RxD2™

User Guide

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About This Book

This book describes the RxD2™ components:

- RxD2/LINK provides access to DB2 from REXX.
- RxD2/FlexTools provides DB2 administration and application development functions.

This book contains procedures for customizing and executing RxD2 in your chosen REXX environments where access to DB2 is desired. It covers general usage information and provides information on all major functions of the product. It also can be used when writing REXX execs using the extensions provided by RxD2/LINK.

This book is intended for database administrators (DBAs), DB2 application developers, and DB2 system programmers.

RxD2 must be installed as described in the Boole & Babbage *Product Installation and Maintenance Guide* and customized as described in "Installation" on page 1 of this User Guide.

How This Book Is Organized

This book is divided into five parts:

- Part 1, "Installation" on page 1 contains installation instructions.
- Part 2, "Using RxD2/LINK" on page 13 describes how to use the RxD2/LINK component.
- Part 3, "Using RxD2/FlexTools" on page 43 describes how to use the RxD2/FlexTools component.
- Part 4, "Appendix" on page 135 contains the Customer Support appendix.
- Part 5, "Index" on page 139 contains the index.

Conventions Used in This Book

The following symbols define command syntax and should never be typed:

- Brackets [ ] enclose optional parameters or keywords.
- Braces { } enclose a list of parameters; one must be chosen.
- A line | separates alternative options; one can be chosen.
- An underlined parameter is the default.
- An ITEM IN CAPITAL LETTERS must be entered exactly as shown.
- Items in lowercase letters are values that you supply.

Recommended Reading

The following books are recommended:

- *MVS/REXX User's Guide*, SC28-1882
- *MVS/REXX Reference*, SC28-1883
- *DB2 SQL Reference*, SC26-4380 or SC26-4890
- *MVS Principles of Operations*, SA22-7085
- Boole & Babbage *Product Installation and Maintenance Guide*, TD-2024
- *RxD2 User Guide*, TD-2110
- MainView for DB2 *New Release Information*, TD-2129
- MainView for DB2 *Master Index*, TD-2130
- *Getting Started with* MainView for DB2 *and RxD2*, TD-2095

RxD2 Library

The following books are included in the RxD2 library:

- The *Boole & Babbage Product Installation and Maintenance Guide* gives instructions for basic installation of the product libraries.
- The *RxD2 User Guide* describes the RxD2 product and provides further installation information.
- MainView for DB2 *New Release Information* summarizes the new features in the current release of MainView for DB2 and RxD2. This enables you to quickly see what's new.
- The MainView for DB2 *Master Index* includes index entries for all the product-specific books in the MainView for DB2 library. This index shows where you can find information for specific topics in individual MainView for DB2 and RxD2 manuals.
- *Getting Started with* MainView for DB2 *and RxD2* is an introduction for new users of these products. It helps you use these products to solve problems more effectively in a short time.

What Is In Release 2.1.0

This section discusses the changes to both the product and the book for Release 2.1.0.

Product Changes

The following enhancements are included in this release. Those documented since the last edition of this book are marked with revision bars (|).

Release 2.1 of RxD2 provides support for DB2 3.1, 4.1, and 5.1. DB2 Release 2.3 is no longer supported. RxD2 2.1 requires Release 4.1 or higher of MainView for DB2 for hyperlink support.

These enhancements are available as of October, 1997:

DB2 5.1 Support

- **Support for DB2 Version 5 Catalog Changes**

  All functions are updated to reflect changes to the DB2 catalog for DB2 5.1. Changed functions include

  – DDF Administration
  – Stored Procedure Administration
  – EXPLAIN PLAN_TABLE

Installation Improvements

- **Easier to Get Started**

  With PTF BPD1124, you no longer need to

  – Use IRXFUSER

  – Have the RxD2 load libraries in the TSO logon concatenation

    RXDPRIM now adds RXD21 load libraries to a new RXDLLIB allocation and to ISPLLIB LIBDEF.

  There is now a step in MainView for DB2 AutoCustomization for RxD2 installation.

These enhancements are available as of March, 1996:

DB2 4.1 Support

- **Complete DB2 Version 4 Exploitation**

  RxD2 now provides detailed reporting on the new features of DB2 4.1. This includes

  – A new Stored Procedures dialog
  – A new Table Check Constraints dialog accessed from the Table Administration panel
  – An enhanced EXPLAIN function
  – New columns added to many existing displays

Installation Improvements

- **Fewer Setup Steps for User Access**

  For access from MainView, no additional installation steps are necessary. AutoCustomization adds LIBDEF statements for ISPSLIB to TSCLIST or the MAINVIEW CLIST. Procedures to avoid modifying TSO logon procs are provided with previously documented PUT 9501 changes.

Remote DB2 Support

- **Access Any Remote DB2 Connected with DDF**

  Support for remote DDF locations is further enhanced. New fields are added to the Defaults panel and all selection panels to specify both the target location and catalog prefix of remote sites.

  This allows you to connect to and administer any remote DB2 connected by DDF. In addition to catalog browsing, all RxD2 functions except plan BIND functions and DB2 commands are now supported.

  Also, you can now hyperlink directly from MainView for DB2 to remote DB2s connected by DDF.

Sort Enhancements

- **Sorting Made Easier**

  Tabular displays can be sorted by any column by tabbing to the column header and pressing ENTER.

  In addition, these panels are enhanced to include selective column name SORTs:

  – EXPLAIN PLAN_TABLE
  – Show Table Space
  – Show Partitions
  – Show Index
  – Show Index Partitions

Additional EXPLAIN Options

- **Improved Access to EXPLAIN Data**

  From the DISPLAY PLAN/PACKAGE SQL panel, which displays the complete text for a selected SQL statement, you can now

  – EXPLAIN the SQL statement to a PLAN_TABLE
  – Display an existing PLAN_TABLE entry for the SQL statement
  – Execute the SQL statement, so you can test and change the SQL

  A new line command is available on the EXPLAIN PLAN_TABLE panel. You can now

  – Display detailed package information

  The display is reformatted to be easier to use.

Group Utility Generator

- **Generate Utility JCL for All Selected Resources**

You can now invoke the Group Utility Generator to create utility JCL for multiple resources from these panels:

– Show Table Space
– Show Partitions
– Show Index
– Show Index Partitions
– DB2 Storage Group Administration

PUT 9501 Changes

The following enhancements to RxD2 were first made available with PUT 9501 on Release 1.1.0:

- The Primary Option Menu is reorganized for ease of use.
- DB2 Packages are now supported. Option 2 on the Primary Option Menu takes you to a comprehensive package administration dialog and package information is included in the authorization dialogs.
- RxD2/FlexTools now supports many hyperlinks from MainView for DB2 3.1.0 to provide DB2 information related to the displays. This includes
  - EXPLAIN information for a currently executing SQL statement, either static or dynamic

    From the DUSER service, you can expand to RxD2 to EXPLAIN a currently executing SQL statement or display existing PLAN_TABLE data.
  - SQL text and EXPLAIN/execute options for static SQL captured in a trace

    You can expand from both the STRAC and DTRAC SQL Statement pop-ups to a display of the complete statement text for static SQL. From there, you can choose to EXPLAIN the statement, access existing EXPLAIN data in a PLAN_TABLE, or execute the statement.
  - Catalog information for selected object(s)

    You can quickly hyperlink to corresponding RxD2 catalog displays for the selected object(s) from DBTS, all DBIO displays, and the DTRAC EXPLAIN pop-up.
- New line commands are available on the DB2 Plan Administration panel. You can now
  - Perform plan BIND and REBIND functions
  - Display all collections used by a specified plan
- New line commands are available on the DB2 Tablespace and DB2 Tablepart Administration panels. You can now
  - Run the REORG utility with a COPY afterwards
  - DROP a selected tablespace
- A new line command is available on the DB2 Database Administration panel. You can now
  - CREATE a database
- The Defaults menu option has been enhanced to include
  - JCL options for jobcards
  - DB2 load library name

  used in the generated JCL.

  You also can now specify a default image copy media on the Defaults panel.
- Alternate or remote catalog access is now fully supported. The target catalog prefix can be specified in the Defaults menu option or on any selection menu. An alternate catalog can be used to reduce contention or limit privileges on the standard catalog. By specifying a location name in the prefix, the catalog of any remote DB2 connected by DDF can be accessed through the local DB2.

- You can now alter the authorization scope by changing the value in the new Current SQLID field when performing these tasks:

  – CREATE TABLE
  – CREATE DATABASE
  – GRANT privileges
  – REVOKE privileges
  – Execute SQL

  If this field is changed, the new SQLID must have sufficient authority to perform the task.

- You can specify an SQLID if you want to change the authorization ID and PLAN_TABLE designation when EXPLAINing an SQL statement.

- Procedures are documented so that it is no longer necessary to modify TSO logon procs when installing RxD2.

Book Changes

The following additions have been made to the documentation library for RxD2 Release 2.1:

- Master Index

  The Master Index for the entire MainView for DB2 library is updated. It now includes references to these books:

  – *MainView for DB2 User Guide*, Volumes 1, 2, and 3

  – *MainView for DB2 Customization Guide*

  – *MainView for DB2 Performance Reporter User Guide*

  – *RxD2 User Guide*

  – *Getting Started with MainView for DB2 and RxD2*

  – *Using MainView*

- New Release Information

  This document is updated to give you a quick overview of the new features of MainView for DB2, Release 5.1, and RxD2, Release 2.1.

- Getting Started

  Getting Started with MainView for DB2 and RxD2 provides updated tutorials that step you through many of the new features of MainView for DB2, RxD2, and the hyperlinks between them. It also provides scenarios to help you use the new windows-mode views to solve problems and maximize performance.

Note: Edition 1 of the *RxD2 User Guide*, which documented the changes to RxD2 1.1 through the PUT 9501 maintenance level, revised and replaced the following books in the RxD2 library:

- *RxD2/LINK User Guide and Reference*, TD-J1J1-0891
- *RxD2/FlexTools User Guide and Reference*, TD-J2J1-0891

Part 1. Installation

This part discusses customizing RxD2. Refer to the Boole & Babbage *Product Installation and Maintenance Guide* for instructions on installing product libraries.

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Customizing RxD2/LINK 3
Customizing RxD2/FlexTools 8

Chapter 2. Installation Verification 11
Verifying RxD2/LINK 11
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Chapter 1. Customization

You must first install the product libraries according to the instructions in the Boole & Babbage *Product Installation and Maintenance Guide*. RxD2/FlexTools with RxD2/LINK requires six product libraries:

BBCLIB Contains sample REXX execs.

BBLINK Contains the product load modules.

BBMLIB Contains the messages for **RxD2/FlexTools**.

BBPLIB Contains the product panels for **RxD2/FlexTools**.

BBSAMP Contains sample JCL, bind control statements, and DB2 DBRM members for the **RxD2/LINK** plan.

