so on through USER10. You can now group these users by the criteria you use to determine authorization. Our examples use the following three User Groups:

User Group Definitions

```
UGROUP1 consists of User1, User2, User3, User4, User5, User6
UGROUP2 consists of User1, User7, User8, User9, User10
UGROUP3 consists of User1 through User10
```

Note: User1 is in all 3 groups, all ten users are in UGROUP3.

Use the User Group Menu to add or delete a User Group, to define the members of a User Group, and to list User Groups. To reach the User Group Menu: From the Group Authorization Menu, select Option **1** to reach the User Group Menu.

Figure 27 on page 65 show how to add the UGROUP1 User Group.

```
    mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    USER GROUP MENU      ------------------------*
| DATABASE   => SQLDBA                                                     |
| GROUP      => UGROUP1                                                    |
| OPTION     => 1                                                          |
|                                                                          |
|  1 ADD  GROUP                                                            |
|  2 DROP GROUP                                                            |
|  3 ADD USERS TO A GROUP                                                  |
|  4 LIST GROUPS                                                           |
|  5 LIST USERS IN A GROUP                                                 |
|  6 LIST GROUP AUTHORIZATIONS                                             |
|                                                                          |
|                                                                          |
|                                                                          |
| ************************************************************************ |
|                                                                          |
| DESCRIPTION       => Executives                                          |
|                                                                          |
|                                                                          |
*-------------------------------------------------------------- SQC20 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=RETURN
```

Figure 27. Adding a User Group

Figure 28 shows the result of using option **4** to see what groups already exist.

```
    mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    USER GROUP LIST    ---------------------------*
| DATABASE   => SQLDBA                                                     |
|                                                                          |
|                                                                          |
|         GROUP    DESCRIPTION                                             |
|                                                                          |
|         TESTGRP  TEST GROUP 1                                            |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
*-------------------------------------------------------------- SQC21 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=RETURN
```

Figure 28. Checking for Existing User Group

Step 4: Add Users to the User Groups

Now choose Option **3** to add users to the User Group you have defined in Step 3. You enter the User Group member on the Add Users screen shown in Figure 29 on page 66, or Option **2** from the Group Authorization Menu.

```
    mm/dd/yyyy                CONTROL CENTER                      hh:mm:ss
*-------------------------       ADD USERS       ------------------------*
| DATABASE => SQLDBA                                                      |
| GROUP    => UGROUP1                                                     |
| OPTION ===> 1                                                           |
|                                                                         |
| 1= ADD USER(S)                                                          |
|                                                                         |
|        USER                                                             |
|        User1                                                            |
|        User2                                                            |
|        User3                                                            |
|        User4                                                            |
|        User5                                                            |
|        User6                                                            |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
*------------------------------------------------------------- SQC29  ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=RETURN
```

Figure 29. Adding Users to UGROUP1

Step 5: Grant Authorities to the User Groups

In this step, you grant object authority to the User Group. Use the Authorization Menu to issue grants or revokes to the User Groups. Figure 30 shows how to grant Select and Update on AGROUP1 to UGROUP1.

```
    mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------  AUTHORIZATIONS MENU  -------------------------*
| DATABASE => SQLDBA                                                      |
|                                                                         |
| OPTION                 => 1     (    1=GRANT   2=REVOKE    )          |
|                                                                         |
| PRIVILEGES             => 1 4   (    1=SELECT  2=INSERT  3=DELETE     |
|                                      4=UPDATE  5=ALL     6=EXECUTE    |
|                                ON                                       |
| OBJECT OWNER           =>                                             |
| OBJECT NAME            =>                                             |
|                                OR                                       |
| APPLICATION GROUP NAME => AGROUP1                                      |
|                                                                         |
|                                                                         |
|                             TO OR FROM                                  |
| USER GROUP             => UGROUP1                                     |
|                                                                         |
| WITH GRANT OPTION      =>           (    1=YES    )                    |
|                                                                         |
*------------------------------------------------------------- SQC27 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=RETURN
```

Figure 30. Authorization Menu

The choices made in the example show in Figure 30, grant Select and Update privileges on tables PERSTAB1, PERSTAB2, PERSTAB3, and PERSVIEW1 to user

IDs USER1 through USER6. To grant multiple privileges at the same time, enter the number corresponding to each privilege separated by a space.

Let's assume you have also granted Select and Update privileges on tables PERSTAB1, PERSTAB2, PERSTAB3, and PERSVIEW1 to UGROUP2 (that contains user IDs USER1, and USER7 through USER10). Note that you have given USER1 Select and Update privileges on the same tables in AGROUP1. If you revoked the Update privilege from UGROUP1, all members of UGROUP1 would lose their Update privilege except USER1. USER1 would keep the UPDATE privilege because it is also a member of UGROUP2 that still has the UPDATE privilege.

Special Considerations

Using Control Center you grant authorizations to Groups, not to individual user ID's.

1. If you want to grant authorizations to an individual user ID, define a User Group with only one user ID in it. You can then grant authorizations to that user group which, in effect, let's you grant authorizations to a single user ID.
2. Authorizations can be granted to an individual table that is not a member of an Application Group. For example:

   Individual Tables
   GRANT Select on SQLDBA.ACTIVITY to UGROUP1

   This will grant the privilege to all users defined in UGROUP1. However, since the grant is to an individual database entity and not to an Application Group, the Group Authorization tool does not record the authorizations in its tables.

   If any user ID in UGROUP1 were to later have its privilege to SQLDBA.ACTIVITY revoked due to the table being defined in an Application Group, the privilege would be deleted from SYSTEM.SYSTABAUTH since the Group Authorization tool does not know about the individually granted authority. If you want the tool to keep a record of the individual authorization, define the table in its own group. Just as you can define a single user in a User Group, you can also define a single object in its own Application Group.
3. You can grant or revoke the following authorizations:
   - SELECT, INSERT, UPDATE, DELETE and ALL on Tables and Views. The ALL authorization is equivalent to the SELECT, INSERT, UPDATE, and DELETE privileges. It does **NOT** include ALTER, INDEX, or REFERENCES.
   - EXECUTE on Packages
   - Use the GRANT option on all the above authorizations:
4. All grants and revokes are executed with the SQLMSTR connect ID.
5. When granting EXECUTE on packages, the "SQLMSTR" ID must have the RUN privilege with GRANT option in order to do the GRANT.
6. You cannot grant referential constraint privileges.
7. The tool will not affect any current authorizations recorded in SYSTEM.SYSTABAUTH and SYSTEM.SYSPROGAUTH, since the "SQLMSTR" ID grants all privileges. As you build your authorization scheme and issue grants using the tool, remove old or non-SQLMSTR grants as appropriate.

8. The following is an example of a query you can use to obtain information from the Group Authorization tables. For example, if you want a list of those users (and their group IDs) that have SELECT authorization to all the objects in a particular Application Group, use:

```
SELECT A.APPL_GROUP_NAME, O.OBJECT_OWNER, O.OBJECT_NAME, G.S_AUTH,
       U.USERID, UG.GROUP_NAME
FROM   SQLMSTR.USERID_GROUP_TAB UG, SQLMSTR.USERID_TAB U,
       SQLMSTR.OBJECT_TAB O, SQLMSTR.GROUP_AUTH_TAB G,
       SQLMSTR.APPL_GROUP_TAB A
WHERE  A.APPL_GROUP_NAME = 'AGROUP5'         AND
       O.APPL_GROUP_ID   = G.APPL_GROUP_ID   AND
       U.GROUP_ID        = G.USERID_GROUP_ID AND
       A.APPL_GROUP_ID   = G.APPL_GROUP_ID   AND
       UG.GROUP_ID       = U.GROUP_ID        AND
       G.S_AUTH > ' '
ORDER BY 1,2,3,5
```

Figure 31. Query Using Join Statement

```
APPL
GROUP      OBJECT     OBJECT                          GROUP
NAME       OWNER      NAME        S AUTH    USERID    NAME
----       ------     --------    ------    ------    ------

AGROUP5    M760595    TABERROR      G       TESTGP3   TESTGP3
AGROUP5    M760595    TABERROR      Y       TESTGP4   TESTGP4
AGROUP5    M760595    TABERROR      G       USER1     TESTGP3
AGROUP5    M760595    TABERROR      Y       USER1     TESTGP4
AGROUP5    M760595    TABERROR      G       USER2     TESTGP3
AGROUP5    M760595    TABERROR      G       USER3     TESTGP3
AGROUP5    M760595    TABERROR      Y       USER4     TESTGP4
AGROUP5    M760595    TABERROR      Y       USER5     TESTGP4
AGROUP5    SQLDBA     ACTIVITY      G       TESTGP3   TESTGP3
AGROUP5    SQLDBA     ACTIVITY      Y       TESTGP4   TESTGP4
AGROUP5    SQLDBA     ACTIVITY      G       USER1     TESTGP3
AGROUP5    SQLDBA     ACTIVITY      Y       USER1     TESTGP4
```

Figure 32. Results of Join Query

Or, if you want to modify a group's description, you can simply update the GROUP_DESC field for the USERID_GROUP_TAB or the APPL_DESC field of the APPL_GROUP_TAB.

Chapter 11. The Monitor Maintenance Menu

The Control Center Monitor Utilities are a DBA's best friend. They keep watch over the database while you are busy doing something else. They notify you when exceptional conditions occur and they capture key information that you need to track performance problems and resource consumption.

Whether you are interested in tracking user activity, locking, physical and logical space use, or the database itself, there are monitors designed to give you that information.

The SHOW ACTIVE and SHOW CONNECT monitors collect information that tells you if users have been waiting for database resources. You can choose to set the Monitor Utility to alert you immediately, on the operator's console, if it detects a user in wait state.

The SHOW LOCK monitor records the number of lock buffers in use and who is locking whom. You can also set this monitor to alert you immediately, on the operator's console, if it detects any kind of user locking.

The SHOW LOG, SHOW DBEXTENT, and SHOW DBSPACE monitors record the use of these vital resources. You can direct the SHOW LOG and SHOW DBEXTENT monitors to notify you immediately if their use exceeds the percentage you specify. The COUNTER * monitor records the occurrence of key events in the database and stores this information in the database. You are then free to develop your own custom queries to track statistics; such as, buffer hit ratio or LPAGBUFF and PAGEREAD.

How the Monitors Work

The monitor "kernel" is the heart of the Monitor Utility. It is a COBOL/CICS program that runs unattached to any terminal. For each database for which you have started a kernel, there will be a separate kernel task. Each time a monitor kernel is activated, it determines what monitors should be scheduled and starts a task for each. At midnight, the kernel schedules the Reset Monitor task, that optionally deletes the monitor data and optionally produces a report for all monitors **scheduled** to be reset.

Each individual monitor:

- Issues a database operator command,
- Captures the output,
- Writes information to the appropriate monitor table,
- Optionally provides notification of exceptional conditions where applicable.

This monitor kernel reactivates itself every minute to check if it needs to dispatch any monitors.

Options and Monitors Available

As shown in Figure 37 on page 75, the Monitor Utilities include options that allow you to:

- Start and stop monitor kernels
- List defined monitors
- Add, modify, delete, and display monitors
- View monitor data online
- Reset monitor data
- Print monitor reports

These options use seven monitors:

- SHOW ACTIVE
- SHOW LOCK
- SHOW DBEXTENT
- SHOW LOG
- SHOW CONNECT
- SHOW DBSPACE
- COUNTER *

Monitor Thresholds and VSE Console Messages

All the monitors listed, except SHOW DBSPACE and COUNTER *, let you specify a threshold at which Control Center will generate a VSE console message.

For instance, if the SHOW ACTIVE monitor finds a CHECKPOINT or USER WAIT situation when it executes, or if SHOW LOG or SHOW DBEXTENT reaches a PERCENT USED value, Control Center sends a message to the VSE console. Similarly, if SHOW CONNECT finds AGENTS WAITING, NOT PROCESSING or INACTIVE, or if the SHOW LOCK monitors meet the locking indicators, Control Center will issue the appropriate message.

Figure 33 is an example of the messages sent to the VSE console when a SHOW ACTIVE monitor threshold is reached.

```
SYSTEM:  VSE/ESA       V2.1.0  --  SVSCVSA                     USER:  VS22
                                                               TIME:  hh:mm:ss
F2 0002 SQM0632 SQLMSTR  IS IN COMMUNICATION WAIT
F2 0002 SQM0318 DATABASE:      SQLDBA
F2 0002 SQM0632 CMORGAN  IS IN COMMUNICATION WAIT
F2 0002 SQM0318 DATABASE:      SQLDBA




==>

1=HLP 2=CPY 3=END 4=RTN 5=DEL 6=DELS 7=RED 8=CONT 9=EXPL 10=HLD         12=RTRV

ACT_MSG: HOLD              PAUSE: 01  SCROLL: 1           MODE:  CONSOLE
```

Figure 33. VSE Console - Monitor Threshold Notification

In this figure, Database SQLDBA shows two agents, SQLMSTR and CMORGAN, in communication wait state. Although neither situation is necessarily a problem, you may want to investigate continued wait states.

Description of Monitor Options

Start the Monitor Kernel

You start the monitor kernel from the Monitor Menu. The Monitor Menu is invoked by selecting Option **09** Monitor Utilities from the Control Center Main Menu, and then Option **1**. It is shown in Figure 34. You must have defined ("Add a Monitor" on page 72) at least one monitor in order to use this function. Once started, the monitor kernel runs until you execute the Stop Monitor command.

```
    mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*--------------------------   MONITOR UTILITY   --------------------------*
|                                                                          |
| DATABASE     => SQLDBA                                                   |
|                                                                          |
| ************************************************************************ |
|                                                                          |
| OPTION       =>    01 START KERNEL             02 STOP KERNEL          |
|                    03 LIST MONITORS            04 ADD MONITOR          |
|                    05 MODIFY MONITOR           06 DELETE MONITOR       |
|                    07 DISPLAY MONITOR          08 VIEW DATA            |
|                    09 RESET DATA               10 PRINT REPORT         |
|                                                                          |
| ************************************************************************ |
|                                                                          |
| MONITOR      =>    01 SHOW ACTIVE              02 SHOW LOCK            |
|                    03 SHOW DBEXTENT            04 SHOW LOG             |
|                    05 SHOW CONNECT             06 SHOW DBSPACE 00001   |
|                    07 COUNTER *                                        |
|                                                                          |
*------------------------------------------------------------------ SQC40 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 34. Monitor Menu

Stop the Monitor Kernel

Lets you end the execution of all active monitors, once monitors currently executing have been completed. When you stop the Monitor Kernel, you stop all the monitors.

List Monitors

Lists all the monitors defined for the specified database on your terminal. Figure 35 on page 72 shows the monitors belonging to the SQLDBA database.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*--------------------------      MONITOR LIST    ----------------------------*
| DATABASE     => SQLDBA                                                      |
|                                                                             |
| MONITOR_____       DESCRIPTION_____________________________________________ |
| ACTIVITY           SHOW ACTIVE                                              |
| LOCKING            SHOW LOCK ACTIVE                                         |
| COUNTERS           COUNTER *                                                |
| LOG                SHOW LOG                                                 |
| POOL               SHOW POOL                                                |
| DBEXTENT           SHOW DBEXTENT                                            |
| DBSPACE00001       SHOW DBSPACE     1                                       |
| DBSPACE00002       SHOW DBSPACE     2                                       |
| DBSPACE00003       SHOW DBSPACE     3                                       |
| DBSPACE00004       SHOW DBSPACE     4                                       |
| DBSPACE00005       SHOW DBSPACE     5                                       |
| DBSPACE00006       SHOW DBSPACE     6                                       |
| DBSPACE00007       SHOW DBSPACE     7                                       |
| DBSPACE00010       SHOW DBSPACE    10                                       |
| DBSPACE00022       SHOW DBSPACE    22                                       |
*------------------------------------------------------------------ SQC43 ----*
F1=HELP F3=EXIT F4=TOP F5=BOT F7=BWD F8=FWD F12=CANCEL
```

Figure 35. Monitor List

Add a Monitor

Lets you define a monitor, the first step in using one. You specify the database you want to monitor, the type of monitor, the frequency, and the start and stop times. You also define the threshold at which notification will occur.

Modify a Monitor

Lets you view the monitor definition information. You can choose to update the frequency, start and stop times, and the monitor thresholds, and to activate or deactivate a monitor.

Delete a Monitor

Lets you delete a monitor. To delete the SHOW LOG monitor from the SQLDBA database, for example, select Option **06**. Next select Monitor **04** and press ENTER.