BBSLIB Contains the skeleton JCL for **RxD2/FlexTools**.

You must customize the LINK component first; then the FlexTools component. The sections in this chapter take you through these steps.

Note: You need to complete all the steps in this chapter that were not completed during AutoCustomization.

Customizing RxD2/LINK

Table 1 is a checklist for customizing RxD2/LINK.

Table 1. RxD2/LINK Customization Checklist

____	1.	Obtain system privileges; Step 1.
____	2.	Install RxD2/LINK into the REXX environment; Step 2 on page 4 (optional).
____	3.	Set up execution environments; Step 3 on page 5.
____	4.	Define RxD2/LINK to DB2 (BIND plan and packages); Step 4 on page 5.
____	5.	GRANT DB2 privileges; Step 5 on page 6.
____	6.	Tailor batch jobs; Step 6 on page 6.
____	7.	AutoOPERATOR considerations (optional); Step 7 on page 7.

1. **Step 1—Obtain System Privileges**

   - Obtain SYSADM privilege from your DB2 system administrator.
   - Obtain write access to SYS1.LINKLIB or to MLPALIB from your MVS systems programmer (optional).

2. **Step 2—Install into REXX Environment** (optional)

   After PTF BPD1124, the IRXFUSER function package is no longer required unless you are using some of the RxD2 special functions described in Chapter 6, “RxD2/LINK Special Functions” on page 33 within some of your private (non-RxD2) REXX execs. In that case, you can still avoid using IRXFUSER by including RXDPRIM RXDLLIB and ISPLLIB allocations as shown in Figure 1 on page 9. Simply using the distributed RXDPRIM exec and TSCLIST is sufficient for any RxD2 processing.

   If you do choose to perform this step, rather than using SYS1.LINKLIB for the following installation steps, a system MLPA data set may be used. It is mandatory that the RxD2 version of IRXFUSER be the first one located during TSO LOGON processing.

   RxD2/LINK distributes a REXX user function package as module IRXFUSER in BBLINK. You can use one of the following four methods:

   - Copy module IRXFUSER from BBLINK to SYS1.LINKLIB, replacing the dummy module of the same name (IRXFUSER) distributed with TSO/E. You can rename the dummy module first if you prefer.

     Note: This is the preferred method unless the IRXFUSER module is already used by another function.

   - Rename the module IRXFUSER in BBLINK to IRXFLOC and copy it to SYS1.LINKLIB, replacing the dummy module IRXFLOC.

     Note: Again, this is a simple method unless IRXFLOC is already used.

   Boole & Babbage recommends using SMP to replace the IRXFUSER module with a USERMOD to guard against regression when using SMP.

   - If both the IRXFUSER and IRXFLOC modules are already used, you can combine user function packages. Consult with your systems programmer to include the RxD2 definition into your existing IRXFUSER. See the “Directory of Function Packages” section in the *MVS/REXX Reference* book for further information.

     The sample definition for RxD2/LINK is in member IRXFPACK in BBSAMP.

   - Or, you can leave IRXFUSER in BBLINK and modify the JCL of every address space that uses RxD2/LINK (including the TSO LOGON PROC) to include BBLINK in the STEPLIB.

     Note: This approach requires that all libraries in the STEPLIB concatenation be APF-authorized, including BBLINK.

3. **Step 3—Set Up Execution Environments**

   RxD2/LINK can be used in any MVS environment where REXX is supported. This includes TSO/E (with or without ISPF), batch jobs, NetView, and AutoOPERATOR REXX execs executing in a BBI-SS PAS. In addition, a user in a MainView terminal session (TS) running under TSO/ISPF can access RxD2/FlexTools directly.

   The DB2 load library SDSNLOAD must be accessible in each of the address spaces where RxD2 is to be used. SDSNLOAD usually is already in LINKLIST, but, if not, it needs to be added to the TSO LOGON STEPLIB of every address space where RxD2 may be accessed.

   BBLINK must also be accessible in each of the address spaces where RxD2 is to be used. Do one of the following:

   - Add BBLINK to the system LINKLIST.

     Note: This approach does not require that BBLINK be APF authorized.

   - Add BBLINK to the STEPLIB of every address space where RxD2 may be accessed.

     Note: This approach does require that BBLINK be APF authorized.

   - Modify the distributed RXDPRIM exec and TSCLIST CLIST to do necessary BBLINK allocations.

     Note: This approach does not require that BBLINK be APF authorized.

   To prevent problems with scrolling within an RxD2 session, a special ISPF ISPKEYS member is provided to define PF keys for RxD2. PTF BPD0939 provides a sample source for ISPKYLST with PF7/8 set for UP and DOWN scrolling and a compiled version in ISPKEYS. Both are distributed in BBSAMP library. To install ISPKEYS, copy it to the ISPTLIB concatenation ahead of ISPF's default ISPKEYS or use the RXDTLIB allocation and ISPTLIB LIBDEF in RXDPRIM. (See Figure 1 on page 9.)

4. **Step 4—Define** RxD2/LINK **to DB2**

   BBSAMP members RXBIND1 and RXBIND2 contain the control statements for the DSN processor to bind the packages and plan for RXDB2. Replace the target DB2 in the DSN statement with the name of your target DB2 system.

   The member RXBINDJ in BBSAMP contains the JCL to run RXBINDn. Tailor the job to site standards and run when DB2 is up. This step must be done for each DB2 to be accessed by RxD2.

   Note: This job must be run again when maintenance is applied that changes any of the DBRMs (RXSEL1M-EM). Any such maintenance will have a HOLD FOR ACTION code requesting that the bind job be run.

5. **Step 5—GRANT DB2 Privileges**

   The member RXXIAD in BBSAMP contains the control statements to invoke the SQL processor (DSNTIAD). These control statements must be updated to reflect your DB2 target system. Replace the target DB2 in the DSN statement with the name of your target DB2 system.

   The member RXAUTHJ in BBSAMP uses RXXIAD to GRANT execution privileges to PUBLIC. Tailor the job to site standards and run when DB2 is up. This step must be done for each DB2 to be accessed by RxD2.

   GRANT DB2 privileges as necessary to user address spaces. If only the RxD2/FlexTools Application Functions are to be made available to a user, no further authorization may be required.

   DB2 Security

   RxD2 does not circumvent DB2 security already in place. A user of RxD2 has no further privileges than those previously GRANTed within the DB2 system. Standard DB2 authorization rules apply for SQL access and DB2 commands issued from RxD2.

   However, a user of RxD2 now has a simple method to access valuable DB2 functions that were previously too complex for other than experienced administrators. Users may perform functions for themselves that previously had to be done for them by others. These functions could require additional authorization; for example:

   - GRANT read access to catalog tables in the test system
   - GRANT update privileges to edit or drop user tables
   - GRANT SYSADM in the test system to allow full use of the RxD2/FlexTools catalog Resource Administration facilities.

6. **Step 6—Tailor Batch Jobs**

   Tailor the sample JCL in BBSAMP members RXBATSQL and RXBATCMD to site standards to enable you to run RxD2 in a batch environment. Include BBLINK and SDSNLOAD in the STEPLIB if necessary (see Step 3 on page 5).

7. **Step 7—AutoOPERATOR Considerations** (optional)

   If AutoOPERATOR is installed, the BBI-SS PAS must be GRANTed the privileges for the actions to be performed in AO REXX execs. For example, if the exec is to store or retrieve data from a DB2 table, the BBI-SS PAS must have been GRANTed the desired privileges on that table. The authorization ID of the BBI-SS PAS is determined by the access security system used, such as RACF and ACF2; for example:

   - If no such security is installed or in effect, the BBI-SS PAS subsystem ID is used as the authorization ID for the AutoOPERATOR execs.
   - If security is in effect and the BBI-SS PAS is run as a job, the USER= value on the job card is used.
   - If security is in effect and the BBI-SS PAS is run as a started task, the value specified in the security system's Started Procedure Table (or equivalent) is used. (For RACF, this table is named ICHRIN03.)

     If you are using the CA-TOP SECRET security system, issue the following commands to define the BBI-SS PAS ACID to CA-TOP SECRET. The ACID is the BBI-SS PAS AUTHID to DB2.

     ```
     TSS CREATE (X) FACILITY (STC) *NOPW* DEPT(ZZZ) (X=STARTED TASK NAME)
     TSS ADD(X) PROFILE(SYSOPR)                     (Y=STEP OR JOB NAME)
     TSS ADD(STC) PROC(Y) ACID(X)
     ```

Customizing RxD2/FlexTools

Table 2 is a checklist for customizing RxD2/FlexTools.

Table 2. RxD2/FlexTools Customization Checklist

____	1.	Make RxD2 accessible from TSO; Step 1.
____	2.	Tailor skeleton JCL members; Step 2 on page 10.
____	3.	Add RxD2/FlexTools to an ISPF menu; Step 3 on page 10.
____	4.	Install RxD2/FlexTools into the BBI environment; Step 4 on page 10.
____	5.	Set the default options; Step 5 on page 10.

1. **Step 1—Make RxD2 Accessible from TSO**

   Use one of the following methods to make RxD2 accessible from TSO:

   - Option 1: Modify TSO logon procedures

     Modify the TSO logon procedures for each user of RxD2/FlexTools to add the following libraries:

ddname	RxD2 low-level dsname
SYSPROC	BBCLIB
ISPPLIB	BBPLIB
ISPMLIB	BBMLIB
ISPSLIB	BBSLIB
ISPLLIB	BBLINK
ISPTLIB	BBSAMP

     Note: ISPTLIB is needed only if RxD2/LINK version of ISPKEYS is desired.