Note that you can press PF3 to cancel deleting the monitor.

Display a Monitor

Lets you view the definition of a monitor.

View Data

Lets you view the data the monitor has collected. With this option, you can analyze the output and watch for significant database use or trends.

Reset Data

Deletes all rows of data collected by the monitor from the associated monitor table. Data keeps accumulating until the monitor is reset.

Print Report

Generates a monitor report and places it directly on the VSE/POWER List queue. The monitor report includes all the data that the monitor has captured. To Print a Monitor Report, select Option **10** from the main Monitor Menu, together with the desired monitor ID.

The figure that follows is where you include appropriate job submission parameters. The **RESET DATA?** option keeps the data or deletes it from the related monitor table when the job executes. Specify ″1″ to refresh the table, or ″2″ to show cumulative data.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*---------------------------    MONITOR REPORT    ---------------------------*
|                                                                             |
| DATABASE     => SQLDBA_____________              MONITOR     => DBSPACE00001 |
|                                                                             |
| **********************      REPORT PARAMETERS      ********************** |
|                                                                             |
| REPORT NAME       => ________                                               |
|                                                                             |
| CLASS             => A                                                      |
|                                                                             |
| PRI               => 3                                                      |
|                                                                             |
| DISP              => D (D,H,L,K)                                            |
|                                                                             |
| ***************************************************************************** |
|                                                                             |
| RESET DATA?       => 1 (1=YES/2=NO)                                         |
|                                                                             |
|                                                                             |
*------------------------------------------------------------------ SQC26 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 36. Monitor Report Option

Types of Monitors

SHOW ACTIVE

Monitors active database users. You can set this monitor to send a message to the VSE console when it detects an active checkpoint agent or a user agent in checkpoint, communication, or lock wait.

SHOW LOCK

Monitors database lock contention. You can set this monitor to send a message to the VSE console whenever it detects a lock holder not processing situation, due to a checkpoint or any lock contention at all.

SHOW DBEXTENT

Monitors page use for storage pools. You can set this monitor to send a message to the VSE console if the percentage of the pages in use for any storage pool reaches the specified threshold.

SHOW LOG

Monitors database log use. You can set this monitor to send a message to the VSE console if the log reaches or exceeds the percentage used that you specify.

SHOW CONNECT

Monitors users connected to the database. You can set this monitor to send a message to the VSE console whenever it detects an active user not processing or inactive users.

SHOW DBSPACE

Monitors dbspace use. You must specify a dbspace number.

COUNTER *

Monitors the occurrence of key events in the database.

For more detailed information about the DB2 Server for VSE commands, refer to the *DB2 Server for VSE & VM Operation* manual.

Invocation

You start monitors from the Monitor Utility Menu. To reach this menu, choose Option **9** Monitor Utility, from Control Center's main menu.

How To Use the Monitors

To use the monitors, you:

1. Add a monitor. As part of adding the monitor, you define the conditions you want to set for the monitor and the database name.
2. Start a kernel for the database to which the monitor has been defined.
3. Work with the information that the monitors give you.

Adding A Monitor

To add a monitor, choose:

1. The name of the database you want to monitor,
2. Option 4 (Add Monitor), and
3. The monitor identifier (number) that you want to add.

Figure 37 on page 75 shows an example of adding the SHOW ACTIVE monitor for the SQLDBA database.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    MONITOR UTILITY   ---------------------------*
|                                                                           |
| DATABASE     => SQLDBA                                                    |
|                                                                           |
| ************************************************************************* |
|                                                                           |
| OPTION       => 04 01 START KERNEL              02 STOP KERNEL            |
|                    03 LIST MONITORS             04 ADD MONITOR            |
|                    05 MODIFY MONITOR            06 DELETE MONITOR         |
|                    07 DISPLAY MONITOR           08 VIEW DATA              |
|                    09 RESET DATA                10 PRINT REPORT           |
|                                                                           |
| ************************************************************************* |
|                                                                           |
| MONITOR      => 01 01 SHOW ACTIVE               02 SHOW LOCK              |
|                    03 SHOW DBEXTENT             04 SHOW LOG               |
|                    05 SHOW CONNECT              06 SHOW DBSPACE 00001     |
|                    07 COUNTER *                                           |
|                                                                           |
*--------------------------------------------------------------- SQC40 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT
```

Figure 37. How to Add a SHOW ACTIVE Monitor

When you press ENTER to process the choices you have made on the Monitor Menu, you see the Monitor Maintenance menu. The Monitor Maintenance menu shows you the status of the monitor in the current database. You use this menu to make a specific monitor active or not. You also can schedule when you want the monitor to run. You can choose to reset the data the monitor has collected as well as define and print reports from here.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    MONITOR MAINTENANCE    -------------------------*
|                                                                           |
| DATABASE          => SQLDBA              MONITOR          => ACTIVE       |
|                                                                           |
| DESCRIPTION       => monitor our active users                             |
| ACTIVE?           => 1          (1=YES/2=NO)                              |
|                      1 2 3 4 5 6 7                                        |
| RUN DAYS          => 2 1 1 1 1 1 2  (1=YES/2=NO)                          |
| START TIME        => 1400       (HHMM)                                    |
| STOP TIME         => 1600       (HHMM)                                    |
| INTERVAL          => 0005       (HHMM)                                    |
| RESET DATA?       => 2          (1=YES/2=NO)                              |
| RESET DAY         => 1          (1-7)                                     |
| PRINT REPORT?     => 1          (1=YES/2=NO)                              |
|                                                                           |
| ************************     REPORT PARAMETERS     ********************** |
|                                                                           |
| REPORT NAME       => ACTIVE     CLASS     => A                            |
| PRI               => 3          DISP      => D (D,H,L,K)                  |
*--------------------------------------------------------------- SQC42 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 38. Adding a Monitor on the Monitor Maintenance menu

The monitor shown above is active and scheduled to run Monday-Friday (days 2-6), every five minutes, from 14:00 to 16:00. Additional options include printing the report and controlling the resetting of the data collected in the monitor table.

Using the Monitor Maintenance Menu

You can specify:

Field	Description
DATABASE	Displays the name of the database you specified on the Monitor Menu.
MONITOR	Shows the status of the monitor.
DESCRIPTION	Enter a brief description of the monitor. (It will be converted to all uppercase letters.)
ACTIVE?	Deactivates a monitor without having to delete the monitor definition. Use **1** to activate the monitor and **2** to deactivate it.
RUN DAYS	Indicates the days of the week on which you want the monitor to run. You can specify all days, specific days, or a range of days. Use 1 for YES and 2 for NO under the number for each day where 1=Sunday, 2=Monday, 3=Tuesday, and so on. The figure above shows monitor execution from Monday through Friday (days 2-6 are set to ″1″).
START TIME	Indicates when the monitor is to start for the day(s) specified. This is specified as HHMM, for example, 0001 for one minute after midnight. This value must be earlier than the STOP TIME value.
STOP TIME	Indicates when the monitor is to stop for the day(s) specified. This is specified as HHMM, for example, 2359 for one minute before midnight. This value must be later than the START TIME value.
INTERVAL	Indicates **approximately** how often the monitor will run during the time period between the start and stop times. You can schedule the monitors to run with frequencies from 2 minutes to several hours. The actual interval may vary, depending upon the system loading and the time needed for the task to begin executing.
RESET DATA?	Deletes all rows of data collected by the monitor from the associated monitor table. Use **1** to delete all the rows and **2** to keep them.
RESET DAY	Used to indicate on what day to RESET DATA. The reset takes place at about 23:59. This value is ignored unless RESET DATA is 1.
PRINT REPORT?	Generates a monitor report and places it directly on the VSE/POWER List queue.
REPORT NAME	Specifies the name for the monitor report job and its associated queue entries.

CLASS Specifies the class (partitions) in which you want this job to run. The class defaults to A.

PRI Specifies the priority that is to be assigned to the job. Specify a number from 0 to 9 where 9 is the highest priority. Default priority is 3.

DISP Specifies how the job is to be handled in the VSE reader queue. Disposition may be specified as:

- D - Delete after processing
- H - Hold until released
- K - Keep after processing
- L - Leave in the queue

Disposition defaults to D.

Specifying Monitor Thresholds

When Adding a SHOW ACTIVE, SHOW CONNECT, SHOW DBEXTENT, SHOW LOCK or a SHOW LOG monitor, you can also specify a threshold for the monitor.

Figure 39 shows how to set the CHECKPOINT WAIT and USER WAIT thresholds for the SHOW ACTIVE monitor that belongs to database SQLDBA.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*------------------------      MONITOR THRESHOLDS   --------------------------*
|                                                                              |
| DATABASE     => SQLDBA                          MONITOR     => ACTIVITY      |
|                                                                              |
| ***************************     SHOW ACTIVE     *************************** |
| CHECKPOINT WAIT                        => 1 (1=YES/2=NO)                     |
| USER WAIT                              => 1 (1=YES/2=NO)                     |
|                                                                              |
| ***************************    SHOW CONNECT     *************************** |
| AGENT NOT PROCESSING                   => 2 (1=YES/2=NO)                     |
| INACTIVE                               => 2 (1=YES/2=NO)                     |
|                                                                              |
| ****************************    SHOW LOCK    **************************** |
| CHECKPOINT                             => 2 (1=YES/2=NO)                     |
| ANY LOCKING                            => 2 (1=YES/2=NO)                     |
|                                                                              |
| ***************         SHOW LOG AND SHOW DBEXTENT          *************** |
| PERCENT USED                           => __ %                               |
|                                                                              |
*------------------------------------------------------------------- SQC42 ----*
PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 39. SHOW ACTIVE Threshold Specification

To activate threshold checking, for the SHOW ACTIVE, SHOW CONNECT, or SHOW LOCK monitors, specify ″1″ (YES). To deactivate threshold checking, specify ″2″ (NO).

To initiate SHOW LOG or SHOW DBEXTENT threshold checking, specify PERCENT USED as a number between 1 and 99. Figure 40 is a partial screen image showing how to set the **SHOW LOG** monitor to issue a VSE console message if the monitor detects a value of 75% or greater.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-----------------------      MONITOR THRESHOLDS   --------------------------*
| DATABASE     => SQLDBA                        MONITOR     => LOG            |
|                                                                             |
|                                                                             |
| ***************         SHOW LOG AND SHOW DBEXTENT          *************** |
| PERCENT USED                              => 75%                            |
*-------------------------------------------------------------------- SQC42 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 40. SHOW LOG Threshold Specification

The fields displayed on the Monitor Threshold screen set thresholds for:

Entry Field	Description
CHECKPOINT WAIT	The checkpoint agent is active and is in "wait" state.
USER WAIT	User is in a wait state caused by locking, checkpoint or communication wait.
AGENT NOT PROCESSING	Active agent that is not processing.
INACTIVE	User connected but inactive.
CHECKPOINT	Users locked because the database is taking a checkpoint.
ANY LOCKING	Users locked for any reason.
PERCENT USED	For the SHOW LOG monitor, log use has reached the percent specified. For the SHOW DBEXTENT monitor, log use has reached the percent specified.

Starting a Monitor

Once you have defined a monitor, you need to enable it. Choose Option **1**, **Start Kernel** from the Monitor Utility menu. A kernel must be "started" in each database for which any monitor is defined before that monitoring activity can take place.

Changing a Monitor

Once you are using a monitor, you may decide you want to change some or all of its settings. For example, you may decide you want the monitor to execute more frequently. If you want to modify a monitor, choose Option **5** on the Monitor Menu. You will see the Monitor Maintenance menu where you can make your changes to the monitor. Figure 41 on page 79 shows how to enter **2** in the ACTIVE? field to deactivate the SHOW ACTIVE monitor.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    MONITOR MAINTENANCE    -------------------------*
|                                                                             |
| DATABASE          => SQLDBA              MONITOR           => ACTIVE        |
|                                                                             |
| DESCRIPTION       => MONITOR OUR ACTIVE USERS                               |
| ACTIVE?           => 2                    (1=YES/2=NO)                      |
|                      1 2 3 4 5 6 7                                          |
| RUN DAYS          => 2 1 1 1 1 1 2        (1=YES/2=NO)                      |
| START TIME        => 1400      (HHMM)                                       |
| STOP TIME         => 1600      (HHMM)                                       |
| INTERVAL          => 0005      (HHMM)                                       |
| RESET DATA?       => 2         (1=YES/2=NO)                                 |
| RESET DAY         => 1         (1-7)                                        |
| PRINT REPORT?     => 1         (1=YES/2=NO)                                 |
|                                                                             |
| ************************     REPORT PARAMETERS     ************************ |
|                                                                             |
| REPORT NAME       => ACTIVE    CLASS     => A                               |
| PRI               => 3         DISP      => D (D,H,L,K)                     |
*-------------------------------------------------------------------- SQC42 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 41. Updating (Deactivating) a Monitor

Figure 42 shows how to enter **2** to execute the SHOW ACTIVE monitor every two minutes instead of the five minutes originally defined in Figure 41.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*-------------------------    MONITOR MAINTENANCE    -------------------------*
|                                                                             |
| DATABASE          => SQLDBA              MONITOR           => ACTIVE        |
|                                                                             |
| DESCRIPTION       => MONITOR OUR ACTIVE USERS                               |
| ACTIVE?           => 2                    (1=YES/2=NO)                      |
|                      1 2 3 4 5 6 7                                          |
| RUN DAYS          => 2 1 1 1 1 1 2        (1=YES/2=NO)                      |
| START TIME        => 1400      (HHMM)                                       |
| STOP TIME         => 1600      (HHMM)                                       |
| INTERVAL          => 2         (HHMM)                                       |
| RESET DATA?       => 2         (1=YES/2=NO)                                 |
| RESET DAY         => 1         (1-7)                                        |
| PRINT REPORT?     => 1         (1=YES/2=NO)                                 |
|                                                                             |
| ************************     REPORT PARAMETERS     ************************ |
|                                                                             |
| REPORT NAME       => ACTIVE    CLASS     => A                               |
| PRI               => 3         DISP      => D (D,H,L,K)                     |
*-------------------------------------------------------------------- SQC42 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 42. Updating (Deactivating) a Monitor

Viewing Monitor Data

The View Data Option displays the selected monitor report at the user's terminal. An example of the View Data Option for the **SHOW ACTIVE** monitor is below. This information is useful in monitoring trends or resource consumption of your database.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*---------------------------     MONITOR DATA     ---------------------------*
| DATABASE     => SQLDBA                          MONITOR     => ACTIVE       |
|                                                                             |
|                                                                             |
|                                          COMM LOCK CHKPT PAGE BLOCK  I/O    |
|    DATE      TIME   NACT NIW R/O R/W NEW WAIT WAIT  WAIT WAIT  WAIT WAIT   |
| ---------- -------- ---- --- --- --- --- ---- ---- ----- ---- ----- ----   |
| 2000-01-18 16.25.10    3   2   1   0   0    0    0     0    0     0    0   |
| 2000-01-18 17.06.56    3   2   1   0   0    0    0     0    0     0    0   |
| 2000-01-19 16.16.37    3   2   1   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.17.05    3   2   1   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.20.01    3   2   1   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.22.01    3   0   3   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.24.01    3   0   3   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.26.01    3   1   2   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.28.01    3   1   2   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.49.18    3   2   1   0   0    2    0     0    0     0    0   |
| 2000-01-19 16.55.18    3   1   2   0   0    2    0     0    0     0    0   |
| 2000-01-19 17.01.18    3   1   2   0   0    2    0     0    0     0    0   |
*------------------------------------------------------------------ SQC44 ----*


F1=HELP F3=EXIT F4=TOP F5=BOT F7=BWD F8=FWD F10=LEFT F11=RIGHT F12=CANCEL
```

Figure 43. Monitor Report Data

To understand the monitor measurements, refer to the appropriate sections of the *DB2 Server for VSE & VM Operation* manual.

Stopping a Monitor

There are two methods that can be used to stop a monitor. You can disable **ALL** monitors in a specific database by selecting the STOP KERNEL option from the Monitor Utility menu, or you can disable a single monitor by deactivating it from the Monitor Maintenance menu. To restart all monitors, stopped due to the kernel being stopped, select the START KERNEL from the Monitor Utility menu, or to restart a single monitor, reactivate it from the Monitor Maintenance menu. For a monitor to be active, a kernel must be running in its database.

Chapter 12. Table Utility

The Table Utility provides an easy way for you to create a table or view a list of tables stored in a DB2 Server for VSE database, and select one (or to directly specify a single table) and then do these DBA-oriented operations on it:

- Drop (delete) a table.
- Reorganize a table (recreating all associated DDL).
  - Generate DDL.
  - Unload a table to tape or disk in a DBSU internal format.
  - Perform a full reorganization on a table.
  - Reload a table from tape or disk generated by an Unload.
- Update statistics.

The Table Utility consists of a set of programs, a batch DDL generator program, and batch jobstreams that execute Database Services Utility (DBSU) commands.

Based on your selections, the Table Utility will:

- generate the DDL required to recreate a table and the objects related to it, including:
  - Table Definition
  - Data
  - Referential Integrity constraints
  - Unique column definitions
  - Indexes
  - Views
  - Grants
  - Table and Column Comments
  - Table and Column Labels
  - Packages
- load data in clustering index sequence
- update statistics
- reprep invalidated packages
- support:
  - Commitcount use
  - table backup (image copy)
  - copying a table to a different database
  - copying a table to a different owner and/or name
  - moving a table to a different DBSPACE or Server
  - reloading data into a different table
- drop a table
- provide a screen interface to define (create) a table.

Invocation

There are two ways to invoke the Table Utility:

1. on the Control Center Main Menu - select option **10** (TABLE UTILITY) and press ENTER.
2. directly from CICS, by typing the Table Utility transaction ID ″**SQTU**″ and pressing ENTER.

When either of these is done, the Table Utility main menu is displayed.

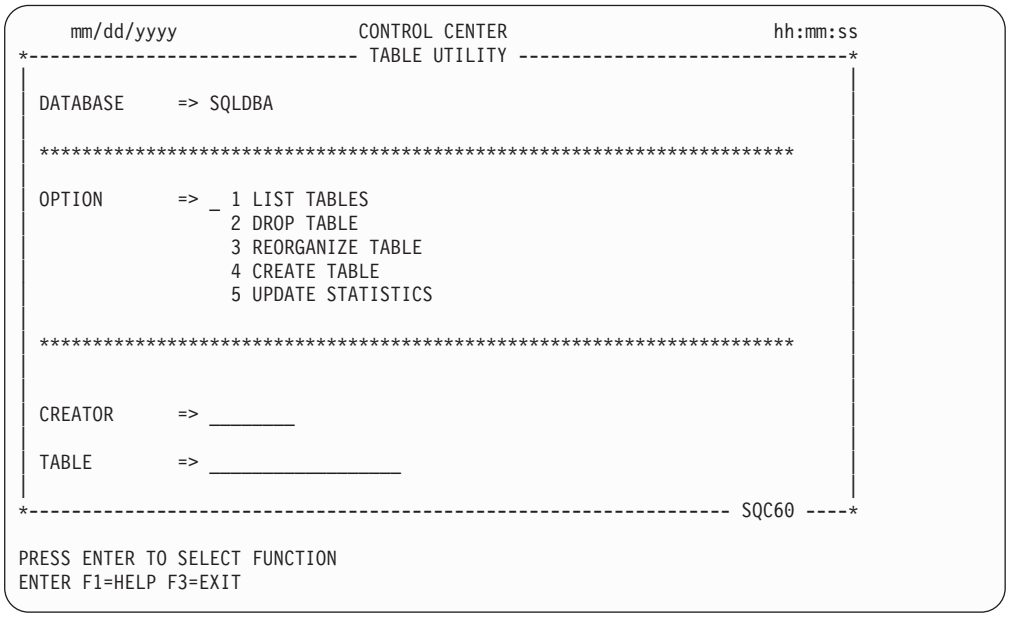

Figure 44. Table Utility Main Menu

There are 5 major functions you can select from this menu. They are described in:
"LIST TABLES" on page 83
"DROP TABLE" on page 84
"REORGANIZE TABLE" on page 85
"CREATE TABLE" on page 93
"UPDATE STATISTICS" on page 98

If Option 1 is selected, several choices exist:

- If CREATOR and TABLE are left blank, then **all** tables in the database will be listed.
- If one of the CREATOR or TABLE fields is blank or specified as "ALL", all tables with the matching other field will be listed.

  Both, or each of the CREATOR and TABLE field values can have a trailing percent sign (%) to represent a string of zero or more characters in the same way you can use the LIKE predicate in an SQL statement.

If Option 2, 3, or 5, is selected, an existing database table name (TABLE) and creator (CREATOR) must be entered (or have been selected by using Option 1, List TABLES).

If Option 4 is selected, then a CREATOR and non-existing TABLE name must be entered.

Pressing PF12, RETURN, when available, returns control to the invoking screen. Pressing PF3, EXIT, returns control to the point from where the Table Utility was started, the Control Center main menu or CICS.

Functions 2 through 5 produce a job that is submitted to VSE/POWER for execution. If you code DISP=H on the job submission screens, then you can view, and if necessary, alter the job for your particular environment.

LIST TABLES

The LIST TABLES function is used to select a table to be operated on by the other functions of the Table Utility.

Using the List Tables function you can search a database for a specific table, several tables with common NAMEs or CREATORs (using "wildcard" specification) or all tables. Tables meeting the search criteria are displayed in the TABLE LIST menu. A specific table can then be selected and its NAME and CREATOR will be returned to the Table Utility main menu and displayed on it.

The Table List menu is displayed when the Table List Search criteria you specify on the Table Utility main menu are satisfied. If no tables match the search criteria, a message is displayed indicating that no such tables can be found.

Additional information (described below) is displayed about the tables. Note that these statistics may be correct only as of the last statistics update or table reorganization.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*-------------------------------- TABLE LIST ----------------------------------*
| DATABASE => SQLDBA                                                          |
|                                                                             |
|   CREATOR  TNAME              AVGROWLEN ROWCOUNT  NPAGES PCTPAGES NOVERFLOW |
|                                                                             |
| _ SQLMSTR  APPL_GROUP_TAB            39        1       1      100          |
| _ SQLMSTR  COUNTER                    0        0       0        0          |
| _ SQLMSTR  GROUP_AUTH_TAB            18        1       1      100          |
| _ SQLMSTR  MONITOR_CONTROL          142        1       1      100          |
| _ SQLMSTR  OBJECT_TAB                36        1       1      100          |
| _ SQLMSTR  RAY_TEST                  13        1       1      100          |
| _ SQLMSTR  RAY_TEST2                 13        1       1      100          |
| _ SQLMSTR  SHOW_ACTIVE                0        0       0        0          |
| _ SQLMSTR  SHOW_CONNECT               0        0       0        0          |
| _ SQLMSTR  SHOW_DBEXTENT              0        0       0        0          |
| _ SQLMSTR  SHOW_DBSPACE               0        0       0        0          |
| _ SQLMSTR  SHOW_LOCK                  0        0       0        0          |
| _ SQLMSTR  SHOW_LOG                   0        0       0        0          |
| _ SQLMSTR  SQLMAINT                  85       16       1      100          |
*------------------------------------------------------------------ SQC63 ----*

SELECT A TABLE AND PRESS ENTER TO RETURN
F1=HELP F3=EXIT F4=TOP F5=BOT F7=BWD F8=FWD F12=CANCEL
```

Figure 45. Table List Screen

From this menu you can scroll forward or backward, and to the top or bottom, if there are multiple menus. You can choose one table by placing an "X" (or any non-blank character) next to the table name and then pressing ENTER to return to the Table Utility main menu. The chosen table NAME and CREATOR will be placed in the respective fields of the main menu for use with Table Utility options 2, 3, and 5. For option 4, Create Table, you can use the List function to check that the planned new table's name does *not* exist.

If you press F3, control returns to the Control Center main menu. If you press F12, control returns to the Table Utility main menu, without changing anything that was originally on that menu.

The Table List menu (Figure 45) displays these table attributes from SYSTEM.SYSCATALOG:

Column Label	Content
AVGROWLEN	the average length of the rows in this table
ROWCOUNT	the number of rows in this table as of the last statistics update
NPAGES	the number of pages in the DBSPACE in which rows of this table appear
PCTPAGES	the approximate percentage of the active pages in the DBSPACE that have rows from this table in them
NOVERFLOW	the number of rows that have overflowed from their original page in storage to another page

List Tables Processing Flow

When you choose the LIST TABLES function, Control Center reads the system catalogs to build a list of tables. Values you specify as CREATOR and TABLE name are passed to SQL to use as filters.

DROP TABLE

This option provides you with an easy method of dropping (deleting) a table.

On the Table Utility main menu, you can directly specify the table to be dropped or you can use the Table List function, option **1**, to identify the table. Then, select option **2**, Drop Table. You will be prompted with a message asking for confirmation of the DROP TABLE request as shown in Figure 46. You can then cancel the request (F12) or proceed with the drop (F10).

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*------------------------------ TABLE UTILITY --------------------------------*
|                                                                             |
|  DATABASE     => SQLDBA                                                     |
|                                                                             |
|  ***************************************************************************|
|                                                                             |
|  OPTION       => 2 1 LIST TABLES                                            |
|                    2 DROP TABLE                                             |
|                    3 REORGANIZE TABLE                                       |
|                    4 CREATE TABLE                                           |
|                    5 UPDATE STATISTICS                                      |
|                                                                             |
|  ***************************************************************************|
|                                                                             |
|                                                                             |
|  CREATOR      => SQLMSTR                                                    |
|                                                                             |
|  TABLE        => COUNTER                                                    |
|                                                                             |
*------------------------------------------------------------------ SQC60 ----*

PRESS F10 TO VERIFY DROP OR F12 TO CANCEL
ENTER F1=HELP F3=EXIT
```

Figure 46. Table Utility Main Menu with Prompt for Verifying a Drop Request

Drop Table Processing Flow

When you choose the drop table option and have entered a table's CREATOR and NAME, Control Center issues a SQL DROP TABLE statement for immediate execution. If the drop is successful, message REQUEST SUCCESSFULLY PROCESSED, will be displayed; if not, an SQL error message will be displayed.

REORGANIZE TABLE

The Reorganize Table function is used to simplify your work for backup and restore, table reorganization, and saving table structure information. The function provides four options; see Figure 47 on page 86.

You can choose one of the following options:

1 - GENERATE DDL
Generates from the database all of the DDL required to recreate the table and the objects it contains, including indexes, views, and grants. The DDL is placed in the punch queue for inspection, alteration, or later use.See Figure 49 on page 91.

2 - UNLOAD TABLE
Generates DDL (as in Option 1) and writes it to a VSAM file. Then, a DBSU UNLOAD TABLE step is executed that writes the table data to a SAM or tape file. If SAM is selected, the file is REPRO'd to a VSAM file for more permanent retention. The unloaded data and generated DDL can be used as the basis for a subsequent RELOAD TABLE (Option 4) job. The table is not dropped. An example of an UNLOAD TABLE job created to do this is in Figure 60 on page 120.

3 - REORGANIZE TABLE
Results in a full table reorganization. A jobstream is created that generates the DDL, UNLOADS the table, DROPs, recreates, and RELOADS the TABLE. Error recovery logic is included. An example of a REORGANIZE TABLE job is in Figure 61 on page 121.

4 - RELOAD TABLE
Submits a job to recreate and reload a table that has been unloaded by Option 2. This is basically a table recovery facility. An example of the job created to do this is in Figure 62 on page 124.

Each of the options is discussed in detail below and is accompanied by a sample JCL stream created by the Table Utility.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*---------------------- TABLE REORGANIZATION UTILITY ------------------------*
| DATABASE  => SQLDBA_____________                                           |
| CREATOR   => SQLDBA__                                                      |
| TABLE     => ACTIVITY___________                                           |
| FILE      => 1 (1-3)                                                       |
| OPTION    => 3 (1 GENERATE DDL                2 UNLOAD TABLE)              |
|                (3 REORGANIZE TABLE            4 RELOAD TABLE)              |
| ***********************     OPTIONAL PARAMETERS     ******************     |
| DATABASE  => ____________________                                          |
| OWNER     => ________                                                      |
| DBSPACE   => ____________________                                          |
| CREATOR   => ________                                                      |
| TABLE     => ____________________                                          |
|                                                                            |
|                                                                            |
| REBIND PACKAGE => 1 (1=YES/2=NO)         UPDATE ALL STATISTICS => : 2 (1/2) |
| COMMITCOUNT    => __________            DATA CAPTURE          => : none    |
|                                                                            |
| TLBL FILE-ID   => ________________                                         |
*---------------------------------------------------------------- SQC61 ----*