     Important

     If you plan to tailor the delivered dialogs or add your own, be sure to allocate your own user libraries and concatenate them in front of the RxD2/FlexTools target libraries for all four of these ddnames. ***Boole & Babbage does not support user modifications.***

   - Option 2: Use BBSAMP member, RXDPRIM, to invoke the RxD2 dialogs from ISPF

     Use of this sample REXX, shown in Figure 1 on page 9, eliminates the need to change the TSO logon procedures for RxD2. You need to

     a. Customize the product library names in RXDPRIM.

     b. Move the customized RXDPRIM to a library in the SYSPROC concatenation.

```
/* REXX - RMID = BPDxxxx ---------------------------------------*/
/* RXDPRIM                                                      */
/* BPD1124 - Adds RXDLLIB/ISPLLIB statements.                   */
/* BPDxxxx - Adds RXDTLIB/ISPTLIB statements for ISPKEYS.       */
/* Sample REXX to dynamically allocate the RxD2 libraries       */
/* and invoke the application.                                  */
/* To use this REXX as the normal method of entering RxD2:      */
/* 1. Customise the library assignments for                     */
/*    RXDCLIB, RXDMLIB, RXDPLIB, RXDSLIB, and RXDLLIB           */
/* 2. Change the primary option panel to                        */
/*   R, 'CMD(%RXDPRIM) NEWAPPL(RXD)'.                           */
/* 3. Remove any RxD2 libraries from TSO logon procs.           */
/* 4. ENSURE THAT THIS REXX IS IN THE SYSPROC CONCATENATION.    */
/*--------------------------------------------------------------*/

TRACE 0
/*    CHANGE THE FOLLOWING LIBRARY NAMES TO SUIT   */
RXDCLIB = "'RXD21.BBCLIB'"  /*<=== Change to your BBCLIB */
RXDMLIB = "'RXD21.BBMLIB'"  /*<=== Change to your BBMLIB */
RXDPLIB = "'RXD21.BBPLIB'"  /*<=== Change to your BBPLIB */
RXDSLIB = "'RXD21.BBSLIB'"  /*<=== Change to your BBSLIB */
RXDTLIB = "'RXD21.BBSAMP'"  /*<=== Change to your BBTLIB */
RXDLLIB = "'RXD21.BBLINK'"  /*<=== Change to your BBLINK */

"ALLOC F(RXDCLIST) DA("RXDCLIB") SHR REUSE"
"ALLOC F(RXDMLIB) DA("RXDMLIB") SHR REUSE"
"ALLOC F(RXDSLIB) DA("RXDSLIB") SHR REUSE"
"ALLOC F(RXDPLIB) DA("RXDPLIB") SHR REUSE"
"ALLOC F(RXDTLIB) DA("RXDTLIB") SHR REUSE"
"ALLOC F(RXDLLIB) DA("RXDLLIB") SHR REUSE"

"ALTLIB ACTIVATE APPL(CLIST) DD(RXDCLIST)"

ADDRESS ISPEXEC
  "LIBDEF ISPPLIB LIBRARY ID(RXDPLIB)"
  "LIBDEF ISPMLIB LIBRARY ID(RXDMLIB)"
  "LIBDEF ISPSLIB LIBRARY ID(RXDSLIB)"
  "LIBDEF ISPTLIB LIBRARY ID(RXDTLIB)"
  "LIBDEF ISPLLIB LIBRARY ID(RXDLLIB)"

ADDRESS ISPEXEC
  "SELECT PANEL(RPD@PRIM)"
ADDRESS ISPEXEC
  "LIBDEF ISPPLIB"
  "LIBDEF ISPMLIB"
  "LIBDEF ISPSLIB"
  "LIBDEF ISPTLIB"
  "LIBDEF ISPLLIB"

ADDRESS TSO
"ALTLIB DEACT APPL(CLIST)"

EXIT
```

Figure 1. Sample Initialization REXX (RXDPRIM)

2. **Step 2—Tailor Skeleton JCL**

   RxD2/FlexTools can generate various utility jobs from the dialogs. The skeleton JCL is in BBSLIB and includes all members prefixed with RJ. Tailor each member to installation standards where necessary.

3. **Step 3—Add** RxD2/FlexTools **to an ISPF Menu**

   Add the RxD2/FlexTools option to an ISPF menu to make it accessible to your users. If you want to add it to the ISPF/PDF Primary Option Menu, it is normally named ISR@PRIM.

   a. Define the chosen option and descriptive text in the display portion; for example:

      ```
      R RxD2 - RxD2/FlexTools for DB2
      ```

   b. Insert one of the following lines into the translate statement in the procedure section:

      - If the TSO logon procedures were modified (Step 1, Option 1):

        ```
        R, 'PANEL(RPD@PRIM) NEWAPPL(RXD)'
        ```

        where `R` is the chosen option character.

      - If RXDPRIM was used (Step 1, Option 2):

        ```
        R, 'CMD(%RXDPRIM) NEWAPPL(RXD)'
        ```

        where `R` is the chosen option character.

4. **Step 4—Install** RxD2 **into BBI**

   This step provides access to RxD2 from MainView for DB2 and the other products in the BBI-SS PAS. DB2 authorization is required for access to DB2 resources through RxD2.

   If RxD2 is in different SMP zones than the BBI products, you must make sure all the RxD2 members in BBCLIB, BBPLIB, BBMLIB, and BBSLIB are accessible in the MAINVIEW CLIST. (Copy the members to the BBI data sets or concatenate the libraries.)

5. **Step 5—Set the Default Options**

   The first time you use RxD2/FlexTools, select Option D to set the default values for the target, location, and jobcard.

Chapter 2. Installation Verification

First verify the installation of the LINK component; then verify the FlexTools installation. This chapter takes you through these steps.

Verifying RxD2/LINK

There are three samples that can be executed after customization is complete to verify that all necessary steps have successfully installed the RxD2 environment. These steps require DB2 privileges for the IBM-supplied DB2 Installation Verification Procedure (IVP) tables and DISPLAY command authority. You may need to change some data set names, DB2 table names, and the DB2 SSID in the samples before executing them.

To verify the installation of RxD2/LINK:

1. Execute the sample exec RXIVP (from BBCLIB) from a TSO session with a logon procedure customized for RxD2; for example:

   ```
   ex 'prefix.BBCLIB(RXIVP)'
   ```

   A dialog starts that allows execution of the DB2 IVP functions.

2. Submit the customized sample batch job RXBATCMD in BBSAMP to issue the command:

   ```
   -DIS THD(*)
   ```

   Check that the output from the command is in SYSTSPRT.

3. Submit the customized sample batch job RXBATSQL in BBSAMP to execute an SQL statement.

   Check that the SQL output is in SYSTSPRT.

Note: For Steps 2 and 3, ensure that the PARM specifies an active DB2 subsystem.

Verifying RxD2/FlexTools

To verify that all installation and customization steps have been successfully completed for the ISPF interface:

1. Log on to the customized TSO session and invoke the RxD2/FlexTools option from the ISPF panel to which it was added.

   You need SYSADM authority to access the catalog to test the Resource Administration functions of the Primary Option Menu.

2. If this is the first time you have accessed RxD2/FlexTools, select Option D to set the default options.

3. Select Option 1, Plan Administration, from the Primary Option Menu.

   a. Type a qualifier, such as D*, in the PLAN field to select a list of plans.

   b. Choose a plan from the list and execute one or more of the line commands.

4. In ISPF/Edit, edit a data set or member that contains one or more SQL statements.

   a. Use the EXPL command to EXPLAIN a statement pointed to by the cursor and browse the output.

      Note: A PLAN_TABLE must already exist in the DB2 tables for this user ID before the EXPL command can be executed. Change the current SQLID, if necessary.

   b. Use the TEX command to execute a statement pointed to by the cursor and browse the output.

5. (optional) If you have any BBI product installed, test RxD2/FlexTools access from BBI.

   a. Exit from RxD2/FlexTools to ISPF.

   b. Execute the MAINVIEW CLIST to invoke your terminal session, from Option 6 on the ISPF Primary Option Menu.

   c. If you have added RxD2/FlexTools to the MainView for DB2 menu, type RX on the COMMAND line to present the RxD2/FlexTools Primary Option Menu and execute a few options.

   d. Press PF3 from the RxD2/FlexTools Primary Option Menu to return to the terminal session.

   e. Access the DUSER service and select the EXPLAIN hyperlink button. This presents RxD2/FlexTools EXPLAIN dialogs.

   f. Access the DBTS display, type parameters to select a particular table space, and then select the hyperlink CATALOG. This presents a panel in RxD2/FlexTools showing the selected table space.

Part 2. Using RxD2/LINK

This part discusses how to use the RxD2/LINK component.

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Chapter 3. Introduction to RxD2/LINK

RxD2/LINK is a REXX/DB2 interface. Using standard SQL statements and syntax, you can write a REXX EXEC issuing the ADDRESS DB2 command to access and manipulate DB2 data. Results are placed in REXX variables.

More specifically, the product creates a Host Command Environment (HCE) in REXX to facilitate the access of DB2 data using dynamic SQL and DB2 commands. The DB2 data is returned in REXX variables, where it can be processed with the full capabilities of the REXX language.

RxD2/LINK provides a simple interface in which

- The REXX EXEC can ADDRESS DB2 as it can ADDRESS MVS or ADDRESS ISPEXEC
- There is no precompile, compile, or link edit needed, and no DB2 plan to bind for the individual REXX EXECs
- The system requires only a single plan
- The SQL is executed dynamically
- There are no data dependencies on DB2 tables or views

  The interface, when invoked, dynamically determines and constructs the resulting data structure.
- All standard DB2 security applies

This interface is valid for all REXX execution environments. This includes TSO/ISPF, batch jobs, NetView, the Boole & Babbage product AutoOPERATOR, and so on.

Chapter 4. Getting Started with RxD2/LINK Facilities

This chapter provides an overview of how to use the RxD2/LINK facilities and REXX EXECs.

Using RxD2/LINK in Different Environments

The following sections describe how to use RxD2/LINK in different environments.

TSO/ISPF

ISPF dialogs can be developed quickly for any function requiring DB2 access; for example, application prototyping.

A sample is provided based on the DB2 Installation Verification Program (IVP). Member RXIVP in BBCLIB shows how to

- Select from a DB2 table
- Display data from an ISPF table
- Receive and process user input from a panel
- Do update processing

Batch Environment

RxD2/LINK can run in batch TSO, but, like REXX, it also can run in a batch job executing the standard IBM program IRXJCL.

The major benefit is that the REXX EXEC return code is returned to the JES initiator managing the JCL step return code, as opposed to batch TSO where the EXEC return code gets lost. See the IBM publication *MVS/REXX User Guide* for details on IRXJCL and the JCL specifications.

Figure 2 on page 21 is an example of how to write an EXEC to execute in batch, with the output displayed in line mode.

NetView

RxD2/LINK can be used in REXX EXECs running in NetView.

The common function EXEC RXSAMPEX in BBCLIB can be used in NetView to issue either SQL statements or DB2 commands, with the responses returned to the log.

AutoOPERATOR

RxD2/LINK can be used in AutoOPERATOR REXX EXECs. They execute in the BBI-SS PAS address space. There are no additional requirements beyond those described in the *MainView for DB2 Customization Guide*.

Security

RxD2 does not circumvent DB2 security already in place. A user of RxD2 has no further privileges than those previously GRANTed within the DB2 system. Standard DB2 authorization rules apply for SQL access and DB2 commands issued from RxD2.

However, a user of RxD2 now has a simple method to access valuable DB2 functions that were too complex to extend beyond experienced administrators. Users may perform functions for themselves that previously had to be done by others. These functions could require additional authorization; for example:

- GRANT read access to catalog tables in the test system
- GRANT update privileges to edit or drop user tables
- GRANT SYSADM in the test system to allow full use of the RxD2/FlexTools catalog Resource Administration facilities.

If only the RxD2/FlexTools Application Functions are to be made available to a user, no further authorization may be required.