PRESS ENTER TO PROCESS
F1=HELP F3=EXIT
```

Figure 47. Table Reorganization Screen

The following is a summary of the various processing options:

1. Generate DDL

   If the Generate DDL option is specified, the utility will generate the table create statement and all associated database objects, including indexes, views, and grants.

2. Unload Table

   This option creates a backup copy of a table using the UNLOAD TABLE DBSU command. The DDL will also be generated for backup purposes. The table will not be dropped.

3. Table Reorganization

   If only the source database and table (at the top of the menu) are specified (meaning that this is not a migration), the utility will perform a table reorganization by generating a job to:

   a. generate the DDL for recreating the table and its objects,
   b. unload the data to a VSAM file,
   c. copy the VSAM file to a SAM file,
   d. drop the table,
   e. recreate the table,
   f. reload the table,
   g. and generate the table objects, such as indexes, etc.

   When data and DDL are both generated for a reorganization, the program has DBA authority for copying **all** dependent objects within the database (including those of other users). Control Center will copy the data using UNLOAD TABLE, will DROP and CREATE the table, RELOAD TABLE to reload the data, and then recreate all dependent objects (indexes, views, and grants).

   The presence of optional parameters affects the ultimate type of reorganization selected. These are:

   - Table Migration

The utility will migrate data or table DDL between databases if the "optional" DATABASE parameter is specified. The source table will not be dropped or modified in any way.

- Table Copy

  The utility will copy the DDL and data if the "optional" CREATOR and/or TABLE parameter are specified. The target table will be dropped before being defined. The source table will not be dropped or modified in any way. It is important to note that if the target CREATOR is the same as the source table CREATOR, the INDEX and VIEW create names will be identical to the existing ones in the old table; the create statements will fail. A warning message will be displayed to this effect and then you can confirm whether to proceed or cancel processing.

- Table Move

  The utility will move a table to a new DBSPACE if the optional OWNER and/or DBSPACE parameters are specified. Note that the old table will be dropped only if the new CREATOR and TABLE name remain the same as the old CREATOR and TABLE.

  If you are moving to a database created prior to DB2 Version 5.1:

  – Control Center cannot access the passwords on that database. This means that for any grants for which a password is needed, the password from the old database (at the top of the menu) will be used if it exists. This may cause the connect in the new data base to fail if the password is different. If there is no password on the old database, one is generated for you. This would be executed on the new database, thereby changing your password if it existed on the new database.

  – If the TABLE NAME or OWNER change, any view text referencing the old table will **not** change. This means that the view create may fail if the table name is used in the view and it does not exist in the new database.

4. Reload Table

   This option reloads a table from a previous backup made with the UNLOAD TABLE function. The unloaded table resulting from a reorganization function that failed can also be used as input to this option.

Reorganize Table Processing Flow

When you submit a table reorganization job, Control Center:

1. Links and establishes communication to the target server.
2. Connects as user SQLREORG.
3. Verifies the availability of the new DBSPACE (if specified).
4. Gathers system catalog information about the specified table and creates corresponding DDL statements in the DBSU command file:
   a. Table create statements
   b. Table comments
   c. Column comments
   d. Table reload statements
   e. Referential integrity constraints
   f. Unique column definitions
   g. Index create statements
   h. Table column grants
   i. Table grants
   j. View creates/grants/comments/labels
   k. Package rebind statements
5. Unloads the table data to the specified disk or tape.

6. Executes the SQLDBSU command file from the Database Services Utility to reorganize the table and rebind any dependent packages.

Special Processing Considerations:

1. In order to retain hierarchical dependencies, Control Center issues all grants in the same chronological order in which they were originally issued.
2. In order to grant authority to an object, the grantor must first connect as the user who originally issued the grant. Therefore, the program must gather database connect passwords for all grantors. If a grantor does not have a connect password, a temporary password is assigned and later removed.
3. The database server does not remove grant information from the system catalogs when a user is removed from the SYSTEM.SYSUSERAUTH table. Consequently, the REORGANIZATION job may need to connect as a nonexistent user in order to re-establish a grant. If this situation occurs, Control Center temporarily grants connect authority to you and later revokes it.
4. Referential Integrity Considerations:
   - If the table being reorganized has a deactivated primary key, any dependent tables (that is, those with foreign keys) will not be able to have their foreign keys created.
   - If the table being reorganized has an **implicitly** deactivated foreign key, it cannot be created.
   - If the table being reorganized has an **explicitly** deactivated foreign key, it can be created, then deactivated, **IF** the parent table's primary key is active.
   - If the table being reorganized has an active primary key, any dependent table with an explicitly deactivated foreign key **may** be able to have its foreign key created **AFTER** the primary key table is loaded. The create will fail if the dependent table's data is not correct. If the create is successful, the key will then be deactivated.

Table Reorganization Menu Required Parameters

To reach the Table Reorganization menu shown in Figure 47 on page 86, choose Option **3** on the Table Utility main menu.

When the menu is displayed, the DATABASE, CREATOR and TABLE fields at the top of the menu will be filled in from the Table Utility main menu.

When you installed Control Center, you defined one to three SAM DDL files to hold generated DDL. Specify the number of the file you want to use in the FILE field. (1 selects the small file, 2 selects the medium file, 3 selects the large file.) The number also indicates what SAM data file to use if you have not entered a Tape File Name. You do not need to specify the file number if you choose Option 1 or 2, because the DDL is written to the punch queue instead of to a file.

Enter the number of the option you want to execute in the Option field.

Table Reorganization Menu Optional Parameters

Parameters below the "OPTIONAL PARAMETERS" line are not required.

DATABASE
The name of a different database into which the table is reloaded. Use of this parameter lets you migrate a table from one database to another. For example, you can migrate a table from a development database to a production database. Before you migrate the table, you may want to ensure

that the two databases are compatible so that all reload statements execute successfully. When you use the optional DATABASE parameter, the table in the old database remains unchanged.

OWNER/DBSPACE

If used, these two parameters must be used as a pair; however, if you omit one of the two, Control Center provides a default value. They indicate that you want to specify a new DBSPACE for the table.

If the new CREATOR/TABLE option is used, a copy will be performed. If a new CREATOR/TABLE is not specified, the table will be moved from the current DBSPACE to the new DBSPACE.

CREATOR/TABLE

If used, these two parameters must be used as a pair; however, if you omit one of the two, Control Center provides a default value. They indicate that you want to specify a new TABLE name (and CREATOR) for the DDL and/or data from the old table. Use of this option pair will cause the source table to be copied, (when using options other than 1 - Generate DDL) with the source table remaining unchanged.

Note: The table view names and index names will not be changed, causing failure of the DDL CREATE statements if the original table CREATOR is the same as the new CREATOR.

REBIND PACKAGE

Once a table has been reloaded, the Table Utility rebinds all PACKAGES that are dependent on that table. To bypass package rebind processing, specify 2 (NO). The default value is 1 (YES). This option is not valid when the OWNER name is changed.

UPDATE ALL STATISTICS

By default, UPDATE STATISTICS is done for a table during reload and during index create. Statistics (including the number of rows and number of unique values in a column) are, by default, gathered only for columns that appear as the first column in an index. To update the statistics for all the columns in all of your indexes, specify 1 (YES) for this parameter.

Note: To perform periodic statistics updates, use the Table Utility main menu Option 5, Update Statistics.

When this parameter is set to NO, the statistics are reset only for the first column in each index. When set to YES, the statistics are reset for all columns in all indexes. The statistics include such things as the number of rows in a table and the number of unique values in an index column. They are used by SQL to optimize retrievals. Since this is can be a lengthy and resource consuming process, it is recommended that you do not reset all of the statistics during normal work hours. If you are reloading a table, this is an optimal time to reset ALL of the statistics.

COMMITCOUNT

Used to specify the frequency of COMMITS during reload processing. Enter a number in the range 1 through 2,147,483,647 (without the commas) to cause a COMMIT WORK to be executed after that number of input rows has been reloaded.

TAPE FILE NAME (TLBL FILE-ID)

Used to specify that data should be unloaded to tape instead of disk. The tape file must have been defined by the WORK FILE LABEL DEFINITION

tool “Chapter 6. Work File Label Definition Tool” on page 39. This field does not apply to DDL because DDL is **always** unloaded to disk.

DATA CAPTURE
Allows changing or adding the attribute to a table for DB2 Release 5.1 (or later) databases. The default is to use what is currently in the catalog for the table. The value “CHANGES” can be used to change the current value held in the catalog. This affects how much information is retained in the log when a table is changed.

After entering the desired parameters, press ENTER to proceed to the Table Reorganization Submit Screen.

Using the TABLE REORGANIZATION Option

The Table Reorganization option can be used in a variety of ways to achieve different goals. Each of the options is discussed in more detail.

Option 1 - GENERATE DDL

By reading the catalogs, this option generates the DDL necessary to recreate a table and all of its associated objects. DDL is written to the VSE/POWER punch queue in the form of DBSU commands and can be used, as is, to recreate the table. This option:

- relieves DBAs from having to maintain large libraries of DDL
- saves library disk space
- solves the problem of who owns the ″official″ DDL
- provides an easy way to determine table and index characteristics
- provides authorization and ″where-used″ information.

Figure 48 is an example of the jobstream produced by Control Center to generate DDL for the SQLDBA.ACTIVITY table.

```
* $$ JOB JNM=GENDDL,CLASS=0,DISP=D,PRI=9
* $$ LST CLASS=A,PRI=3
* $$ PUN PRI=3
// JOB TRAY2 GENERATE DDL FOR TABLE "SQLDBA"."ACTIVITY"
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMTPRM,'SQLMSTR.TABLE.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.DB2710.EXAMPLE.ROUTINE',0,VSAM,                      X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS006,SYSPCH
// ASSGN SYS011,SYSLST
// EXEC SQB60,SIZE=AUTO
%%SQLDBA            SQLDBA  ACTIVITY          1 N
/*
/&
```

Figure 48. Table Reorg Option 1 (Generate DDL) - Sample Jobstream

Option 2 - UNLOAD TABLE

This option generates the DDL necessary to recreate a table and writes it to a VSAM file. It then unloads the table to a SAM disk file (or a tape if a tape label was specified). The SAM data file is then REPRO’d to a VSAM-managed SAM file for more permanent retention. Data is unloaded in system-defined format; you must make sure that this data file is not altered prior to reloading the table. This

option is essentially a table backup. Used in conjunction with a RELOAD TABLE (Option 4), it provides the capability to recover from application errors.

Figure 60 on page 120 shows a jobstream generated by Control Center to unload the SQLDBA.ACTIVITY TABLE.

Option 3 - REORGANIZE TABLE

This is the most comprehensive option of the reorganization tool. It schedules a full table reorganization, including generating all related DDL and executing it. Depending on the optional parameters chosen, a table can be migrated to another DBSPACE or another owner, the table name can be changed, and the table can be moved to another database.

Figure 61 on page 121 shows a jobstream generated by Control Center to reorganize the SQLDBA.ACTIVITY table.

Option 4 - RELOAD TABLE

This option generates a job to reload a table previously unloaded or reorganized using Control Center. The previously created DDL and data files are used to recreate the table in its entirety. This option is the recovery counterpart to the UNLOAD TABLE option, (Option 2), and is the method of recovering from an error during a reorganization reload step.

Figure 62 on page 124 shows a jobstream generated by Control Center to reload the SQLDBA.ACTIVITY table.

Table Reorganization Submit Screen

Figure 49 shows the Table Reorganization Submit Screen.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*-------------------- TABLE REORGANIZATION SUBMIT SCREEN ----------------------*
|                                                                              |
| JOBNAME   => ________                CLASS     => A                          |
|                                                                              |
| PRI       => 3                       DISP      => D (D,H,K,L)                |
|                                                                              |
| FROM      => ________                LST CLASS => A                          |
|                                                                              |
| DUETIME   => ____ (HHMM)             DUEDATE   => ______  (AABBYY)           |
|                                                                              |
| DUEDAY    => ____________________________________________                    |
|                                                                              |
| OTHER     => ____________________________________________________________    |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------ SQC62 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 49. Table Reorganization Submit Screen

To reach this menu, press ENTER from the Control Center Table Reorganization menu.

Table Reorganization Job Submission Screen Parameters

On each of the job submission screens (Table Reorganization, Create Table, and Update Statistics), there are parameters that are required, that are "required" but have defaults, and some that are optional. The following parameter descriptions apply to **ALL** of the Table Utility job submission screens.

JOBNAME
Specifies the job name for the Table Reorganization job and its associated queue entries. The JOBNAME parameter is the only parameter that you must enter because there are default values for the other parameters that are required.

CLASS
Specifies the class or partition in which you want this job to run. This parameter is required; its default value is **A**.

PRI Specifies the priority to be assigned to the job. Specify a number from 0 to 9 where 9 is the highest priority. This parameter is required; its default value is **3**.

DISP Specifies how the job is to be handled in the reader queue. DISPosition may be specified as:

- **D** - Delete after processing
- **H** - Hold until released
- **K** - Keep after processing
- **L** - Leave in the queue

This parameter is required; its default value is **D**.

Note: If you enter data for any of the Table Utility functions that cause job submission and the job fails, you can easily resubmit the job. However, this is not completely true when creating a table because you may have entered a lot of data to define the table. There is no way to "reload" that data entry menu, but, there **is** a way to recover.

If you use **DISP=K**, then the job is kept in the VSE/POWER queue after the job ends, whether it is successful or not. If it is not successful, you can edit the job, fix the problem, and resubmit the job. If you use **DISP=K**, be sure to delete the job from the queue when you are done.

FROM
Specifies the ID of the user being allowed to manipulate or retrieve the job. This parameter is required. It defaults to the CICS User ID, even though that is **not displayed** on the screen.

LST CLASS
Defines the class to be assigned to printed output. The value of this parameter is used on a VSE/POWER $$ LST card. Specify any letter of the alphabet, or any number 0 through 9. This parameter is required; its default value is **A**.

DUETIME
Specifies the job processing start time using **HH** for hour and **MM** for minute in 24-hour clock time (OPTIONAL).

DUEDATE
Specifies the date on which the job is to be run, using **YY** for the year. Depending on the format defined for your system, **AA** is the month and **BB** is the day, or **AA** is the day and **BB** is the month (OPTIONAL).

DUEDAY

Specifies the day(s) the job is to be scheduled. You can enter a day name or abbreviation such as **MON** for Monday, or a list of these separated by commas and enclosed in parentheses. You can enter the number of the month or a list of day numbers separated by commas and enclosed in parentheses, and can also specify DAILY to schedule the job every day of the year. Certain combinations of the date and time parameters specify repeated processing. The *VSE/POWER Installation and Operations Guide* manual explains the logic used to control repeated processing (OPTIONAL).

If you schedule repetitive processing, you can cancel the job whenever necessary by displaying the POWER READer queue and deleting the job.

OTHER

The VSE/POWER * $$ JOB card offers many parameters that do not appear on the Table Utility job submission screens. Use this field to have Control Center include those parameters when the job is submitted (OPTIONAL).

After entering the desired submit parameters, press ENTER to submit the job to VSE/POWER. For more information on VSE/POWER jobs, see the *VSE/POWER Installation and Operations Guide*. After submitting any Table Utility job, control returns to the screen from which job submission was selected.

CREATE TABLE

The Create Table function provides you with an easy, interactive, interface for defining DB2 tables and having them created by the Table Utility. You are presented with a Create Table screen (see Figure 50).

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*------------------------------ CREATE  TABLE -------------------------------*
| DATABASE    => SQLDBA                                                      |
| CREATOR     => SQLDBA                  OWNER       => ________            |
| TABLE       => ACTIVITY2               DBSPACE     => ___________________ |
|                                                                            |
|   COL CNAME              COLTYPE         LENGTH NULLS (1/2)                |
|   001 ___________________ _______________ _____   _                        |
|   002 ___________________ _______________ _____   _                        |
|   003 ___________________ _______________ _____   _                        |
|   004 ___________________ _______________ _____   _                        |
|   005 ___________________ _______________ _____   _                        |
|   006 ___________________ _______________ _____   _                        |
|   007 ___________________ _______________ _____   _                        |
|   008 ___________________ _______________ _____   _                        |
|   009 ___________________ _______________ _____   _                        |
|   010 ___________________ _______________ _____   _                        |
| **********************    OPTIONAL PARAMETERS    ******************        |
| GRANT SELECT TO PUBLIC => 2 (1=YES/2=NO)           DATA CAPTURE => NONE___ |
| COMMENT ON TABLE => ____________________________________________________   |
*---------------------------------------------------------------- SQC65 ----*

ENTER DATA AND A VALID FKEY TO CONTINUE PROCESSING
ENTER F1=HELP F3=EXIT F8=FWD F12=CANCEL
```

Figure 50. Create Table Data Entry Screen

Create Table Processing Flow

Screen rows are scanned from the top to the bottom (including the DATABASE, CREATOR, OWNER, TABLE, and DBSPACE). If any errors are detected, an error message is issued; when processing resumes, the top-to-bottom scan restarts at the top of the screen.

A data column must have a name (CNAME), column type (COLTYPE), and if required by the column type, a length (default lengths are described just below). An embedded blank row (column definition) is not allowed. When you press ENTER, the SQL statements corresponding to the table structure are generated and made ready for job submission.

Using the Create Table Function

Entering a Column's Data

Note: In the remainder of the Table Create discussion, the term **row** refers to a row on the screen; this is synonymous with **table column**.

Each data column to be defined for the table is specified on a row on the CREATE TABLE screen. Each row on the screen must be completed (at a minimum, have a column name, type, and length if required) before you can scroll down to the next screen. No intermediate, empty, rows are allowed. Each CREATE TABLE entry screen has space to enter data for 10 data columns; when 10 entries are made, you can scroll down to make the next 10 entries. Before you can scroll down, the entries you have made must be correct for the fields you have entered. When you scroll away from a screen on which you have entered data, Control Center, if you have not entered a length, will fill in the length field with the SQL default length length for the specific data type, such as, character fields default to length 1.

Note: SQL has a limitation on the length of a row in a database table. The CREATE TABLE statement syntax (in the *DB2 Server for VSE & VM SQL Reference* manual) describes the limitation. The limit is approximately 4K bytes, however, variable length, and large character strings, each require only a few bytes of the 4K, so this limit is usually not significant.

There are many infrequently used SQL options that you may want to specify when defining a table column, such as UNIQUE. Control Center cannot directly support these due to their number and complexity; however, there **is** a way for you to specify them. In the description of the "job submission DISP parameter" on page 92, note that you can specify that after a job is submitted, it should be held rather than run. When you create a table and you need to include specifications that Control Center does not directly support, use DISP=HOLD. Then, you can copy the job from the VSE/POWER queue to the ICCF library, edit it, add the additional specifications, and then resubmit the job.

Control Center does not directly support specifying a primary key, although you **can** do this by using DISP=HOLD as described immediately above. The designers of Control Center assume that if you are creating a table, you will usually follow that with a bulk load. Existence of a primary key when a table is initially loaded can cause serious performance degradation. It is much more efficient to do the load first and then specify the primary key.

When You Think You're Done

DO NOT PRESS ENTER UNTIL YOU HAVE ENTERED **ALL** OF THE COLUMN DATA YOU PLAN TO ENTER FOR ALL OF THE ROWS.

Pressing the ENTER key indicates that you have completed entering the table's definition. If no errors are found, the CREATE TABLE job submission screen (see Figure 52 on page 98) is displayed. *If you accidentally press ENTER, when the CREATE TABLE job submission screen is displayed, press PF12 to cancel the job submission and return to the CREATE TABLE screen.*

Inserting and Deleting Data Columns

If you have not yet submitted the table create job, you can change, insert, and delete rows. Suppose that you have specified columns 1 through 10, used PF8 to scroll to a second screen, and have specified additional columns. At this time, you decide to make changes to rows specified on the first screen. Press PF7 to return to the previous screen. If there are no errors in the specification of the rows on the current screen, the previous screen will be displayed. If there are errors, they must be fixed before you can scroll.

You will now notice that a new field, with no heading, has been added to the screen. Located to the left of the column number (COLNO) field, this field is used for indicating that you want to insert or delete a column. The field has no meaningful use when an empty CREATE TABLE screen is first presented, so it does not appear the first time a screen is displayed for column data entry. You must scroll away from a screen and then back to it for the new field to be displayed.

You can use this field to insert or delete a row. To delete a row, type a **2** in the new field at the left end of the row. To insert a new row **ahead** of another, type a **1** in the new field and then overtype the row's data with the new information; the original row's data will not be changed. In addition to inserts and deletes, you can also overtype existing fields that you want to change, and, finish any partially complete entries; over-type changes are automatically recognized by Control Center.