REXX EXEC Capabilities

This section discusses REXX EXECs. It also describes how to issue dynamic SQL statements and DB2 commands. Refer to Chapter 5, “Language Reference” on page 23 for further details.

Enable RxD2/LINK Environment

To read a DB2 table or view, your REXX EXEC must first invoke the RxD2/LINK REXX function UENV (update environment) to enable the RxD2/LINK environment. The message OK is returned if the function is successful. REXX now knows what to do with the command ADDRESS DB2.

Connect to Local DB2

Your REXX EXEC then issues ADDRESS DB2 ‘SIGNON’ ssid to connect to the local DB2 system. RxD2/LINK turns on the FAILURE condition if the signon request does not complete successfully.

Connect to Remote DB2

After a successful signon to the local DB2 system, you can connect to a remote DB2 system by issuing the ADDRESS DB2 ‘CONNECT’ rloc command.

Dynamic SQL

Once your REXX EXEC is connected to the target DB2, you can ADDRESS DB2 followed by almost any dynamic SQL statement.

Cursors

For SQL SELECT, RxD2/LINK requires you to use cursors; for example:

1. You need to DECLARE RXCSR1 CURSOR FOR the SQL SELECT statement (no embedded host variables).
2. OPEN RXCSR1 and start to FETCH RXCSR1 repeatedly, until SQLCODE 100 (EOF) is returned.

   SQLCODE is a special REXX variable that is set by RxD2/LINK to reflect the SQL return code.

There are 14 cursors defined that can be used concurrently. They are RXCSR1 through RXCSRE. RXCSR1 defaults to DECLARE CURSOR WITH HOLD.

REXX Variables

After each successful FETCH, a series of REXX variables are set to reflect the row just fetched. The variable names are those of the table column names. For example, REXX variable LASTNAME will contain the data of column LASTNAME from the DSN8310.EMP table.

When a column name is not available (for example, from a column function), RxD2/LINK uses the cursor name as the stem variable, with the subscripts containing the returned column data in specified order. In other words, RXCSR1.1 has the data from the first column, RXCSR1.2 has the data from the second column, and so on. RXCSR1.0 has the number of RXCSR1. variables. In addition, whenever possible, RXCSR1.1.NAME has the name of the first column, RXCSR1.2.NAME has the name of the second column, and so on.

SIGNOFF

When you have completed your task, you should issue CLOSE RXCSR1 and SIGNOFF to disconnect from the target DB2. If this is not done explicitly in the EXEC, the connection is automatically broken at end of task. This, however, shows up as an abnormal EOT on SMF 101 DB2 accounting records.

When using other SQL statements, you must issue ADDRESS DB2 COMMIT to record the update(s) permanently. At implicit SIGNOFF time, all uncommitted updates are rolled back.

DB2 Commands

You can also issue DB2 commands using this interface, with the responses returned in REXX variables. These variables are named $DB2RESP.n. $DB2RESP.0 has the number of variables.

REXX Sample Statements

Refer to Figure 2 on page 21 for a sample REXX EXEC.

```
/* REXX - SO THAT TSO/E KNOWS                    */
/*********************************************/
/* SAMPLE USAGE                                  */
/* YOU MAY NEED TO MAKE CHANGES TO THIS EXEC:  */
/*   CHANGE RXD21.BBLINK TO YOUR LIBRARY       */
/*   CHANGE DSN8410 TO THE PROPER DB2 RELEASE  */
/*   CHANGE DB2A TO DB2 SSID                   */
/*********************************************/
TRACE O
SIGNAL ON FAILURE
$TGT = 'DB2A'
SELSTMT = 'SELECT * FROM DSN8410.EMP'

RXDLLIB = "'RXD21.BBLINK'"  /*<=== CHANGE TO YOUR BBLINK */
"ALLOC F(RXDLLIB) DA("RXDLLIB") SHR REUSE"
ADDRESS ISPEXEC "LIBDEF ISPLLIB LIBRARY ID(RXDLLIB)"
UENVRC = UENV(DB2)          /* TO ENABLE DB2 HCE */
ADDRESS ISPEXEC "LIBDEF ISPLLIB"
IF UENVRC  ^= "OK" THEN EXIT 32  /* PICK YOUR OWN RETURN CODE */

ADDRESS DB2 "SIGNON" $TGT       /* CONNECT TO TARGET DB2 */
ADDRESS DB2 "DECLARE RXCSR1 CURSOR FOR",
             SELSTMT
ADDRESS DB2 "OPEN RXCSR1"

DO WHILE SQLCODE = 0
   ADDRESS DB2 "FETCH RXCSR1"   /* GET A ROW */
   IF SQLCODE ^= 0 THEN ITERATE /* OK? */
   /*********************************************************/
   /* ALL REXX VARIABLES CORRESPONDING TO THE ROW ARE SET    */
   /*********************************************************/
   /* ANY REXX PROCESSING YOU WANT HERE, FOR EXAMPLE:        */
   SAY "EMPNO=" EMPNO "LASTNAME=" LASTNAME,
         "FIRSTNME=" FIRSTNME
   /*********************************************************/
   END /* WHILE SQLCODE = 0 */

ADDRESS DB2 "CLOSE RXCSR1"

/*****************/
/* WAY NOME      */
/*****************/
BYE:
ADDRESS DB2 "SIGNOFF"
EXIT

/*****************/
/* ERROR ROUTINE */
/*****************/
FAILURE:
SAY "RC=" RC "$RSN=" $RSN
SAY "$DB2RC=" $DB2RC "$DB2RSN=" $DB2RSN
IF DATATYPE(SQLEMSG.0) = 'NUM' THEN DO I = 1 TO SQLEMSG.0
   SAY "SQLEMSG."I "=" SQLEMSG.I
   END
SIGNAL BYE
```

Figure 2. Sample REXX Statements

Chapter 5. Language Reference

This chapter describes the REXX language extensions provided by RxD2/LINK and how to use them to execute SQL statements and issue DB2 commands. It also covers the limitations inherent in the supported environment and the variables and return codes used by RxD2/LINK.

Enabling REXX Host Command Environment (HCE) for RxD2/LINK

REXX is a language interpreter. When it sees a command for the host environment, it must know to whom to direct the command. This is achieved by the ADDRESS verb, which identifies the Host Command Environment (HCE) to receive the command.

For example, REXX issues ISPF commands to the ISPF HCE through ADDRESS ISPEXEC. RxD2/LINK conforms to standard REXX conventions by providing ADDRESS DB2 capabilities.

The UENV function is required to enable the ADDRESS DB2 command. The built-in UENV function causes control to be routed to the RXDB2 load module when ADDRESS DB2 is encountered. The DB2 HCE is not valid until the UENV function has been invoked.

Note: If you are not using IRXFUSER, you need to allocate RXDLLIB and do a LIBDEF as is done in BBSAMP member RXSAMP00.

Before you use ADDRESS DB2 for the first time in an EXEC, you must issue

```
X = UENV(DB2)
```

where `X` can be any REXX variable.

UENV ensures that an HCE called DB2 exists; otherwise it asks REXX to create one.

X is set to ‘OK’ if successful.

REXX rejects any ADDRESS DB2 with RC=-3 should you fail to enable the DB2 HCE.

Using ADDRESS DB2 Commands

The following sections discuss the use of the ADDRESS DB2 command.

SIGNON to DB2

You must establish a connection with the local DB2 to which you want to talk before you can issue any SQL statement or DB2 command. This is done by issuing the command

```
ADDRESS DB2 'SIGNON' ssid
```

where `ssid` is the local DB2 subsystem ID.

RxD2/LINK uses the Call Attach Facility (CAF) to connect the current task to the target DB2. REXX variable SYSDB2 is set to the target DB2 subsystem ID when this is completed successfully.

A REXX failure condition is raised if the connection request fails. See “Return Codes” on page 29 and “Diagnostic Variables” on page 30 for the diagnostic information provided.

An EXEC can be connected to only one DB2 system at a time. However, you can SIGNOFF from one DB2 and SIGNON to another DB2 within one EXEC. The REXX variable SYSDB2 is updated automatically at each change.

CONNECT to Remote DB2

If you want to access a remote DB2 system (connected to the local system with DDF), you can issue the command

```
ADDRESS DB2 'CONNECT' rloc
```

where `rloc` is the remote DB2 subsystem ID.

This command generates an SQL CONNECT statement to establish the environment. You can then perform any allowable function on the remote system.

SQL SELECT

Once the HCE is enabled and the connection to the target DB2 is made, you are free to use all the RxD2/LINK facilities.

RxD2/LINK uses the standard dynamic SQL interface, but, like other procedural languages, does require you to use a cursor to FETCH (read) the row(s). For example, you issue

```
ADDRESS DB2 'DECLARE RXCSR1 CURSOR FOR' selstmt
```

where `selstmt` is a REXX variable containing an SQL statement such as

```
SELECT * FROM DSN8410.EMP
```

You can then ADDRESS DB2 OPEN RXCSR1 and ADDRESS DB2 FETCH RXCSR1 repeatedly—most likely in a do-loop to read one row at a time. For each column in the row fetched, RxD2/LINK sets a REXX variable of the column name to contain the column data converted from DB2 internal format. For example, if column SALARY is defined as decimal(6,2), variable SALARY may contain data like 1235.67.

In addition, RxD2/LINK sets variable

RXCSR1.0 To contain the number of columns in the row fetched

RXCSR1.n To contain the column data of the nth column

RXCSR1.n.NAME To contain the name of the nth column, if possible

This is most useful for the derived columns such as AVG(salary) where a column name is not available.

Variable SQLCODE is set to the standard SQL return code; for example, SQLCODE=100 means no more rows. A failure condition is raised when the SQL statement is in error (SQLCODE<0). A series of diagnostic variables also is set. See “Return Codes” on page 29 and “Diagnostic Variables” on page 30 for details.

RxD2/LINK provides 14 cursors that can be used concurrently:

RXCSR1 through RXCSRE

However, RXCSR1 is the only cursor that supports the WHERE CURRENT OF and the CURSOR WITH HOLD clauses in an UPDATE or DELETE SQL statement.

Important

Remember that, like any other DB2 program, COMMIT destroys all active cursors. To establish the cursor position(s) again, you must DECLARE, OPEN, and FETCH them again.

SQL INSERT/UPDATE/DELETE

You can use the standard dynamic SQL statement syntax after ADDRESS DB2; for example:

```
ADDRESS DB2 “INSERT INTO ABC.TABLE (COL1,COL2) VALUES('ABC',123)”
```

Important

You must either issue ADDRESS DB2 COMMIT to make the changes permanent or issue ADDRESS DB2 SIGNOFF SYNC to COMMIT the changes and disconnect from DB2 at the same time. RxD2/LINK at implicit SIGNOFF time automatically rolls back any unCOMMITted updates.

Variable SQLCODE is set to the standard SQL return code; for example, SQLCODE=-911 means deadlock or lock timeout. A failure condition is raised when the SQL statement is in error (SQLCODE<0). A series of diagnostic variables also is set. See “Return Codes” on page 29 and “Diagnostic Variables” on page 30 for details.

Important

For UPDATE and DELETE, the WHERE CURRENT OF clause is supported by RXCSR1 only.

To use the WHERE CURRENT OF clause, you must use WHERE CURRENT OF RXCSR1, and that RXCSR1 must point to a row. To use any other cursor causes an SQL error condition.

Additionally, to use UPDATE...WHERE CURRENT OF RXCSR1, RXCSR1 must have been declared with the FOR UPDATE OF clause.

Other SQL Statements

All dynamic SQL statements are allowed after ADDRESS DB2, except the ones listed in “Limitations” on page 27. For example, you can ADDRESS DB2 GRANT ..., but you cannot ADDRESS DB2 WHENEVER .....

Important

You must either issue ADDRESS DB2 COMMIT to make the changes permanent or issue ADDRESS DB2 SIGNOFF SYNC to COMMIT the changes and disconnect from DB2 at the same time. RxD2/LINK at implicit SIGNOFF time automatically rolls back any unCOMMITted updates.

Variable SQLCODE is set to the standard SQL return code; for example, SQLCODE=-911 means deadlock or lock timeout. A failure condition is raised when the SQL statement is in error (SQLCODE<0). A series of diagnostic variables also is set. See “Return Codes” on page 29 and “Diagnostic Variables” on page 30 for details.

DB2 Commands

You can issue DB2 commands by issuing the ADDRESS DB2 COMMAND followed by the command itself; for example:

```
ADDRESS DB2 'COMMAND -DIS THD(*)'
```

As in SPUFI, the command recognition character must be a hyphen (-). The command is always directed to the connected target DB2 system.

The replies are returned in the $DB2RESP.n variables, with $DB2RESP.0 containing the number of the $DB2RESP.n variables. A failure condition is raised when the command does not complete successfully, and a series of diagnostic variables is set. See “Return Codes” on page 29 and “Diagnostic Variables” on page 30 for details.

SIGNOFF from DB2

You must ADDRESS DB2 SIGNOFF to disconnect from the target DB2 system. If this is not explicitly done, at End-Of-Task (EOT) of the current task, the connection is broken automatically. This, however, causes the SMF 101 DB2 accounting record to identify this transaction as Abnormal EOT, and all the uncommitted changes are rolled back.

Explicit SIGNOFF syntax is

```
ADDRESS DB2 'SIGNOFF' opt
```

where `opt` can be ABRT or SYNC.

ABRT is the default and will ROLLBACK all pending updates before disconnecting from DB2.

SYNC commits all pending updates before disconnecting from DB2.

Limitations

The following discusses limitations inherent in the supported environment.

Constraints on REXX

All the constraints on REXX are still applicable. For example, the name of a REXX variable cannot exceed 250 characters.

Constraints on Dynamic SQL

All the constraints on dynamic SQL are still applicable. For example, you cannot issue the following SQL verbs:

- DESCRIBE
- EXECUTE
- EXECUTE IMMEDIATE
- INCLUDE
- PREPARE
- WHENEVER

Queries with Cursor(s)

As a result of the RxD2/LINK processing technique, all queries must use the FETCH cursor interface, one row at a time. This means you must use the following in your SQL statement:

- DECLARE
- OPEN
- FETCH
- CLOSE

Other Unique Dynamic SQL Statement Constraints

RxD2/LINK does not support host variables; hence it does not support SELECT..INTO.

RxD2/LINK does not support the embedded Parameter Marker (represented by a question mark).

Finite Number of Concurrent Cursors

RxD2/LINK supports up to 14 concurrently opened cursors (RXCSR1 through RXCSRE).

When you DECLARE cursor, you must use one of the 14 cursor names.

CURSOR WITH HOLD

Only RXCSR1 supports the CURSOR WITH HOLD clause in an UPDATE or DELETE SQL statement.

WHERE CURRENT OF Clause in UPDATE or DELETE Statement

The only cursor that supports the WHERE CURRENT OF clause is RXCSR1. To use the WHERE CURRENT OF clause, you must

1. DECLARE RXCSR1...FOR UPDATE OF...
2. Open the cursor and use FETCH to get to the right row
3. Either DELETE...WHERE CURRENT OF RXCSR1 or UPDATE...WHERE CURRENT OF RXCSR1

Any other cursor name causes an SQL error. You must COMMIT to make the changes permanent.

BIND, REBIND, FREE, and DCLGEN Support

RxD2/LINK does not support BIND, REBIND, FREE, and DCLGEN because they are not supported in the Call Attach Facility environment. Currently, they must be invoked in the DSN processor environment.

Special Variables

Special variables are set by RxD2/LINK.

SYSDB2 Contains the target DB2 name (subsystem ID) after successful SIGNON. It is uninitialized (that is, SYSDB2 = 'SYSDB2') before the first SIGNON. It is null after SIGNOFF.

$DB2RESP. Stem variable for DB2 command responses. $DB2RESP.0 contains the number of $DB2RESP.n variables that were set to contain the responses. $DB2RESP.1 through $DB2RESP.n contains the actual command responses.

$XDC For internal use only. Debug control variable.

Return Codes

RC is a REXX special variable that is set to the codes listed in Table 3, depending on the severity of error and where the error occurred.

The failure and error conditions cause their respective REXX trap to spring; for example:

```
SIGNAL ON FAILURE
```

takes place when any failure RC is set. This can be used to gain control to display additional diagnostic information (see "Diagnostic Variables" on page 30).

RC=0 indicates that the specified command was executed successfully.

Table 3. Return Code Settings

RC	FAILURE	ERROR	WARN
RxD2/LINK	-13	9	1
DB2	-14	10	2
REXX	-15	11	3

Diagnostic Variables

Diagnostic variables are set by RxD2/LINK to provide additional information about error conditions.

In addition to the REXX special variable RC, RxD2/LINK sets the following diagnostic variables:

$RSN Contains the failure reason to complement RC in describing the error condition.

$DB2RC Return code from DB2 CAF (SIGNON and SIGNOFF) or IFI (COMMAND and READS).

$DB2RSN Reason code from DB2 CAF (SIGNON and SIGNOFF) or IFI (COMMAND and READS).

SQLCODE SQLCODE from SQLCA.

SQLERRD3 SQLERRD3 from SQLCA.

SQLWARN SQLWARN from SQLCA.

SQLERRM SQLERRM from SQLCA.

SQLEMSG. Stem variable for SQL error messages. These error messages, like the ones from SPUFI, describe the SQL error in detail.

SQLEMSG.0 contains the number of SQLEMSG.n variables, while SQLEMSG.1 through SQLEMSG.n contains the actual error message texts.

Reserved Variables

Reserved variables are used internally by RxD2/LINK.

Warning

Do not use the RxD2/LINK reserved variables. Unpredictable consequences may result if you alter their contents.

- RCTL
- $SQLCA
- $WQAL
- $WBUF
- $IFCA

Sharing the RxD2 Environment

If you have multiple REXX EXECs and want to share the RxD2 environment, you must make sure these two variables are available to the called REXX:

- SYSDB2
- RCTL

If the called REXX is an external routine, you must either pass the parameter in the call list or use the REXX PUSH and PULL instructions.

The example in Figure 3 uses the PUSH and PULL instructions to share the variables for an RxD2 application. It consists of a main routine that performs a sign-on to DB2 and then calls an external subroutine to access DB2. SYSDB2 and RCTL are PUSHed onto the stack in the main routine and then PULLed off in the subroutine. With this method, the original environment that was set up by the sign-on is shared across multiple REXX EXECs.

```
/*REXX - MAIN ROUTINE           */
PARSE ARG MAXLOOP
TRACE 0
SAY 'ENV(DB2) = ' UENV(DB2)
ADDRESS DB2 "SIGNON DB2F"
DO I = 1 TO  MAXLOOP
  PUSH SYSDB2                   /* PASS TO LOWER REXX */
  PUSH $R$CTL                   /* PASS TO LOWER REXX */
  CALL TEST2
  PARSE PULL $R$CTL             /* RETRIEVE SETTINGS  */
  PARSE PULL SYSDB2
  END  /* END OF DO LOOP      */
ADDRESS DB2 "SIGNOFF SYNC"
EXIT
/* REXX - CALLED ROUTINE */
TRACE 0
PARSE PULL $R$CTL
PARSE PULL SYSDB2
ADDRESS DB2 "DECLARE RXCSR1 CURSOR FOR",
        "SELECT CURRENT DATE, CURRENT TIME",
        "FROM SYSIBM.SYSPLAN",
        "WHERE NAME = 'RXDB2'"
ADDRESS DB2 "OPEN RXCSR1"
ADDRESS DB2 "FETCH RXCSR1"
SAY '====> ' RXCSR1.1 RXCSR1.2
ADDRESS DB2 "CLOSE RXCSR1"
PUSH SYSDB2
PUSH $R$CTL
RETURN
```

Figure 3. Sample Application Sharing the RxD2 Environment

Chapter 6. RxD2/LINK Special Functions

Several special functions are provided with RxD2/LINK that are required or useful when accessing DB2.

In REXX, you invoke a function by issuing

```
V1 = FUNC(ARG1,ARG2)
```

where `V1` is the variable into which the function FUNC places the result.