Pressing ENTER after INS or DEL displays the changed screen. You must press ENTER again if you are finished with the table's definition.

Note: When you do an insert, under some conditions, a row of data that is pushed down onto the next set of ten entries may be marked internally as not being processed; if this happens, a message is displayed identifying the unprocessed row (data column). To clear the message and proceed, scroll down until the unprocessed row is visible on the screen. Then continue what you were doing. If the message was displayed because you pressed ENTER, press it again. If there is another unprocessed row, the message will be displayed again. Scroll down until it is displayed and continue what you were doing. Scrolling off a screen with such a row or pressing ENTER will cause it to be processed.

When you have completed all of the changes on a screen, press a scroll key, or if you are finished with the table definition, press ENTER to actuate the inserts, deletes, and changes. Control Center will process the new information on the screen, inserting and deleting rows, and changing any other data you have entered. Error checking is performed as usual and the screen is re-displayed with deleted rows removed, inserted rows added, and any other changes made. Inserts and deletes cause automatic renumbering of the rows. Make these types of changes carefully; there is **no** way to undo a change other than retyping the original data, or using the DISP=HOLD technique.

OK, When You Really Are Done

When you have completed all of the column definitions, press ENTER to display the CREATE TABLE job submission screen. When the job is submitted, Control Center creates the JCL and DDL statements to define the table, and submits the job to the VSE/POWER queue for execution.

Create Table Parameters

The DATABASE, CREATOR and TABLE fields are required and are automatically filled in from the Table Utility main menu. The COLNO parameter is initialized to column numbers 1 - 10 on the first screen displayed. When the screen is scrolled forward, columns 11 - 20 will be displayed (and so on with any further screen entries). A maximum of 255 column entries is allowed.

The OWNER and DBSPACE parameters are required because they are needed in the CREATE TABLE DDL statement generated by Control Center.

Parameters below the ″OPTIONAL PARAMETERS″ line are **not** required.

These fields are used to define the table to be created:

CNAME
This is the column name.

COLTYPE
The datatype of the column. Valid types are those defined in the CREATE TABLE statement in the *DB2 Server for VSE & VM SQL Reference* manual. Abbreviations allowed by SQL are also allowed here. Note that the *DB2 Server for VSE & VM SQL Reference* manual does not show that **DEC** is a valid abbreviation for DECIMAL, although Control Center accepts it.

LENGTH
A LENGTH is required for VARCHAR and VARGRAPHIC data types only. All other data types have a default length (or precision) specified in the *DB2 Server for VSE & VM SQL Reference* manual. Unless you specify a LENGTH value, the SQL defaults will be used.

You can add additional column specification parameters if necessary. To do this, when you submit the Create Table job, use DISP=H as the disposition parameter on the Create Table Submit Screen. Then, you can remove the job from the READER queue, edit it, add the additional parameters, and resubmit the job for execution.

NULL Specify ″1″ if the column allows NULLS, ″2″ if the column may not be NULL. This field defaults to ″1″.

These are the ″OPTIONAL PARAMETERS″:

GRANT SELECT TO PUBLIC
Specifying a 1 (YES) for this parameter will cause the statement to be generated in the DDL following the CREATE TABLE (OPTIONAL).

DATA CAPTURE This field causes the table to be defined with DATA CAPTURE NONE (the default), or DATA CAPTURE CHANGES if CHANGES is specified. It affects how much information is retained in the log when a table is changed.

COMMENT ON TABLE This field allows you to add a comment to the

generated table. The COMMENT ON TABLE statement will be generated in the DDL. The comment may not contain apostrophes or quotation marks. It is converted to all uppercase letters.

Figure 51 is an example of a filled in Create Table screen.

After entering the desired parameters and column descriptions, press F8 to scroll forward for entry of more column definitions or press ENTER to proceed to the Create Table Submit screen.

```
     mm/dd/yyyy                CONTROL CENTER                          hh:mm:ss
*------------------------------ CREATE TABLE ---------------------------------*
| DATABASE    => SQLDBA                                                       |
| CREATOR     => SQLDBA                   OWNER       => owner                |
| TABLE       => ACTIVITY2                DBSPACE     => dbspacename          |
|                                                                             |
|   COL CNAME              COLTYPE         LENGTH NULLS (1/2)                 |
|   001 name-last          char             20                                |
|   002 name-first         char             25                                |
|   003 name-middle        char             25     1                          |
|   004 title              char             10                                |
|   005 address 1          char             25                                |
|   006 address 2          char             25     1                          |
|   007 address 3          char             25     1                          |
|   008 city               char             25                                |
|   009 state              char             2                                 |
|   010 zip-5              char             5                                 |
| **********************     OPTIONAL PARAMETERS     ******************       |
| GRANT SELECT TO PUBLIC => 2 (1=YES/2=NO)            DATA CAPTURE => NONE    |
| COMMENT ON TABLE =>                                                         |
*------------------------------------------------------------------- SQC65 ----*

ENTER DATA AND A VALID FKEY TO CONTINUE PROCESSING
ENTER F1=HELP F3=EXIT F4=TOP F5=BOT F7=BWD F8=FWD F12=CANCEL
```

Figure 51. Create Table Data Entry Screen

When you press ENTER, the Create Table Submit screen is displayed; see Figure 52 on page 98.

```
     mm/dd/yyyy                CONTROL CENTER                        hh:mm:ss
*------------------------ CREATE TABLE SUBMIT SCREEN -------------------------*
|                                                                             |
|  JOBNAME   => ________                CLASS     => A                      |
|                                                                             |
|  PRI       => 3                       DISP      => D (D,H,K,L)            |
|                                                                             |
|  FROM      => ________                LST CLASS => A                      |
|                                                                             |
|  DUETIME   => ____ (HHMM)             DUEDATE   => ______                 |
|                                                                             |
|  DUEDAY    => ___________________________________________                   |
|                                                                             |
|                                                                             |
|  OTHER     => ____________________________________________________________  |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
*------------------------------------------------------------------- SQC66 ----*

PRESS ENTER TO PROCESS
ENTER F1=HELP F3=EXIT F12=CANCEL
```

Figure 52. Create Table Submit screen

The first parameter, JOBNAME, is the only one that is required because the other parameters have default values.

For a detailed description of the job submission parameters, see the description of the job submission parameters on page 92.

Note: In the discussion of the "job submission DISP parameter" on page 92, be sure to note that using DISP=K as a means of recovering from some of the errors you might make when creating a table.

A job return code of 6 is normal.

UPDATE STATISTICS

This function provides you with the capability of issuing the UPDATE STATISTICS or UPDATE ALL STATISTICS commands in a background DBSU job.

When you select Option 5, Update Statistics, on the Table Utility main menu, the Update Statistics Submit screen is displayed (Figure 53 on page 99).

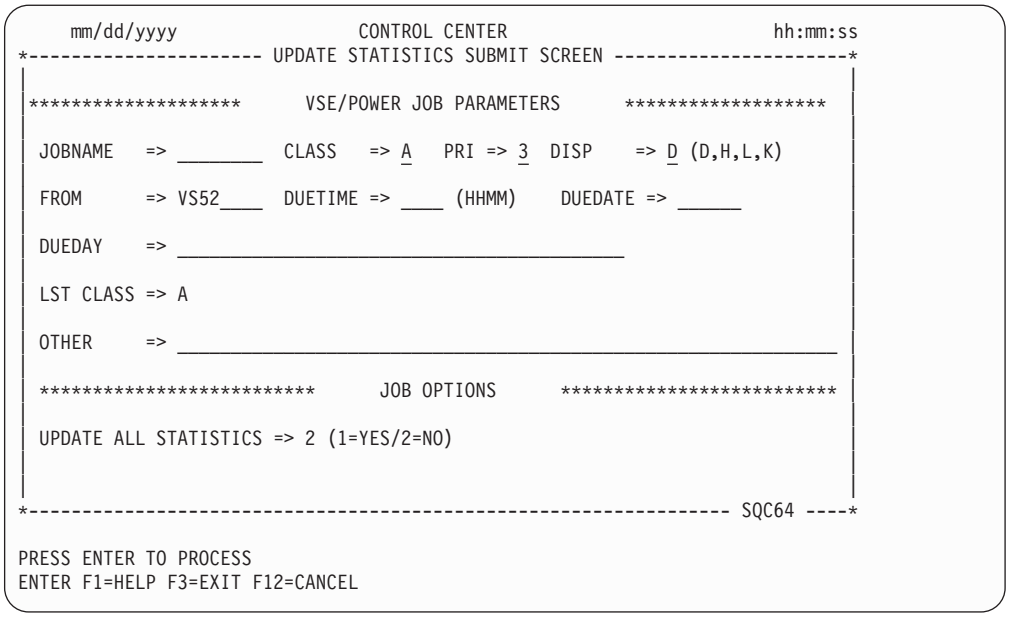

Figure 53. Update Statistics Submit Screen

Update Statistics Submit Screen Required Parameters

The first parameter, JOBNAME, is the only one that is required. For a detailed description of the job submission parameters, see "job submission parameters" on page 92.

Update Statistics Submit Screen Optional Parameters

UPDATE ALL STATISTICS Specifies whether ALL should be added to the UPDATE STATISTICS command. 1 indicates YES, 2 indicates NO. When this parameter is set to NO, the statistics are reset for the first column in each index. When set to YES, the statistics are reset for all columns in all indexes. The statistics include such things as the number of rows in a table and the number of unique values in an index column. They are used by SQL to optimize retrievals. Since this is can be a lengthy and resource consuming process, it is recommended that you do not reset all of the statistics during normal work hours.

Note: You should update all statistics on a periodic basis for tables that are subject to frequent change.

After entering the desired submit parameters, press ENTER to submit the job to VSE/POWER.

Chapter 13. Installing Stored Procedures Support

DB2 UDB's Web Control Center, running on your workstation, can be used to perform certain tasks using a DB2 Server for VSE & VM database running on a "host" computer. Control Center for VSE and VM provides stored procedures that are used to do that type of processing. The stored procedures are invoked by UDB's Web Control Center to process DB2 commands such as Reorganize Index and Rebind Package.

Web Control Center stored procedures support requires Version 7 or greater of DB2 UDB, DB2 for VSE, and Control Center for VSE. If you are planning to use DB2 Web Control Center, then perform the process described below. If you will not be installing DB2 Web Control Center, then the following process is not needed.

This optional procedure is used to install two IBM-supplied stored procedures. One can be used to Reorganize an Index and to Rebind a Package; the other is used as part of the Visual Explain services.

To use stored procedures, you must define a stored procedure server (part of your DB2 installation and tailoring process) and then inform DB2 about the stored procedures you want to execute. The stored procedures must be accessible to the stored procedure server at execution time. Stored procedures are explained in detail in the *DB2 Server for VSE & VM Database Administration* manual.

In this step, you will:

1. Define the stored procedures to DB2. (Step 1 in SQMSPRC1)
2. Linkedit the procedures into the Control Center library. A linkedit is necessary because the Language Environment (LE) used by the Control Center development team may be different than that you are using. (Step 2 in SQMSPRC1)
3. Load the stored procedure packages into the databases that will use them. (Step 3 in SQMSPRC1)
4. Make the Control Center library accessible to the stored procedure server.

To install the support, punch SQMSPRC1.Z from your Control Center installation library, tailor it for your installation and submit it for execution.

Note: The SQMSPRC1 job must be re-run for each database that will use these stored procedures. Each time you re-run it, the stored procedures' phases will be linkedited into the Control Center library again although the rest of the job will involve a different database each time. Setting up the job in this manner involves a little extra CPU time, but simplifies your installation process.

Executing this process does not START the stored procedure server nor any stored procedures; it only enables those actions.

There are a number of stored procedure server initialization procedures that are required, including previously defining a stored procedure server. See the *DB2 Server for VSE & VM Database Administration* manual for information about these.

To complete this step:

1. Punch SQMSPRC1.Z and edit.
2. Modify EACH procedure used to start a stored procedure server so that it can refer to your Control Center library. The sample procedure is in the *DB2 Server for VSE & VM Database Administration* manual which discusses Stored Procedures.

```
$ $$ JOB JNM=SQMSPRC1,CLASS=0,DISP=D,PRI=9
$ $$ LST CLASS=Q
// JOB SQMSPRC1       INSTALL THE STORED PROCEDURES   04/22/2000
// LIBDEF *,SEARCH=PRD2.DB2710
*
* ******************************************
*
* NOTE: YOU MUST HAVE AT LEAST ONE PSERVER DEFINED TO DB2 BEFORE
*       RUNNING THIS PROCESS!
*
* ******************************************
*
* CHANGE ALL PARAMETERS ENCLOSED IN <> AND REMOVE THE <>.
* THE PARAMETERS ARE:
*   DATABASE NAME                                              (4X)
*   SQLDBA PASSWORD                                            (2X)
*   CONTROL CENTER LIBRARY:   WHERE CONTROL CENTER IS INSTALLED (2X)
*   STORED PROCEDURE LIBRARY: WHERE THE EXECUTABLE MODULES FOR  (1X)
*                             THE STORED PROCEDURES WILL RESIDE
*
```

Figure 54. Install Stored Procedures (SQMSPRC1.Z) (Part 1 of 3)

```
* ****************************************
*
* STEP 1: DEFINE THE STORED PROCEDURES
*
* ****************************************
*
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(<DATABASE NAME>)'
 CONNECT SQLDBA IDENTIFIED BY <SQLDBA PASSWORD> TO <DATABASE NAME>
 CREATE PROCEDURE ARISCCF
       (IN  FUNCODE INT,
        IN  OWNER   CHAR(8),
        IN  PARM1 CHAR(18),
        IN  PARM1LN INT,
        IN  PARM2 INT,
        OUT RETCODE INT )
   LANGUAGE PLI,
   EXTERNAL,
   SERVER GROUP,
  GENERAL,
  RESULT SET 0;
 CREATE PROCEDURE ARISVEF
     (IN  CREATOR CHAR(8),
      IN  PKNAME  CHAR(8),
      OUT RETCODE INT )
  LANGUAGE PLI,
  EXTERNAL,
  SERVER GROUP,
  GENERAL,
  RESULT SET 0;
#*
// IF $RC > 0 THEN
// GOTO $EOJ
* ****************************************
*
* STEP 2. LINK EDIT THE STORED PROCEDURES
*
* ****************************************
*
// OPTION CATAL
// LIBDEF *,SEARCH=(<CONTROL CENTER LIBRARY>,PRD2.DB2710)
// LIBDEF PHASE,CATALOG=<STORED PROCEDURE LIBRARY>
   PHASE ARISCCF,*
   INCLUDE ARISCCF
// EXEC LNKEDT,PARM='MSHP'
// IF $RC > 4 THEN
// GOTO $EOJ
   PHASE ARISVEF,*
   INCLUDE ARISLKSV
// EXEC LNKEDT,PARM='MSHP'
// IF $RC > 4 THEN
// GOTO $EOJ
```

Figure 54. Install Stored Procedures (SQMSPRC1.Z) (Part 2 of 3)

```
* ******************************************
*
* STEP 3. LOAD THE STORED PROCEDURE PACKAGE INTO THE DATABASE
*
* ******************************************
*
// LIBDEF *,SEARCH=(<CONTROL CENTER LIBRARY>,PRD2.DB2710)
// OPTION LOG
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(<DATABASE NAME>)'
 CONNECT SQLDBA IDENTIFIED BY <SQLDBA PASSWORD> TO <DATABASE NAME>
 COMMENT '***** RELOAD PACKAGE SQLDBA.ARIS7VE *****'
 RELOAD PACKAGE (SQLDBA.ARIS7VE)
     REPLACE
     KEEP
 INFILE(SYSIPT BLKSZ(80) PDEV(DASD));
 READ MEMBER ARIS7VE.Q (NOCONT
#*
#&
$ $$ EOJ
```

Figure 54. Install Stored Procedures (SQMSPRC1.Z) (Part 3 of 3)