Table 4. Special Functions

Special Function	Description
CONVSTCK(tod)	Converts the 8-byte TOD clock into display format of YYYYDDD HHMMSSTH. Valid from 1/1/1988 onward. The 8-byte TOD format is such that bit 51 equals 1 microsecond (see the IBM publication *MVS Principles of Operations*). `TSTMP = 'A42AE3F94CE5BB31'X` `SAY "TIMESTAMP=" CONVSTCK(TSTMP)` **DEFAULT** None **RETURN** *value* if function completes successfully NOGO *reason* if function fails for the reason given
CTOD(tod)	Converts the 8-byte TOD clock time into display format of HHMMSSTH. The 8-byte TOD format is such that bit 51 equals 1 microsecond (see the IBM publication *MVS Principles of Operations*). `CPUT = '0000000160B79C00'X` `SAY "CPUT=" CTOD(CPUT)` **DEFAULT** None **RETURN** *value* if function completes successfully NOGO *reason* if function fails for the reason given
F2C(f)	Do a floating point conversion on variable f and return the floating point number in display format. `/* TEST F2C */` `A = '4498765432100000'X` `SAY "F2C=" F2C(A)` **DEFAULT** None **RETURN** *value* if function completes successfully NOGO if function fails

Table 4. Special Functions (Continued)

Special Function	Description
GBLVAR (GETV,varname) (SETV,varname) (DROP,varname) (UPDV,varname)	Create and manage the global variable environment. The global variable environment is created at first use. Subsequent environment shares the same environment. The environment is destroyed at the EOT of the task that created the environment. **GETV** Gets the global variable varname and places its content in the local variable varname. `SAY “TESTVAR=” TESTVAR` `SAY “GBLVAR(‘GETV’,’TESTVAR’)=” GBLVAR(‘GETV’,’TESTVAR’)` `SAY “TESTVAR=” TESTVAR` **SETV** Gets the local variable varname and creates a global variable varname. If the global variable varname already exists, it is not replaced. `TESTVAR= “TEST VARIABLE FOR TEST GBLVAR”` `SAY “GBLVAR(‘SETV’,’TESTVAR’)=” GBLVAR(‘SETV’,’TESTVAR’)` **DROP** Drops the global variable varname. **UPDV** Gets the local variable varname and updates the global variable varname. If the global variable varname does not exist, the function is treated like “SETV”. **DEFAULT** None **RETURN** OK if function completes successfully OK *warn* if function completes with a warning NOGO *reason* if function fails for the reason given
P2C(p)	Do an unpack on variable p and returns the packed decimal number in display format. `/* TEST P2C */` `A = ‘123456789C’X` `SAY “P2C=” P2C(A)` **DEFAULT** None **RETURN** *value* if function completes successfully NOGO if function fails

Table 4. Special Functions (Continued)

Special Function	Description
UENV(hcename,pgm)	Identify to REXX Host Command Environment (HCE) called hcename, such that pgm will receive control for ADDRESS hcename. The hcename currently is required to be DB2. `SK = UENV(DB2)` `IF SK ¬= "OK" THEN DO` `  SAY "UNABLE TO ENABLE RXDB2"` `  EXIT 16` `  END` **DEFAULT** hcename = DB2 pgm = RXDB2 **RETURN** OK if function completes successfully NOGO if function fails
VARSPF(varname)	A compound variable (AA.1) cannot be used in an ISPF dialog. Function VARSPF(AA.1) creates a new simple variable AA1 containing the same data as AA.1 so it can be used in an ISPF dialog. The function first compresses out the period(s) in the compound variable name and then ensures that the resulting variable name is no more than 8 characters long. `IF DATATYPE(SQLEMSG.0) = NUM THEN` `  DO I = 1 TO SQLEMSG.0` `  SQLEM.I = SPACE(SQLEMSG.I)` `  A = VARSPF("SQLEM."I)` `  END /* I LOOP */` **DEFAULT** None **RETURN** OK if function completes successfully NOGO if function fails TRUNCATED if function has to truncate the variable name
WAITSEC(n)	Wait n seconds before continuing to process. `DO I = 1 TO 5` `  A = WAITSEC(2) /* WAIT 2 SECONDS */` `  SAY "LOOP COUNT=" I "TIME=" TIME()` `  END` **DEFAULT** n = 5 (seconds) **RETURN** OK if function completes successfully NOGO if function fails

Chapter 7. Common Function EXECs

Several EXECs are delivered with RxD2/LINK to provide commonly used functions and reduce user coding. They are ready to use and can be invoked from any other EXEC.

Table 5. Common Function EXECs

Common Function EXECs	Description
RXBKLINE(mxlen,iline)	This EXEC truncates the character text in ILINE at a word boundary to a length no greater than MXLEN. This EXEC is useful in displaying a long SQL statement. If either argument is null, a null string is returned. `RXBKLINE(9,'This is an example') -> 'This is'` `RXBKLINE(9,'This too, is an example') -> 'This too,'` `RXBKLINE(72,'This is an example') -> 'This is an example'`
RXQCHAR(wname,wdata)	This EXEC builds a predicate for the character-type column WNAME from the string entered as a qualifier in WDATA. It is used to generate SQL predicates from user input specifying a selection qualifier for a column of a table. `RXQCHAR('NAME','DSN')  -> "NAME = 'DSN'"` `RXQCHAR('NAME','DSN*')  -> "NAME LIKE 'DSN%'"` `RXQCHAR('NAME','D+N')  -> "NAME LIKE 'D_N'"` `RXQCHAR('NAME','NULL')  -> "NAME IS NULL"` `RXQCHAR('NAME','^NULL')  -> "NAME IS NOT NULL"` `RXQCHAR('NAME',"^='DSN'")  -> "NAME ^= 'DSN'"` `RXQCHAR('NAME',"<'DSN'")  -> "NAME < 'DSN'"` `RXQCHAR('NAME',">'DSN'")  -> "NAME > 'DSN'"`
RXQNUM(wname,wdata)	This EXEC builds a predicate for the numeric-type column WNAME from the string entered as a qualifier in WDATA. It is used to generate SQL predicates from user input specifying a selection qualifier for a column of a table. `RXQNUM('NAME','123')  -> "NAME = '123'"` `RXQNUM('NAME','<123')  -> "NAME < '123'"` `RXQNUM('NAME','^=123')  -> "NAME ¬= '123'"`
RXSAMPEX	This is a sample EXEC to process SQL statements or DB2 commands and display the results in line mode. It does not require ISPF and therefore is usable in any address space; for example, batch jobs, NetView, or AutoOPERATOR EXECs. **Note:** The RXSAMPEX EXEC is invoked by the two sample batch jobs, RXBATSQL and RXBATCMD, that are distributed as members in BBSAMP.

Table 5. Common Function EXECs (Continued)

Common Function EXECs	Description
RXSETSQL	This EXEC constructs an SQL statement from the text pointed to by a cursor in an ISPF/PDF edit panel. ⋮ `SQL = RXSETSQL()` ⋮ `A = WORDPOS('INTO',SQL)`
RXVODS(wdsn)	This EXEC verifies that the data set name specified in WDSN is valid. It checks that the data set exists and that the data set is either sequential or a PDS with a member name specified. The EXEC is used to verify an output data set before the data set is used. `WMSG = RXVODS($VLSTDS)` `IF WMSG = 'OK' THEN DO` `"ALLOC DD(LCOUT) DA("$VLSTDS") SHR REUSE"` `IF RC = 0 THEN NOP` `ELSE WMSG = 'ALLOC ERROR' RC` `END /* WMSG = OK THEN */`

Chapter 8. Sample EXECs and Jobs

This chapter discusses the sample EXECs and sample jobs delivered with RxD2/LINK.

Sample EXECs

Two EXECs are delivered with RxD2/LINK in BBCLIB to provide samples of how to code your own EXECs. Both can be executed to verify correct installation of RxD2/LINK.

RXIVP This is a sample EXEC to process the phone book application provided with the DB2 IVP. It shows how to

- Select from a DB2 table
- Display data from an ISPF table
- Receive and process user input from a panel
- Do update processing

RXSAMP00 Figure 4 on page 40 is a sample EXEC to show how to write an EXEC to execute one SQL statement, a SELECT from the DB2 IVP table. The output is displayed in line mode.

Important

The IBM Installation Verification Procedure (IVP) for DB2 must be installed already for both the above sample EXECs.

```
/* REXX - SO THAT TSO/E KNOWS                    */
/************************************************/
/* SAMPLE USAGE                                 */
/* YOU MAY NEED TO MAKE CHANGES TO THIS EXEC:   */
/*   CHANGE RXD21.BBLINK TO YOUR LIBRARY        */
/*   CHANGE DSN8410 TO THE PROPER DB2 RELEASE   */
/*   CHANGE DB2A TO DB2 SSID                    */
/************************************************/
TRACE O
SIGNAL ON FAILURE
$TGT = 'DB2A'
SELSTMT = 'SELECT * FROM DSN8410.EMP'

RXDLLIB = "'RXD21.BBLINK'"  /*<=== CHANGE TO YOUR BBLINK */
"ALLOC F(RXDLLIB) DA("RXDLLIB") SHR REUSE"
ADDRESS ISPEXEC "LIBDEF ISPLLIB LIBRARY ID(RXDLLIB)"
UENVRC = UENV(DB2)          /* TO ENABLE DB2 HCE */
ADDRESS ISPEXEC "LIBDEF ISPLLIB"
IF UENVRC  ^= "OK" THEN EXIT 32  /* PICK YOUR OWN RETURN CODE */

ADDRESS DB2 "SIGNON" $TGT       /* CONNECT TO TARGET DB2 */
ADDRESS DB2 "DECLARE RXCSR1 CURSOR FOR",
             SELSTMT
ADDRESS DB2 "OPEN RXCSR1"

DO WHILE SQLCODE = 0
   ADDRESS DB2 "FETCH RXCSR1"   /* GET A ROW */
   IF SQLCODE ^= 0 THEN ITERATE /* OK? */
   /*********************************************************/
   /* ALL REXX VARIABLES CORRESPONDING TO THE ROW ARE SET    */
   /*********************************************************/
   /* ANY REXX PROCESSING YOU WANT HERE, FOR EXAMPLE:        */
   SAY "EMPNO=" EMPNO "LASTNAME=" LASTNAME,
         "FIRSTNME=" FIRSTNME
   /*********************************************************/
   END /* WHILE SQLCODE = 0 */

ADDRESS DB2 "CLOSE RXCSR1"

/*****************/
/* WAY NOME      */
/*****************/
BYE:
ADDRESS DB2 "SIGNOFF"
EXIT

/*****************/
/* ERROR ROUTINE */
/*****************/
FAILURE:
SAY "RC=" RC "$RSN=" $RSN
SAY "$DB2RC=" $DB2RC "$DB2RSN=" $DB2RSN
IF DATATYPE(SQLEMSG.0) = 'NUM' THEN DO I = 1 TO SQLEMSG.0
   SAY "SQLEMSG."I "=" SQLEMSG.I
   END
SIGNAL BYE
```

Figure 4. Sample REXX Statements (Repeated)

Sample Jobs

Two sample batch jobs are delivered with RxD2/LINK in BBSAMP to provide samples of how to set up batch jobs to execute SQL or DB2 commands. Both can be executed to verify correct installation of RxD2/LINK.

RXBATSQL This is a sample job to execute an SQL statement in a batch job. It invokes the sample EXEC RXSAMPEX.

RXBATCMD This is a sample job to execute a DB2 command in a batch job. It invokes the sample EXEC RXSAMPEX.

Part 3. Using RxD2/FlexTools

This part discusses how to use the RxD2/FlexTools component. It also discusses each of the options of RxD2/FlexTools Primary Option Menu.

Throughout this part references are made to certain types of panels. For a detailed description of the types of panels, refer to

- “Qualifier Panels” on page 49
- “List Panels” on page 52
- “Action Confirmation Panels” on page 49

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Chapter 9. Introduction to RxD2/FlexTools

RxD2/FlexTools is a comprehensive set of tools for DBAs, DB2 application developers, and DB2 system programmers. It is very flexible because it is built from REXX EXECs, ISPF dialogs, and the RxD2/LINK product that provides access to DB2 from REXX.

RxD2/FlexTools and RxD2/LINK together provide many integrated, ready-to-use utilities, plus the added flexibility of tailoring and adding your own dialogs.

RxD2/FlexTools Facilities

RxD2/FlexTools is comprehensive because it encompasses facilities such as

- Security administration
- Catalog facilities
- Table browse and edit
- Utility recommendations
- Utility generation
- DDLGEN
- SQL statement execution from a panel
- SQL statement execution from PDF edit
- Formatted, easy-to-read, EXPLAIN information from PLAN_TABLEs
- EXPLAIN from PDF edit
- Direct access to related plan, table, and index catalog information from the EXPLAIN data panels

RxD2/FlexTools Modes of Access

RxD2/FlexTools facilities can be accessed in three modes:

- RxD2/FlexTools dialogs that run as an ISPF application
- Functions accessible directly from PDF edit
- Direct access to specific RxD2/FlexTools facilities from MainView for DB2 or from other BBI products

Chapter 10. Getting Started with RxD2/FlexTools

The RxD2/FlexTools menu is a standard ISPF Primary Option Menu that can be customized to start from any ISPF selection menu. The menu contains three categories of facilities from which you can choose:

- DB2 Resource Administration

  This category contains the options used mainly by a DBA or systems programmer.

- DB2 Application Functions

  This category contains the options used by application programmers and users of DB2 services.

- General Facilities

  This category contains a DB2 command interface, a panel to update RxD2/FlexTools defaults, and the tutorial and exit options.

Other functions are available from ISPF/PDF Edit.

Each category contains its own facilities from which you can choose.

EXECs are written in a very self-contained fashion. Unlike SPUFI, the workbench connects to the target DB2 system for only as long as necessary.

Primary Option Menu

Figure 5 shows the RxD2/FlexTools Primary Option Menu.

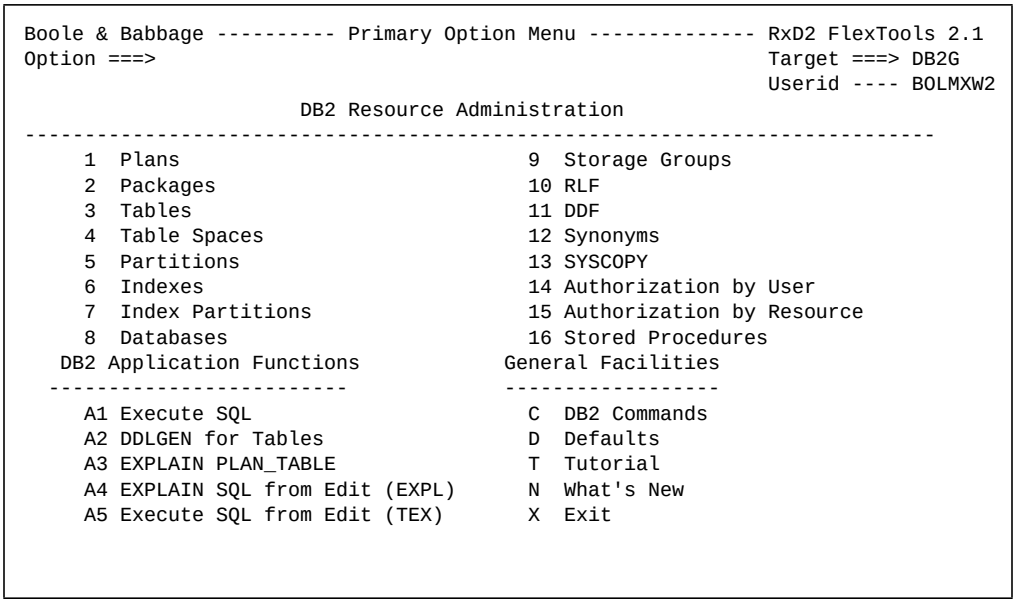


Figure 5. Primary Option Menu

Targets

The selection menus, in most cases, allow you to change the target DB2. This makes getting data from one DB2 system and transporting that data to another DB2 system very easy. Once you select a target DB2, subsequent panels display the selected target.

You can change the target DB2 on panels that have `TARGET` on the top right corner. Any DB2 on the local system can be selected. The last target for this session is saved in your profile and is primed for your next session. Once a target is selected, subsequent panels that do not allow a target change display that target with `TARGET -- xxxx`.

Remote Locations

RxD2/FlexTools provides the option to connect to and administer remote DDF locations with the LOCATION field, which can be found on most panels. You can change this field on any panel, but the change is effective only from a qualifying panel.

Note that plan BINDs, REBINDs, FREEs, and DB2 commands do not work for remote sites. This is a restriction of DB2.

Alternate Catalogs

Most of the RxD2/FlexTools panels also display the catalog prefix at the top of the screen. You can change the catalog prefix from any panel; however, the change becomes effective only from one of the selection menus where you qualify the data you want to display.

The default catalog prefix is SYSIBM. A different prefix can be specified to access an alternate catalog to reduce contention or limit privileges on the standard catalog. The prefix can be specified on a panel as described above, or set in the Defaults menu option. By specifying location name, the catalog of a remote DB2 connected by DDF can be interrogated through the local DB2, but not changed. To update a remote catalog, use the LOCATION parameter to connect to it.

Setting Defaults

The first time you use RxD2/FlexTools, select Option D to set the default values for the target, location, and jobcard (see "Defaults" on page 133).

Note: If you have problems with PF key functions, such as scrolling, see the note on page 52.

DB2 Resource Administration

The DB2 Resource Administration category of the RxD2/FlexTools Primary Option Menu contains the services used mainly by a DBA or systems programmer. Fields on the panels represent DB2 catalog table columns. Some column names on the panels have been modified for clarity. Refer to "Appendix D" of the IBM publication, *DB2 SQL Reference*, for descriptions of the columns.

This category is discussed in detail in Chapter 12, "DB2 Resource Administration" on page 63.

Action Confirmation Panels

The DB2 Resource Administration dialogs provide both catalog browse facilities and actions to be performed, such as to FREE a plan or to GRANT authorization. Both browse and actions are available only to those users with the corresponding DB2 privileges. In general, no action is performed without first requesting positive confirmation.

When selecting an action, such as to FREE a plan, a panel primed with specific information regarding the FREEing of the plan is displayed. This panel is referred to as an action confirmation panel. Some action confirmation panels list more options you can specify. In all action confirmation panels, you press ENTER and a confirmation message is displayed. Press ENTER again to confirm the action. Press END to cancel the action and return to the panel where you initially requested the action.

Qualifier Panels

Each of the services, Option 1 through 15, begins with a panel where you can qualify the particular data you want to display.

Figure 6 on page 50 shows a sample DB2 Plan Administration qualifier panel.

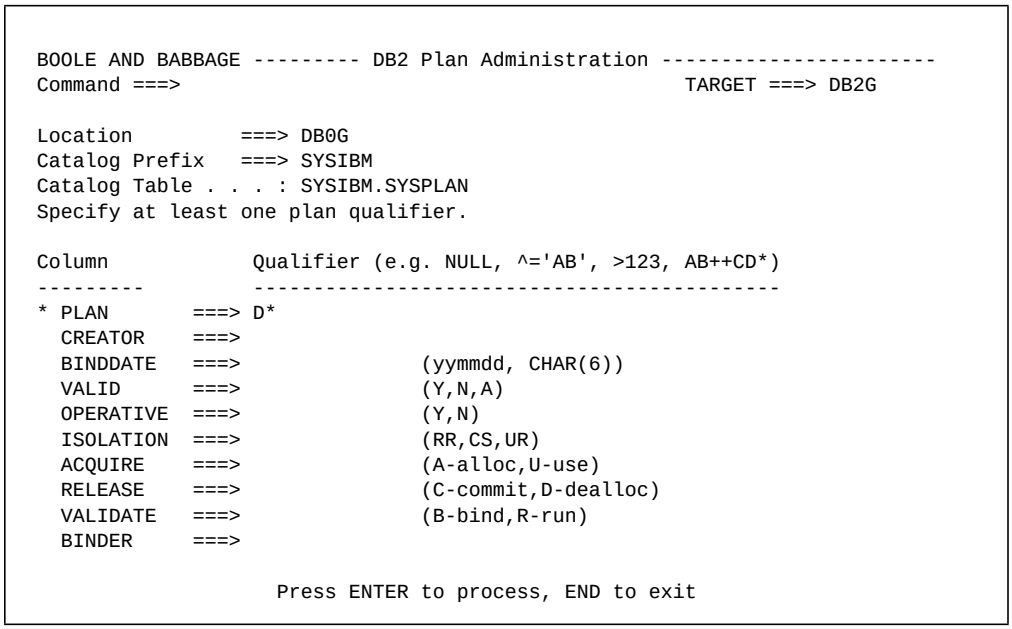


Figure 6. Sample Qualifier Panel

To select DB2 plans, specify one or more qualifiers to select the plans to be displayed; for example:

```
PLAN ==> D*
```

where `D*` means to display all plans starting with D. This generates the SQL predicate; for example:

```
WHERE NAME LIKE ‘D%’
```

Important

The preferred qualifiers are the first key columns because they provide the most efficient access path. They are prefixed by an asterisk (*).

You can use wild cards (plus (+) or underscore (_)) or generic characters (asterisk (*) or percent (%)) in the qualifiers for non-numeric fields.

The following examples show field qualifiers and the resulting SQL WHERE CLAUSE for non-numeric columns:

Field Qualifier field	**SQL WHERE CLAUSE column name**
ABC	=‘ABC’
A*	LIKE ‘A%’
A+C	LIKE ‘A_C’
NULL	IS NULL
¬NULL	IS NOT NULL
¬=‘AB’	¬=‘AB’
>‘AB’	>‘AB’

The following examples show field qualifiers and the resulting SQL WHERE CLAUSE for numeric columns:

Field Qualifier field	**SQL WHERE CLAUSE column name**
123	=123
<1	<1
¬=1	¬=1

Important

NULL is a reserved word.

Qualifiers for multiple fields are ANDed.

List Panels

Once your qualifiers are typed and you press ENTER, a panel displays a list of the items you selected.

You can

- Choose to get more detail using the primary or line commands from the presented list
- Sort the list by any column by tabbing to the column header and pressing ENTER

When scrollable lists are displayed, scrolling follows ISPF standards.

Note: If your program function keys do not work correctly (notably scroll UP and DOWN), it probably means that keylists are enabled for ISPF and the default keylist (ISPKYLST) does not have the correct settings.

Type the KEYLIST command to see the currently active keylist. If one is active:

1. Select the active keylist.
2. Select `EDIT` from the Functions pull-down menu.
3. Change the settings, as required.

Or, you can disable keylists from ISPF Option 0.