Appendix A. Reorganization Job Streams

```
* $$ JOB JNM=DBUNLOAD,CLASS=0,DISP=D
* $$ LST PRI=3
// JOB DBUNLOAD MUM UNLOAD DBSPACE TO DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 RECORD TIME BEFORE DDL GENERATION
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           2NN1
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.SQLDS710.PUBLIC.SQMHELP',0,VSAM,                      X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB01,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           2 N
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 UNLOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(SQLDS710)'
READ MEMBER SQMCONN.C NOCONT
COMMENT '***** UNLOAD DBSPACE "PUBLIC"."SQMHELP" *****'
SET UPDATE STATISTICS OFF;
UNLOAD DBSPACE ("PUBLIC"."SQMHELP")
OUTFILE(SQMDAT1 BLKSZ(02048) PDEV(DASD))
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 55. DBSPACE Reorg Option 2 (Unload DBSPACE) - Sample Jobstream (Part 1 of 2)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 RECORD TIME AFTER UNLOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           2NN2
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 REPRO SAM DATA TO VSAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
 // DLBL SQMDAT,'D.SQLDS710.PUBLIC.SQMHELP',0,VSAM,                      X
               RECORDS=000100,RECSIZE=8240,DISP=(NEW,KEEP),CAT=SQMCAT
 // EXEC IDCAMS,SIZE=AUTO
    REPRO INFILE(SQMDAT1  -
                 ENV(RECFM(SB) -
                     BLKSZ(2048) -
                     RECSZ(8240))) -
          OUTFILE(SQMDAT  -
                 ENV(RECFM(VB) -
                     BLKSZ(8248) -
                     RECSZ(8240)))
 /*
 /&
```

Figure 55. DBSPACE Reorg Option 2 (Unload DBSPACE) - Sample Jobstream (Part 2 of 2)

```
* $$ JOB JNM=DBREORG,CLASS=0,DISP=D
* $$ LST PRI=3
// JOB DBREORG MUM REORG DBSPACE - DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 RECORD TIME BEFORE DDL GENERATION
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           3NN1
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.SQLDS710.PUBLIC.SQMHELP',0,VSAM,                      X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB01,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           3NN
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 UNLOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(SQLDS710)'
READ MEMBER SQMCONN.C NOCONT
COMMENT '***** UNLOAD DBSPACE "PUBLIC"."SQMHELP" *****'
SET UPDATE STATISTICS OFF;
UNLOAD DBSPACE ("PUBLIC"."SQMHELP")
OUTFILE(SQMDAT1 BLKSZ(02048) PDEV(DASD))
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 RECORD TIME AFTER UNLOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           3NN2
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 56. DBSPACE Reorg Option 3 (Reorganize DBSPACE) - Sample Jobstream (Part 1 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 REPRO VSAM DDL TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'L.SQLDS710.PUBLIC.SQMHELP',,VSAM,                      X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDDL1,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYS008,'VSEPK3',1,0,0000445488,00600
// ASSGN SYS008,DISK,VOL='VSEPK3',SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN ) -
        OUTFILE(SQMDDL1 -
                ENV(RECFM(F ) -
                    BLKSZ(0080) -
                    RECSZ(0080)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0006 RECORD TIME BEFORE RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           3NN3
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0007 RELOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// ASSGN SYS004,SYS005
// ASSGN SYS020,SYSIPT
// DLBL IJSYSIN,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYSIPT,'VSEPK3',1,0,0000445488,00600
ASSGN SYSIPT,DISK,VOL='VSEPK3',SHR
// ON $ABEND GOTO CLOSEIPT
// ON $CANCEL GOTO CLOSEIPT
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(SQLDS710)'
/*
// IF $RC > 0006 THEN
// GOTO CLOSEIPT
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0008 RECORD TIME AFTER RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710          PUBLIC  SQMHELP           3NN4
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 56. DBSPACE Reorg Option 3 (Reorganize DBSPACE) - Sample Jobstream (Part 2 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0009 DELETE VSAM DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// ASSGN SYSLST,IGN
// DLBL FILEIN,'L.SQLDS710.PUBLIC.SQMHELP',,VSAM,                      X
               CAT=SQMCAT,DISP=(OLD,DELETE)
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// RESET SYSLST
// GOTO THEEND
/. CLOSEIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0010 CLOSE SYSIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0011 REPRO SAM DATA TO VSAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// DLBL SQMDAT,'D.SQLDS710.PUBLIC.SQMHELP',0,VSAM,                     X
               RECORDS=000100,RECSIZE=8240,DISP=(NEW,KEEP),CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(SQMDAT1  -
                ENV(RECFM(SB) -
                    BLKSZ(2048) -
                    RECSZ(8240))) -
        OUTFILE(SQMDAT  -
                ENV(RECFM(VB) -
                    BLKSZ(8248) -
                    RECSZ(8240)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
// GOTO $EOJ
/. THEEND
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0012 THE END
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
/*
/&
```

Figure 56. DBSPACE Reorg Option 3 (Reorganize DBSPACE) - Sample Jobstream (Part 3 of 3)

```
* $$ JOB JNM=RELOAD,CLASS=0,DISP=D,NTFY=YES
* $$ LST PRI=3
// JOB RELOAD MUM RELOAD DBSPACE FROM DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 CHECK FOR DATA FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// ASSGN SYSLST,IGN
// DLBL FILEIN,'D.SQLDS710.PUBLIC.SQMHELP',,VSAM,                    X
               CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// IF $RC > 0000 THEN
// GOTO NODAT
// RESET SYSLST
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 CHECK FOR DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// ASSGN SYSLST,IGN
// DLBL FILEIN,'L.SQLDS710.PUBLIC.SQMHELP',,VSAM,                    X
               CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// IF $RC > 0000 THEN
// GOTO NODDL
// RESET SYSLST
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 REPRO VSAM DATA TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'D.SQLDS710.PUBLIC.SQMHELP',,VSAM,                    X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,SYS302,1,0,02985,150
// ASSGN SYS007,DISK,VOL=SYS302,SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN   -
                ENV(RECFM(VB) -
                    BLKSZ(8248) -
                    RECSZ(8240))) -
        OUTFILE(SQMDAT1 -
                ENV(RECFM(SB) -
                    BLKSZ(2048) -
                    RECSZ(8240)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 RECORD TIME BEFORE RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710             PUBLIC  SQMHELP           4NN3
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 57. DBSPACE Reorg Option 4 (Reload DBSPACE) - Sample Jobstream (Part 1 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 REPRO VSAM DDL TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'L.SQLDS710.PUBLIC.SQMHELP',,VSAM,                    X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDDL1,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYS008,SYS302,1,0,03835,100
// ASSGN SYS008,DISK,VOL=SYS302,SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN ) -
        OUTFILE(SQMDDL1 -
                ENV(RECFM(F ) -
                    BLKSZ(0080) -
                    RECSZ(0080)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0006 RELOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,SYS302,1,0,02985,150
// ASSGN SYS007,DISK,VOL=SYS302,SHR
// ASSGN SYS006,SYS007
// ASSGN SYS020,SYSIPT
// DLBL IJSYSIN,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYSIPT,SYS302,1,0,03835,100
ASSGN SYSIPT,DISK,VOL=SYS302,SHR
// ON $ABEND GOTO CLOSEIPT
// ON $CANCEL GOTO CLOSIPT
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(SQLDS710)'
/*
// IF $RC > 0000 THEN
// GOTO CLOSEIPT
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0007 RECORD TIME AFTER RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDS710            PUBLIC  SQMHELP           4NN4
/*
// GOTO THEEND
/. CLOSEIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0008 CLOSE SYSIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
CLOSE SYSIPT,SYS020
// GOTO $EOJ
/. NODAT
// RESET SYSLST
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0009 NO DATA FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* RELOAD ABORTED: MISSING FILE = D.SQLDS710.PUBLIC.SQMHELP
// GOTO $EOJ
/. NODDL
// RESET SYSLST
```

Figure 57. DBSPACE Reorg Option 4 (Reload DBSPACE) - Sample Jobstream (Part 2 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0010 NO DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* RELOAD ABORTED: MISSING FILE = L.SQLDS710.PUBLIC.SQMHELP
/. THEEND
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0011 THE END
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
/*
/&
```

Figure 57. DBSPACE Reorg Option 4 (Reload DBSPACE) - Sample Jobstream (Part 3 of 3)

```
* $$ JOB JNM=SUMREORG,CLASS=A,DISP=H,PRI=3
* $$ LST PRI=3
// JOB SUMREORG SUM REORG DBSPACE - DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 RECORD TIME BEFORE DDL GENERATION
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// ON $RC = 4095 CONTINUE
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=N,DBNAME=SQLDBA,PROGX
               NAME=SQB02,NDIRBUF=000010,NPAGBUF=000010'
%%SQLDBA            PUBLIC  SAMPLE            3NY1
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.SQLDBA.PUBLIC.SAMPLE',0,VSAM,                         X
               RECORDS=000500,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// ON $RC = 4095 CONTINUE
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=N,DBNAME=SQLDBA,PROGX
               NAME=SQB01,NDIRBUF=000010,NPAGBUF=000010'
%%SQLDBA            PUBLIC  SAMPLE            3NY
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 UNLOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=N,DBNAME=SQLDBA,PROGX
               NAME=ARIDBS,NDIRBUF=000010,NPAGBUF=000010'
READ MEMBER SQMCONN.C NOCONT
```

Figure 58. Sample Single User Mode DBSPACE Reorganization Jobstream (Part 1 of 4)

```
COMMENT '***** UNLOAD DBSPACE "PUBLIC"."SAMPLE" *****'
SET UPDATE STATISTICS OFF;
UNLOAD DBSPACE ("PUBLIC"."SAMPLE")
OUTFILE(SQMDAT1 BLKSZ(02048) PDEV(DASD))
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 RECORD TIME AFTER UNLOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDBA            PUBLIC  SAMPLE            3NY2
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 REPRO VSAM DDL TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'L.SQLDBA.PUBLIC.SAMPLE',,VSAM,                          X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDDL1,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYS008,'VSEPK3',1,0,0000445488,00600
// ASSGN SYS008,DISK,VOL='VSEPK3',SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN ) -
        OUTFILE(SQMDDL1 -
                ENV(RECFM(F ) -
                    BLKSZ(0080) -
                    RECSZ(0080)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0006 RECORD TIME BEFORE RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%SQLDBA            PUBLIC  SAMPLE            3NY3
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 58. Sample Single User Mode DBSPACE Reorganization Jobstream (Part 2 of 4)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0007 RELOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// ASSGN SYS004,SYS005
// ASSGN SYS020,SYSIPT
// DLBL IJSYSIN,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYSIPT,'VSEPK3',1,0,0000445488,00600
ASSGN SYSIPT,DISK,VOL='VSEPK3',SHR
// ON $ABEND GOTO CLOSEIPT
// ON $CANCEL GOTO CLOSEIPT
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=N,DBNAME=SQLDBA,PROGX
              NAME=ARIDBS,NDIRBUF=000010,NPAGBUF=000010'
/*
// IF $RC > 0006 AND $RC < 4095 THEN
// GOTO CLOSEIPT
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0008 RECORD TIME AFTER RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// ON $RC = 4095 CONTINUE
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=N,DBNAME=SQLDBA,PROGX
              NAME=SQB02,NDIRBUF=000010,NPAGBUF=000010'
%%SQLDBA            PUBLIC  SAMPLE            3NY4
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0009 DELETE VSAM DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// ASSGN SYSLST,IGN
// DLBL FILEIN,'L.SQLDBA.PUBLIC.SAMPLE',,VSAM,                        X
              CAT=SQMCAT,DISP=(OLD,DELETE)
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// RESET SYSLST
// GOTO THEEND
/. CLOSEIPT
```

Figure 58. Sample Single User Mode DBSPACE Reorganization Jobstream (Part 3 of 4)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0010 CLOSE SYSIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0011 REPRO SAM DATA TO VSAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000423488,22000
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// DLBL SQMDAT,'D.SQLDBA.PUBLIC.SAMPLE',0,VSAM,                          X
               RECORDS=000100,RECSIZE=8240,DISP=(NEW,KEEP),CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(SQMDAT1  -
                ENV(RECFM(SB) -
                    BLKSZ(2048) -
                    RECSZ(8240))) -
         OUTFILE(SQMDAT  -
                 ENV(RECFM(VB) -
                     BLKSZ(8248) -
                     RECSZ(8240)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
// GOTO $EOJ
/. THEEND
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0012 THE END
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
/*
/&
* $$ EOJ
```

Figure 58. Sample Single User Mode DBSPACE Reorganization Jobstream (Part 4 of 4)

```
$ $$ JOB JNM=TAPREORG,CLASS=0,DISP=D,PRI=9
* $$ LST PRI=3
// JOB TAPREORG SUM REORG DBSPACE - DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 RECORD TIME BEFORE DDL GENERATION
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// TLBL ARIARCH
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// ON $RC = 4095 CONTINUE
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=A,DBNAME=DB2710,PROGX
               NAME=SQB02,NDIRBUF=000010,NPAGBUF=000015'
%%DB2710            PUBLIC  SAMPLE            3NY1
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// TLBL ARIARCH
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.DB2710.PUBLIC.SAMPLE',0,VSAM,                          X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// ON $RC = 4095 CONTINUE
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=A,DBNAME=DB2710,PROGX
               NAME=SQB01,NDIRBUF=000010,NPAGBUF=000015'
%%DB2710            PUBLIC  SAMPLE            3NY
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 UNLOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// TLBL ARIARCH
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=A,DBNAME=DB2710,PROGX
               NAME=ARIDBS,NDIRBUF=000010,NPAGBUF=000015'
READ MEMBER SQMCONN.C NOCONT
COMMENT '***** UNLOAD DBSPACE "PUBLIC"."SAMPLE" *****'
SET UPDATE STATISTICS OFF;
UNLOAD DBSPACE ("PUBLIC"."SAMPLE")
OUTFILE(SQMDAT1 BLKSZ(02048) PDEV(DASD))
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
```

Figure 59. Sample Single User Mode DBSPACE Reorganization using Tape (Part 1 of 4)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 RECORD TIME AFTER UNLOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%DB2710            PUBLIC  SAMPLE            3NY2
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 REPRO VSAM DDL TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'L.DB2710.PUBLIC.SAMPLE',,VSAM,                          X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDDL1,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYS008,'VSEPK3',1,0,0000239238,00900
// ASSGN SYS008,DISK,VOL='VSEPK3',SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN ) -
        OUTFILE(SQMDDL1 -
                ENV(RECFM(F ) -
                    BLKSZ(0080) -
                    RECSZ(0080)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0006 RECORD TIME BEFORE RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB02,SIZE=AUTO
%%DB2710            PUBLIC  SAMPLE            3NY3
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 59. Sample Single User Mode DBSPACE Reorganization using Tape (Part 2 of 4)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0007 RELOAD DBSPACE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// TLBL ARIARCH
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// ASSGN SYS004,SYS005
// ASSGN SYS020,SYSIPT
// DLBL IJSYSIN,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYSIPT,'VSEPK3',1,0,0000239238,00900
ASSGN SYSIPT,DISK,VOL='VSEPK3',SHR
// ON $ABEND GOTO CLOSEIPT
// ON $CANCEL GOTO CLOSEIPT
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=A,DBNAME=DB2710,PROGX
              NAME=ARIDBS,NDIRBUF=000010,NPAGBUF=000015'
/*
// IF $RC > 0006 AND $RC < 4095 THEN
// GOTO CLOSEIPT
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0008 RECORD TIME AFTER RELOAD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// TLBL ARIARCH
// DLBL SQMPARM,'SQLMSTR.REORG.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMRDAT,'SQLMSTR.REORG.DATA',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// ON $RC = 4095 CONTINUE
// EXEC ARISQLDS,SIZE=AUTO,PARM='SYSMODE=S,LOGMODE=A,DBNAME=DB2710,PROGX
              NAME=SQB02,NDIRBUF=000010,NPAGBUF=000015'
%%DB2710            PUBLIC  SAMPLE            3NY4
/*
// IF $RC > 0000 AND $RC < 4095 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0009 DELETE VSAM DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// ASSGN SYSLST,IGN
// DLBL FILEIN,'L.DB2710.PUBLIC.SAMPLE',,VSAM,                        X
              CAT=SQMCAT,DISP=(OLD,DELETE)
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// RESET SYSLST
// GOTO THEEND
/. CLOSEIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0010 CLOSE SYSIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
CLOSE SYSIPT,SYS020
```

Figure 59. Sample Single User Mode DBSPACE Reorganization using Tape (Part 3 of 4)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0011 REPRO SAM DATA TO VSAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// DLBL SQMDAT,'D.DB2710.PUBLIC.SAMPLE',0,VSAM,                          X
               RECORDS=000100,RECSIZE=8240,DISP=(NEW,KEEP),CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
 REPRO INFILE(SQMDAT1  -
              ENV(RECFM(SB) -
                  BLKSZ(2048) -
                  RECSZ(8240))) -
      OUTFILE(SQMDAT  -
              ENV(RECFM(VB) -
                  BLKSZ(8248) -
                  RECSZ(8240)))
 IF LASTCC > 0000 -
      THEN CANCEL JOB

 GOTO $EOJ
 THEEND
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
STEP0012 THE END
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

Figure 59. Sample Single User Mode DBSPACE Reorganization using Tape (Part 4 of 4)

```
* $$ JOB JNM=TBUNLOAD,DISP=D
* $$ LST CLASS=A,PRI=3
// JOB TBUNLOAD  UNLOAD TABLE "EXAMPLE"."ROUTINE" - DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMTPRM,'SQLMSTR.TABLE.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.DB2710.EXAMPLE.ROUTINE',0,VSAM,                      X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB60,SIZE=AUTO
%%DB2710            EXAMPLE ROUTINE           2 N
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 UNLOAD TABLE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 // DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
 // EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
 // ASSGN SYS007,DISK,VOL='VSEPK3',SHR
 // EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(DB2710)'
 READ MEMBER SQMCONN.C NOCONT
 COMMENT '***** UNLOAD TABLE "EXAMPLE"."ROUTINE" *****'
 SET UPDATE STATISTICS OFF;
 UNLOAD TABLE ("EXAMPLE"."ROUTINE")
 OUTFILE(SQMDAT1 BLKSZ(02048) PDEV(DASD))
 /*
 // IF $RC > 0000 THEN
 // GOTO $EOJ
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 * STEP0003 REPRO SAM DATA TO VSAM
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 // DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
 // EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
 // ASSGN SYS007,DISK,VOL='VSEPK3',SHR
 // DLBL SQMDAT,'D.DB2710.EXAMPLE.ROUTINE',0,VSAM,                       X
               RECORDS=000100,RECSIZE=8240,DISP=(NEW,KEEP),CAT=SQMCAT
 // EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(SQMDAT1  -
                ENV(RECFM(SB) -
                    BLKSZ(2048) -
                    RECSZ(8240))) -
         OUTFILE(SQMDAT  -
                ENV(RECFM(VB) -
                    BLKSZ(8248) -
                    RECSZ(8240)))
/*
/&
```

Figure 60. TABLE Reorg Option 2 (Unload TABLE) - Sample Jobstream

```
* $$ JOB JNM=TBREORG,CLASS=0,DISP=D
* $$ LST CLASS=A,PRI=3
// JOB TBREORG REORG TABLE "EXAMPLE"."ROUTINE" - DISK
// OPTION LOG
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0001 UNLOAD DDL
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMTPRM,'SQLMSTR.TABLE.PARMS',,VSAM,CAT=SQMCAT
// DLBL SQMDDL,'L.DB2710.EXAMPLE.ROUTINE',0,VSAM,                      X
               RECORDS=001000,RECSIZE=80,DISP=(NEW,KEEP),CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB60,SIZE=AUTO
%%DB2710            EXAMPLE ROUTINE           3NN
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0002 UNLOAD TABLE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(DB2710)'
READ MEMBER SQMCONN.C NOCONT
COMMENT '***** UNLOAD TABLE "EXAMPLE"."ROUTINE" *****'
SET UPDATE STATISTICS OFF;
UNLOAD TABLE ("EXAMPLE"."ROUTINE")
OUTFILE(SQMDAT1 BLKSZ(02048) PDEV(DASD))
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 61. TABLE Reorg Option 3 (Reorganize TABLE) - Sample Jobstream (Part 1 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 REPRO VSAM DDL TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'L.DB2710.EXAMPLE.ROUTINE',,VSAM,                      X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDDL1,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYS008,'VSEPK3',1,0,0000239238,00900
// ASSGN SYS008,DISK,VOL='VSEPK3',SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN ) -
        OUTFILE(SQMDDL1 -
                ENV(RECFM(F ) -
                    BLKSZ(0080) -
                    RECSZ(0080)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 RELOAD TABLE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// ASSGN SYS004,SYS005
// ASSGN SYS020,SYSIPT
// DLBL IJSYSIN,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYSIPT,'VSEPK3',1,0,0000239238,00900
ASSGN SYSIPT,DISK,VOL='VSEPK3',SHR
// ON $ABEND GOTO CLOSEIPT
// ON $CANCEL GOTO CLOSEIPT
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME()'
/*
// IF $RC > 0006 THEN
// GOTO CLOSEIPT
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 DELETE PARAMETER RECORD
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMTPRM,'SQLMSTR.TABLE.PARMS',,VSAM,CAT=SQMCAT
// ASSGN SYS005,SYSRDR
// ASSGN SYS011,SYSLST
// EXEC SQB62,SIZE=AUTO
%%DB2710            EXAMPLE ROUTINE            NN
/*
// IF $RC > 0000 THEN
// GOTO $EOJ
```

Figure 61. TABLE Reorg Option 3 (Reorganize TABLE) - Sample Jobstream (Part 2 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0006 DELETE VSAM DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// ASSGN SYSLST,IGN
// DLBL FILEIN,'L.DB2710.EXAMPLE.ROUTINE',,VSAM,                        X
               CAT=SQMCAT,DISP=(OLD,DELETE)
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// RESET SYSLST
// GOTO THEEND
/. CLOSEIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0007 CLOSE SYSIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
CLOSE SYSIPT,SYS020
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0008 REPRO SAM DATA TO VSAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// DLBL SQMDAT,'D.DB2710.EXAMPLE.ROUTINE',0,VSAM,                       X
               RECORDS=000100,RECSIZE=8240,DISP=(NEW,KEEP),CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(SQMDAT1  -
                ENV(RECFM(SB) -
                    BLKSZ(2048) -
                    RECSZ(8240))) -
        OUTFILE(SQMDAT  -
                ENV(RECFM(VB) -
                    BLKSZ(8248) -
                    RECSZ(8240)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
// GOTO $EOJ
/. THEEND
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0009 THE END
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
/*
/&
```

Figure 61. TABLE Reorg Option 3 (Reorganize TABLE) - Sample Jobstream (Part 3 of 3)

```
 * $$ JOB JNM=TBREORG,CLASS=0,DISP=D
 * $$ LST CLASS=A,PRI=3
 // JOB TBREORG   RELOAD TABLE "EXAMPLE"."ROUTINE" - DISK
 // OPTION LOG
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 * STEP0001 CHECK FOR DATA FILE
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 // ASSGN SYSLST,IGN
 // DLBL FILEIN,'D.DB2710.EXAMPLE.ROUTINE',,VSAM,                      X
               CAT=SQMCAT
 // EXEC IDCAMS,SIZE=AUTO
    PRINT INFILE(FILEIN) -
          COUNT(1)
 /*
 // IF $RC > 0000 THEN
 // GOTO NODAT
 // RESET SYSLST
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 * STEP0002 CHECK FOR DDL FILE
 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
 // ASSGN SYSLST,IGN
// DLBL FILEIN,'L.DB2710.EXAMPLE.ROUTINE',,VSAM,                       X
              CAT=SQMCAT
// EXEC IDCAMS,SIZE=AUTO
   PRINT INFILE(FILEIN) -
        COUNT(1)
/*
// IF $RC > 0000 THEN
// GOTO NODDL
// RESET SYSLST
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0003 REPRO VSAM DATA TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'D.DB2710.EXAMPLE.ROUTINE',,VSAM,                       X
              CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN   -
                ENV(RECFM(VB) -
                    BLKSZ(8248) -

                    RECSZ(8240))) -
        OUTFILE(SQMDAT1 -
                ENV(RECFM(SB) -
                    BLKSZ(2048) -
                    RECSZ(8240)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
```

Figure 62. TABLE Reorg Option 4 (Reload TABLE) - Sample Jobstream (Part 1 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0004 REPRO VSAM DDL TO SAM
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL VSAMIN,'L.DB2710.EXAMPLE.ROUTINE',,VSAM,                      X
               CAT=SQMCAT,DISP=(OLD,KEEP)
// DLBL SQMDDL1,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYS008,'VSEPK3',1,0,0000239238,00900
// ASSGN SYS008,DISK,VOL='VSEPK3',SHR
// EXEC IDCAMS,SIZE=AUTO
   REPRO INFILE(VSAMIN ) -
        OUTFILE(SQMDDL1 -
                ENV(RECFM(F ) -
                    BLKSZ(0080) -
                    RECSZ(0080)))
   IF LASTCC > 0000 -
        THEN CANCEL JOB
/*
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0005 RELOAD TABLE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
// DLBL SQMDAT1,'SQLMSTR.DATA.FILE1',0,SD
// EXTENT SYS007,'VSEPK3',1,0,0000201438,06300
// ASSGN SYS007,DISK,VOL='VSEPK3',SHR
// ASSGN SYS006,SYS007
// ASSGN SYS020,SYSIPT
// DLBL IJSYSIN,'SQLMSTR.DDL.FILE1',0,SD
// EXTENT SYSIPT,'VSEPK3',1,0,0000239238,00900
ASSGN SYSIPT,DISK,VOL='VSEPK3',SHR
// ON $ABEND GOTO CLOSEIPT
// ON $CANCEL GOTO CLOSEIPT
// EXEC ARIDBS,SIZE=AUTO,PARM='DBNAME(DB2710)'
/*
// IF $RC > 0006 THEN
// GOTO CLOSEIPT
CLOSE SYSIPT,SYS020
// GOTO THEEND
/. CLOSEIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0006 CLOSE SYSIPT
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
CLOSE SYSIPT,SYS020
// GOTO $EOJ
/. NODAT
// RESET SYSLST
```

Figure 62. TABLE Reorg Option 4 (Reload TABLE) - Sample Jobstream (Part 2 of 3)

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0007 NO DATA FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* RELOAD ABORTED: MISSING FILE =
* D.DB2710.EXAMPLE.ROUTINE
// GOTO $EOJ
/. NODDL
// RESET SYSLST
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0008 NO DDL FILE
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* RELOAD ABORTED: MISSING FILE =
* L.DB2710.EXAMPLE.ROUTINE
/. THEEND
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* STEP0009 THE END
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
/*
/&
```

Figure 62. TABLE Reorg Option 4 (Reload TABLE) - Sample Jobstream (Part 3 of 3)

Appendix B. DBSPACE and Table Reorganization Tool Related Files

A DBSPACE reorganization job involves several files. Depending on the options chosen, some or all of the following files are used:

Filename	File ID & Description
SQMPARM	″SQLMSTR.REORG.PARMS″ This is the DBSPACE Reorganization parameter file. The job submission programs write a record to this file whenever a job is submitted. The SQMPARM record contains REORG parameters and is read by the batch DDL generation and timekeeping programs. SQMPARM is a VSAM KSDS file whose key is composed of database name, owner, DBSPACE name, and option. SQMPARM is defined during installation and resides on the Control Center user catalog. The record is deleted when the REORG completes.
SQMRDAT	″SQLMSTR.REORG.DATA″ This file holds statistical data relating to a DBSPACE unload/reload. At job end, the SQLMAINT table is updated with this data. SQMRDAT is used for Options **2**, **3**, and **4** of the reorganization tool. It is a VSAM KSDS file whose key is composed of database name, owner, and DBSPACENAME. The file is defined during installation and resides on the Control Center user catalog.
SQMTPARM	″SQLMSTR.TABLE.PARMS″ This is the Table Reorganization parameter file. The job submission programs write a record to this file whenever a job is submitted. The SQMTPARM record contains REORG parameters and is read by the batch DDL generation and timekeeping programs. SQMTPARM is a VSAM KSDS file. It is defined during installation and resides in the Control Center user catalog.
SQMDDL	File ID built dynamically during job submission. SQMDDL is a VSAM-managed SAM file that is used to contain the DDL created by SQB01, the batch DDL generation program. The file id is composed of a concatenation of: 1. ″L″ - (indicates DDL) 2. Database name 3. DBSPACE owner name 4. DBSPACE name File size is defined by the DDL STMTS parameter on the DBSPACE REORGANIZATION screen (defaults to 1000 80-byte records). This file resides on the Control Center user catalog and remains there until it is deleted by a successful REORGANIZE DBSPACE or deleted specifically by the user.
SQMDATn	″SQLMSTR.DATA.FILEn″

This SAM file is used to hold the output of the UNLOAD DBSPACE step when DISK is selected as the unload media. ″n″ corresponds to the FILE # parameter that appears on the DBSPACE REORGANIZATION UTILITY screen. Valid values are 1 to 3. This file is defined from the WORK FILE LABEL DEFINITION facility (Option 4 of the Main Menu). It is used in Options 2 and 3 of the reorganization tool.

SQMDDLn ″SQLMSTR.DDL.FILEn″

This SAM file is required to contain the DDL extracted by SQB01, the batch DDL generator. It is used as the DBSU command input file in the RELOAD step. Because DBSU expects commands to come from SYSIPT and a VSAM file cannot be assigned to SYSIPT, the VSAM SQMDDL file is REPRO'd to SQMDDLn. ″n″ corresponds to the FILE # parameter on the DBSPACE REORGANIZATION UTILITY screen. Valid values are 1 to 3. This file is defined from the WORK FILE LABEL DEFINITION facility and is used in Options 3 and 4 of the reorganization tool.

SQMDAT Built dynamically by the submit program.

SQMDAT is a VSAM-managed SAM file that is used to contain the DBSPACE data unloaded from DBSU in the UNLOAD DBSPACE step. The file id is composed of a concatenation of:

1. ″D″ - (indicates data)
2. Database name
3. DBSPACE owner name
4. DBSPACE name

File size is computed from DBSPACE catalog information. This file is only created when a user selects UNLOAD DBSPACE (Option 2) and does not specify tape. This file is also created if an error occurs during the RELOAD step of a REORGANIZE DBSPACE from disk (Option 3). In effect, this file is a backup copy of the unloaded DBSPACE. It can be used as input to a RELOAD DBSPACE (Option 4). SQMDAT resides on the Control Center user catalog and remains there until the same DBSPACE is unloaded again or the file is specifically deleted.

SQMTAPE Specified by the user.

SQMTAPE is used when the user selects tape media by entering a TAPE FILE NAME on the DBSPACE REORGANIZATION UTILITY screen. This file must be defined to Control Center from the WORK FILE LABEL DEFINITION facility (Option 4 of the Main Menu).

SQMMESG ″SQLMSTR.MESSAGES″

SQMMESG is a VSAM KSDS file that is used to contain Control Center error message text. The key is a 4-digit number. SQMMESG is defined during installation and resides on the Control Center User catalog.

SQMWORK ″SQLMSTR.WORK.FILES″

SQMWORK is a VSAM KSDS file that holds the ASSGN, DLBL, EXTENT, and TLBL statements that define your Control Center work files. The key is composed of a 17-character file ID and a

sequence number. SQMWORK is defined during installation and resides on the Control Center user catalog.

Figure 63 on page 130 is an example of the SQMDDL file created when a REORGANIZE DBSPACE job executes for the PUBLIC.SAMPLE DBSPACE. This SQMDDL command file contains all the DDL statements associated with the reorganized DBSPACE and the RELOAD statements required to perform the reorganization.

For DBSPACEs with very complex data structures (many tables, referential integrity, views, grants), the SQMDDL file may contain considerably more commands.

```
COMMENT '**************** CONTROL CENTER DBSPACE REORG **************
COMMENT '*    Database: SQLDBA                                      *'
COMMENT '*     DBSPACE: "PUBLIC"."SAMPLE"                           *'
COMMENT '*        Date: 06/30/00 09:21:58                           *'
COMMENT '*************************************************************'
CONNECT "SQLMSTR" IDENTIFIED BY ********;
COMMIT WORK;
GRANT DBA TO "SQLREORG" IDENTIFIED BY "PU24L5AR";
CONNECT "SQLREORG" IDENTIFIED BY "PU24L5AR";
COMMIT WORK;
COMMENT '*************            Drop DBSPACE            *************'
SET ERRORMODE (CONTINUE)
DROP DBSPACE "PUBLIC"."SAMPLE"              ;
COMMIT WORK;
SET ERRORMODE (OFF)
SET AUTOCOMMIT (ON)
COMMENT '*************          Acquire DBSPACE           *************'
ACQUIRE PUBLIC DBSPACE NAMED "PUBLIC"."SAMPLE"
 (PAGES =     512, PCTINDEX = 33,
  PCTFREE = 10, NHEADER = 8,
  STORPOOL =   1, LOCK = PAGE   );
COMMENT '*************           Create Tables            *************'
CREATE TABLE "SQLDBA"."ACTIVITY" (
  "ACTNO" SMALLINT         NOT NULL
 ,"ACTKWD" CHAR(6)          NOT NULL
 ,"ACTDESC" VARCHAR(20)      NOT NULL
 ) IN "PUBLIC"."SAMPLE"              ;
CREATE TABLE "SQLDBA"."DEPARTMENT" (
  "DEPTNO" CHAR(3)          NOT NULL
 ,"DEPTNAME" VARCHAR(36)      NOT NULL
 ,"MGRNO" CHAR(6)
 ,"ADMRDEPT" CHAR(3)          NOT NULL
 ) IN "PUBLIC"."SAMPLE"              ;
CREATE TABLE "SQLDBA"."EMP_ACT" (
  "EMPNO" CHAR(6)          NOT NULL
 ,"PROJNO" CHAR(6)          NOT NULL
 ,"ACTNO" SMALLINT         NOT NULL
 ,"EMPTIME" DECIMAL(5,2)
 ,"EMSTDATE" DATE
 ,"EMENDATE" DATE
 ) IN "PUBLIC"."SAMPLE"              ;
CREATE TABLE "SQLDBA"."EMPLOYEE" (
  "EMPNO" CHAR(6)          NOT NULL
 ,"FIRSTNME" VARCHAR(12)      NOT NULL
 ,"MIDINIT" CHAR(1)          NOT NULL
 ,"LASTNAME" VARCHAR(15)      NOT NULL
 ,"WORKDEPT" CHAR(3)
 ,"PHONENO" CHAR(4)
 ,"HIREDATE" DATE
 ,"JOB" CHAR(8)
 ,"EDLEVEL" SMALLINT         NOT NULL
 ,"SEX" CHAR(1)
 ,"BIRTHDATE" DATE
 ,"SALARY" DECIMAL(9,2)
 ,"BONUS" DECIMAL(9,2)
 ,"COMM" DECIMAL(9,2)
 ) IN "PUBLIC"."SAMPLE"              ;
CREATE TABLE "SQLDBA"."PROJ_ACT" (
  "PROJNO" CHAR(6)          NOT NULL
 ,"ACTNO" SMALLINT         NOT NULL
 ,"ACSTAFF" DECIMAL(5,2)
 ,"ACSTDATE" DATE             NOT NULL
```

Figure 63. Sample Generated DDL File (Part 1 of 4)

```
 ,"ACENDATE" DATE
 ) IN "PUBLIC"."SAMPLE"              ;
CREATE TABLE "SQLDBA"."PROJECT" (
  "PROJNO" CHAR(6)          NOT NULL
 ,"PROJNAME" VARCHAR(24)      NOT NULL
 ,"DEPTNO" CHAR(3)
 ,"RESPEMP" CHAR(6)
 ,"PRSTAFF" DECIMAL(5,2)
 ,"PRSTDATE" DATE
 ,"PRENDATE" DATE
 ,"MAJPROJ" CHAR(6)
 ) IN "PUBLIC"."SAMPLE"              ;
COMMENT '*************      Deactivated Primary Keys      *************'
COMMENT '*************    Inactive Unique Constraints     *************'
COMMENT '*************          Reload Tables             *************'
RELOAD TABLE("SQLDBA"."ACTIVITY")
 PURGE
 INTABLE("SQLDBA"."ACTIVITY")
 INFILE(DBSFILE);
RELOAD TABLE("SQLDBA"."DEPARTMENT")
 PURGE
 INTABLE("SQLDBA"."DEPARTMENT")
 INFILE(DBSFILE);
RELOAD TABLE("SQLDBA"."EMP_ACT")
 PURGE
 INTABLE("SQLDBA"."EMP_ACT")
 INFILE(DBSFILE);
RELOAD TABLE("SQLDBA"."EMPLOYEE")
 PURGE
 INTABLE("SQLDBA"."EMPLOYEE")
 INFILE(DBSFILE);
RELOAD TABLE("SQLDBA"."PROJ_ACT")
 PURGE
 INTABLE("SQLDBA"."PROJ_ACT")
 INFILE(DBSFILE);
RELOAD TABLE("SQLDBA"."PROJECT")
 PURGE
 INTABLE("SQLDBA"."PROJECT")
 INFILE(DBSFILE);
ALTER DBSPACE "PUBLIC"."SAMPLE"               (PCTFREE =    0);
COMMENT '*************           Comment Tables           *************'
COMMENT '*************          Comment Columns           *************'
COMMENT '*************        Primary Cluster Keys        *************'
ALTER TABLE "SQLDBA"."ACTIVITY"
 ADD PRIMARY KEY
 ("ACTNO" )
 PCTFREE =  10;
ALTER TABLE "SQLDBA"."DEPARTMENT"
 ADD PRIMARY KEY
 ("DEPTNO" )
 PCTFREE =  10;
ALTER TABLE "SQLDBA"."EMPLOYEE"
 ADD PRIMARY KEY
 ("EMPNO" )
 PCTFREE =  10;
ALTER TABLE "SQLDBA"."PROJ_ACT"
```

Figure 63. Sample Generated DDL File (Part 2 of 4)

```
 ADD PRIMARY KEY
 ("PROJNO" ,
  "ACTNO" ,
  "ACSTDATE" )
 PCTFREE =  10;
ALTER TABLE "SQLDBA"."PROJECT"
 ADD PRIMARY KEY
 ("PROJNO" )
 PCTFREE =  10;
COMMENT '*************  Clustering Unique Constraints     *************'
COMMENT '*************           Create Indexes           *************'
CREATE INDEX "SQLDBA"."PROJNOIN"
 ON "SQLDBA"."EMP_ACT"
 ("PROJNO" )
 PCTFREE =  10;
CREATE INDEX "SQLDBA"."DEPTNOI"
 ON "SQLDBA"."PROJECT"
 ("DEPTNO" )
 PCTFREE =  10;
CREATE INDEX "SQLDBA"."EMPNOIN"
 ON "SQLDBA"."EMP_ACT"
 ("EMPNO" )
 PCTFREE =  10;
CREATE INDEX "SQLDBA"."MGRNOI"
 ON "SQLDBA"."DEPARTMENT"
 ("MGRNO" )
 PCTFREE =  10;
CREATE INDEX "SQLDBA"."RESPEMPI"
 ON "SQLDBA"."PROJECT"
 ("RESPEMP" )
 PCTFREE =  10;
CREATE INDEX "SQLDBA"."WORKDEPTI"
 ON "SQLDBA"."EMPLOYEE"
 ("WORKDEPT" )
 PCTFREE =  10;
COMMENT '*************           Primary Keys             *************'
COMMENT '*************       Remaining Foreign Keys       *************'
ALTER TABLE "SQLDBA"."PROJ_ACT"
  ADD FOREIGN KEY "R_ACTIV"
 ("ACTNO"
 ) REFERENCES "SQLDBA"."ACTIVITY"
  ON DELETE RESTRICT;
ALTER TABLE "SQLDBA"."EMPLOYEE"
  ADD FOREIGN KEY "R_DEPT1"
 ("WORKDEPT"
 ) REFERENCES "SQLDBA"."DEPARTMENT"
  ON DELETE SET NULL;
ALTER TABLE "SQLDBA"."PROJECT"
  ADD FOREIGN KEY "R_DEPT2"
 ("DEPTNO"
 ) REFERENCES "SQLDBA"."DEPARTMENT"
  ON DELETE RESTRICT;
ALTER TABLE "SQLDBA"."DEPARTMENT"
  ADD FOREIGN KEY "R_EMPLY1"
 ("MGRNO"
 ) REFERENCES "SQLDBA"."EMPLOYEE"
  ON DELETE SET NULL;
```

Figure 63. Sample Generated DDL File (Part 3 of 4)

```
 ALTER TABLE "SQLDBA"."EMP_ACT"
  ADD FOREIGN KEY "R_EMPLY3"
 ("EMPNO"
 ) REFERENCES "SQLDBA"."EMPLOYEE"
  ON DELETE CASCADE;
ALTER TABLE "SQLDBA"."PROJECT"
  ADD FOREIGN KEY "R_EMPLY2"
 ("RESPEMP"
 ) REFERENCES "SQLDBA"."EMPLOYEE"
  ON DELETE SET NULL;
ALTER TABLE "SQLDBA"."EMP_ACT"
  ADD FOREIGN KEY "R_PROACT"
 ("PROJNO"
 , "ACTNO"
 , "EMSTDATE"
 ) REFERENCES "SQLDBA"."PROJ_ACT"
  ON DELETE RESTRICT;
ALTER TABLE "SQLDBA"."PROJ_ACT"
  ADD FOREIGN KEY "R_PROJ2"
 ("PROJNO"
 ) REFERENCES "SQLDBA"."PROJECT"
  ON DELETE RESTRICT;
COMMENT '*************      Active Unique Constraints     *************'
COMMENT '*************           Table Grants             *************'
CONNECT "SQLDBA" IDENTIFIED BY "BOOMER";
GRANT SELECT
 ON "SQLDBA"."ACTIVITY"
 TO "PUBLIC";
GRANT SELECT
 ON "SQLDBA"."DEPARTMENT"
 TO "PUBLIC";
GRANT SELECT
 ON "SQLDBA"."EMP_ACT"
 TO "PUBLIC";
GRANT SELECT
 ON "SQLDBA"."EMPLOYEE"
 TO "PUBLIC";
GRANT SELECT
 ON "SQLDBA"."PROJ_ACT"
 TO "PUBLIC";
GRANT SELECT
 ON "SQLDBA"."PROJECT"
 TO "PUBLIC";
COMMENT '*************          Column Grants             *************'
COMMENT '*************       Views with Grants            *************'
   COMMENT '******** SQLDBA.VPHONE                  ********'
CREATE VIEW VPHONE (LASTNAME, FIRSTNAME, MIDINITL, PHNUMBER, EMNUMBER,
 DPNUMBER, DEPTNAME) AS SELECT LASTNAME, FIRSTNME, MIDINIT, PHONENO,
 EMPNO, DEPTNO, DEPTNAME FROM EMPLOYEE,
 DEPARTMENT WHERE WORKDEPT=DEPTNO;
GRANT SELECT
 ON "SQLDBA"."VPHONE"
 TO "PUBLIC";
   COMMENT '******** SQLDBA.VPROJ                   ********'
CREATE VIEW VPROJ (EMP_NO, AC_STAFF, DEPT_NO) AS SELECT EMPNO, ACSTAFF,
 DEPTNO FROM EMP_ACT, PROJ_ACT,
 PROJECT WHERE EMP_ACT.PROJNO = PROJ_ACT.PROJNO AND PROJ_ACT.PROJNO =
 PROJECT.PROJNO;
COMMENT '********************  PACKAGE REBIND ********************'
```

Figure 63. Sample Generated DDL File (Part 4 of 4)

DBSPACE Reorganization Tool Related Files

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Glossary

access-path. The path used to get data specified in SQL statements. An access path can involve either an index, a sequential search, or a combination of both.

applid. The name of a CICS system as known to VTAM®.

batch. Processing that involves little or no terminal interaction.

catalog. 1. A set of tables maintained by the database manager. 2. A directory of files and libraries, with reference to their locations. 3. To store a library member such as a phase, module, or book in a sublibrary.

CEDA. The resource definition online transaction.

CICS. Customer Information Control System. IBM's teleprocessing monitor for VSE/ESA.

CICS Report Controller Feature. A set of programs and transactions that interface with VSE/POWER to help users create reports and print them at distributed locations.

CICS transaction. Computing and data-access tasks grouped together as a unit of work.

clustered index. An index whose sequence of key values closely corresponds to the sequence of rows stored in a table.

clustering index. The first index created for a table. The DB2 database manager uses it to determine placement of subsequent rows.

CSD. CICS System Definition file.

Control Center. An IBM licensed program consisting of menus and programs to assist a DBA in the on-going administration of DB2 Server for VSE & VM databases.

database. An organized collection of stored operational data, used by the application systems of an organization.

database administrator (DBA). An individual responsible for the availability, development, design, maintenance, operation, performance, recoverability, and security of the database.

database management system (DBMS). A software system that controls the logical and physical resources and facilities of a database.

dbextent. The physical medium upon which data is stored. One or more dbextents comprise a storage pool.

database manager. A program product that processes SQL statements.

database switching. The facility that allows users and applications to connect from one database server to another.

DBSPACE. A logical allocation of space in a storage pool contained in a database. Contains one or more tables and their associated indexes.

DBSU. Database Services Utility program used to run the DDL needed to perform a function.

DB2 (Database 2). Pertaining to the IBM licensed program that is the version of DB2 Server for the VSE and VM environments.

DB2 Optimizer. A component of a relational DBMS that carries out the logic required to find data in a database. The optimizer determines the access path.

DDL. Data Definition Language. The SQL statements for deleting and defining objects such as tables and indexes in an RDBMS.

distribution tape. A magnetic tape that contains, for example, a preconfigured operating system such as VSE/ESA. This tape is shipped to the customer for program installation.

FCT. File Control Table. This CICS control table contains entries that define files to CICS.

JCL (Job Control Language). A language that serves to prepare a job or each job step of a job to be run.

job scheduling. The process of creating the JCL necessary to run a job, then to invoke VSE/POWER to actually submit the job to the system for execution.

locking. A mechanism that prevents concurrent users from accessing the same data, at the same time. This ensures data integrity.

LIBDEF. A VSE system control statement that defines what sublibraries are to be searched for members of a specified type or the sublibrary in which new phases are to be stored.

menu. A screen that offers the user a choice of execution options.

MUM (multiple user mode). A mode of operating the DB2 database manager in which one or more users or application programs can access the database at the same time.

online processing. Processing by which the input data enters the computer directly from a display station and the output data is transmitted directly to the display station.

Online Resource Adapter. The DB2 code that provides the connection between DB2 databases and online (CICS) applications.

operator command. A statement to a control program, issued using a console or terminal

package. A control structure produced during program preparation that is used to execute SQL statements.

PCT. Program Control Table. The CICS control table that contains entries that describe transactions.

production library. The VSE/ESA library that contains the DB2 and Control Center code (PRD2).

program preparation. The process of producing an executable DB2 application program. The process includes precompilation, compilation, and bind.

pseudo-conversational. A method of on-line programming whereby a program is removed from storage when it is waiting for data from the terminal. A much more efficient technique than conversational programming.

RDBMS. Relational Data Base Management System.

RDO. Resource Definition Online.

rebind. To recreate a package.

SAM. Sequential Access Method. Files processed without an index.

SNT. Signon Table. The CICS control table that contains an entry for each userid.

spanned records. Records that are defined to span multiple blocks.

spool file. 1. A file that contains output data saved for later processing. 2. One of three VSE/POWER files on disk: queue file, data file, and account file.

SQL. Structured Query Language. A data sub-language for defining and accessing data in an RDBMS.

static SQL. SQL statements that are embedded within a program, and are prepared during the program preparation process before the program is executed. Static SQL statements have a corresponding access plan in the database.

standard labels. Disk file labels (DLBLS) that are loaded into either the partition or system standard label areas of a VSE system and are thus available to all subsequent jobs that run in that partition or system.

storage pool. A specific set of available storage areas. These areas are used by the database administrator to control storage of the database. A storage pool contains one or more DBSPACES.

sublibrary. In VSE, a subdivision of a library. Members can only be accessed in a sublibrary.

SUM (single user mode). A mode of operation in which the DB2 database manager and one application run in the same virtual machine. No other application programs or users can access the database at the same time.

time event scheduling. In VSE/POWER, the facility to schedule jobs for processing in a partition at a predefined time once or repetitively.

TLBL. The VSE Tape LaBeL system control statement that defines a tape file to an application.

transaction. Execution of one or more programs that function together as a unit in a CICS environment.

transaction identifier. The unique four-character code that identifies a CICS transaction.

VSE (Virtual Storage Extended). A system that consists of a basic operating system and any IBM supplied and user-written programs required to meet the data processing needs of a user. VSE and the hardware it controls form a complete computing system.

VSE/DITTO (VSE/Data Interfile Transfer, Testing, and Operations). An IBM licensed program that provides file-to-file services for disk, tape, and card devices.

VSE/ESA (VSE/Enterprise Systems Architecture). The most advanced VSE system currently available.

VSE/ICCF (VSE/Interactive Computing and Control Facility). An IBM licensed program that serves as interface, on a time-slice basis, to authorized users of terminals linked to the system's processor.

VSE/ICCF library. A file composed of smaller files (libraries) including system and user data which can be accessed under the control of VSE/ICCF.

VSE/POWER. An IBM licensed program primarily used to spool input and output. The program's networking functions enable a VSE system to exchange files with or run jobs on another remote processor.

XCTL. CICS Transfer Program Control Command.

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