If keylists are not enabled, use the KEYS command to change the global PF key settings.

Figure 7 on page 53 shows a sample DB2 Plan Administration list panel.

```
Boole & Babbage ----------- DB2 Plan Administration ------- Row 13 to 33 of 33
Command ===>                                              SCROLL ===> CSR
                                                          TARGET ---- DB0G
Location         ===> DB2G
Catalog Prefix   ===> SYSIBM

COMMANDS: SORT (column no.)
LC CMDS:  A (plan authorization)        F (free plan)
          B (bind plan functions)       P (show plan detail)
          C (list plan collections)     R (rebind plan)
          D (show plan dependencies)    S (show DBRMs and SQL statements)

            -STATUS--                    ---- BIND ----- ---- BIND OPTIONS ----
LC PLANNAME VALD OPER CREATOR  BOUND BY  DATE    TIME   ISOL VALD ACQ   REL
-- -------- ---- ---- -------- -------- ------ -------- ---- ---- ----- ------
   DSNSTO1  Y    Y    BOLSMR2  BOLSMR2  950817 15353898 CS   DFER USE   COMMIT
   DSNSTO2  Y    Y    BOLSMR2  BOLSMR2  950817 15324173 CS   DFER USE   COMMIT
   DSNSTO6  Y    Y    BOLSMR4  BOLSMR4  950831 09434915 CS   DFER USE   COMMIT
   DSNSTO7  Y    Y    BOLSMR4  BOLSMR4  950831 10183058 CS   DFER USE   COMMIT
   DSNSTO8  Y    Y    BOLSMR2  BOLSMR2  950905 09462713 CS   DFER USE   COMMIT
   DSNTEP41 Y    Y    BOLSMR4  BOLSMR4  950807 18242478 CS   DFER USE   COMMIT
   DSNTIA41 Y    Y    BOLBPL1  BOLBPL1  950725 02061189 CS   DFER USE   COMMIT
   DSNTIB41 Y    Y    BOLSMR2  BOLSMR2  950726 17110707 CS   DFER USE   COMMIT
   DSN8BD41 N    Y    BOLSMR2  BOLSMR2  950726 17374587 CS   DFER USE   COMMIT
   DSN8BF41 N    Y    BOLSMR2  BOLSMR2  950726 17444533 CS   DFER USE   COMMIT
   DSN8BH41 N    Y    BOLSMR2  BOLSMR2  950726 17275293 CS   DFER USE   COMMIT
   DSN8BP41 N    Y    BOLSMR2  BOLSMR2  950726 17505183 CS   DFER USE   COMMIT
   DSN8CC0  Y    Y    BOLSMR4  BOLSMR4  950728 16251537 CS   DFER USE   COMMIT
   DSN8EP   Y    Y    BOLSMR2  BOLSMR2  950816 14013855 CS   DFER USE   COMMIT
   DSN8HC41 Y    Y    BOLSMR2  BOLSMR2  950726 18015165 CS   DFER USE   COMMIT
   DSN8SC41 N    Y    BOLSMR2  BOLSMR2  950726 18011940 CS   DFER USE   COMMIT
   DSN8SMR  Y    Y    BOLSMR2  BOLSMR2  950815 14495245 CS   DFER USE   COMMIT
   DSN8SP41 N    Y    BOLSMR2  BOLSMR2  950726 18151503 CS   DFER USE   COMMIT
   JXREPT   Y    Y    BOLCJN3  BOLCJN3  950823 11360710 CS   DFER USE   COMMIT
   RXDB2    Y    Y    BOLMXW3  BOLMXW3  950822 06492010 CS   DFER USE   COMMIT
   SMRTIA31 Y    Y    BOLSMR4  BOLSMR4  950802 19510580 CS   DFER USE   COMMIT
****************************** Bottom of data ********************************
```

Figure 7. Sample List Panel

Primary Commands

Primary commands provide functions such as SORT by column number or COMMIT all changes since the last commit. Each panel lists the primary commands available for that panel.

Line Commands

Line commands provide functions that are associated with one selected line item on the panel, such as BIND plan, or request further detail for the selected object.

You can type line commands on more than one line. The commands are processed in the sequence in which they are typed.

Utility Recommendations and JCL Generation

Several Resource Administration list panels display recommendations that DB2 utilities should be run and provide line commands to generate the JCL. The JCL can be submitted immediately or saved for later execution.

The recommendations are shown in Table 6. The thresholds are set to default values. You can change these values in the Defaults menu option.

Table 6. Utility Recommendations and JCL Generation

Object Type	Utility	Criteria for Recommendation
TABLESPACE	RUNSTATS CHECK	Active pages ¬> 0 Referential Integrity check pending
TABLEPART	RUNSTATS REORG	FARINDREF, NEARINDREF, PERCDROP = -1 FARINDREF, NEARINDREF, PERCDROP > threshold
INDEXPART	REORG	FARINDREF, NEARINDREF > threshold
STOGROUP	STOSPACE	K-BYTES = 0

The utility JCL shown in Table 7 can be generated.

Table 7. Utility JCL Generated

Object Type	Utility
TABLESPACE	REORG RUNSTATS IMAGE COPY CHECK DATA CHECK INDEX QUIESCE
TABLEPART	REORG RUNSTATS
INDEXPART	REORG RUNSTATS
INDEX	REORG RUNSTATS CHECK INDEX
STOGROUP	STOSPACE

DB2 Application Functions

The DB2 Application Functions category of the RxD2/FlexTools Primary Option Menu contains the services used by application programmers and users of DB2 services. This includes

- Typing the text and executing an SQL statement from a panel
- Browsing EXPLAIN information from PLAN_TABLEs in an easy-to-read format
- Generating DDL to move table definitions to another DB2

This category is discussed in detail in Chapter 13, “DB2 Application Functions” on page 119.

General Facilities

The General Facilities category of the RxD2/FlexTools Primary Option Menu contains a DB2 command interface, a panel to update RxD2/FlexTools defaults, and the tutorial and exit options.

This category is discussed in detail in Chapter 14, “General Facilities” on page 131.

Application Functions from ISPF/PDF Edit

RxD2/FlexTools also provides application functions that you can access from ISPF. While editing a source member that has embedded SQL, you can execute or EXPLAIN any SQL statement by placing the cursor on the first line of SQL text and typing one of the edit macros TEX or EXPL on the COMMAND line. You can modify the SQL statement and execute and EXPLAIN it again and again until you are satisfied with the result.

This category is discussed in detail in Chapter 13, “DB2 Application Functions” on page 119.

Security

The existing security mechanism in use at your site for REXX and DB2 applies to RxD2/FlexTools; for example, user A will not be able to read from table XYZ if the user was not authorized in the first place.

Using Help

An online help facility is available for this product. At any menu or panel, press PF1 and a help panel is displayed.

Making User Modifications

All user modifications to the delivered dialogs should be made in user libraries concatenated in front of the RxD2/FlexTools target libraries. This may include any or all of the following:

- BBCLIB (EXECs)
- BBPLIB (panels)
- BBMLIB (messages)
- BBSLIB (skeleton JCL)

Important

Boole & Babbage does not support user modifications.

Boole & Babbage maintenance is applied directly to the target libraries without HOLD statements. Therefore, if you put your modifications into the target libraries rather than your own, they could be overwritten and lost.

RxD2/FlexTools Naming Conventions

When modifying or adding functions to RxD2/FlexTools, it may be useful to understand Boole & Babbage naming conventions and adopt similar conventions to facilitate maintenance and error diagnostics.

Panels

All function panels in BBPLIB are prefixed with RP. All help and tutorial panels are prefixed with RH. You can use the ISPF primary command PANELID to determine the ID of a panel.

EXECs

EXECs in BBCLIB are prefixed with RX. In most cases, the suffix of the panel displayed by an EXEC matches the suffix of the EXEC. (However, some EXECs handle more than one panel.) For example:

RPPLAN00 Is the qualifier panel for the DB2 Plan Administration function.

RXPLAN00 Is the EXEC that manages the Plan function.

RHPLANxx Are the help panels for the Plan function.

Debugging Facilities

Since RxD2/FlexTools is built on REXX, the full REXX TRACE debugging facility is available. In the prolog of each EXEC, there is a TRACE O statement. You may choose to activate the TRACE facility for debugging purposes by changing the TRACE O to TRACE R.

TRACE R causes each REXX statement to be displayed before processing. This includes the ADDRESS DB2 statements as well. Boole & Babbage recommends that you follow the same convention in any EXEC you write or modify.

The other debug option can be activated by setting the debug option on the DEFAULTS panel (Option D of the Primary Option Menu) to YES. This causes most of the EXECs to display the SQL statements prior to execution.

Chapter 11. Accessing RxD2/FlexTools from BBI Products

The RxD2/FlexTools facility integrates with all MainView products that run in full-screen mode to provide quick access to information about DB2, but it is most closely integrated with MainView for DB2.

- When using the trace for application tuning in MainView for DB2, you can now see the DB2 catalog information on the tables and indexes being used by the application.
- Existing EXPLAIN data from PLAN_TABLEs is easily accessible, or a statement can be explained.
- When analyzing a performance problem for a DB2 application from MainView for DB2, MainView for IMS, or MainView for CICS, you also can access the catalog information for that PLAN and the accessed tables.
- Operational control is improved by providing additional status information accessible from AutoOPERATOR alerts or the Journal log display.

A terminal session, when running in ISPF, or running in VTAM or EXCP with MainView Alternate Access, provides direct access to RxD2/FlexTools.

If RxD2/FlexTools is accessed from MainView for DB2 and the current target is not the same as the default local target for RxD2, the location for the current target is used to connect to that system.

Hyperlinks from MainView for DB2

You can quickly hyperlink to corresponding RxD2 displays from many of the MainView for DB2 Analyzer and Trace services.

CATALOG Hyperlinks for DB2 Objects

From DBTS, all DBIO displays, and the DTRAC EXPLAIN pop-up display, you can expand to the corresponding RxD2 catalog displays for the selected object(s).

From DBTS and the DBIOx displays, a detailed list of databases, table spaces, or indexes is shown, using the current active selection parameters. Detailed catalog information is available per object from these lists. They provide access to table space or index partition specifications, as well as a LISTCAT option that displays space and volume information. (LISTCAT is valid only for local connections.)

From the DTRAC EXPLAIN pop-up display, the corresponding RxD2 catalog display for the table defined in the TABLE NAME column is shown. From the table display, you can access information on columns, indexes, keys, referential constraints, or plan dependencies.

Trace Hyperlinks for Static SQL

You also can expand from both the STRAC and DTRAC SQL Statement pop-up displays to a display of the complete statement text for static SQL.

From this panel, you can choose to

- EXPLAIN the text and access the RxD2 EXPLAIN display for the statement

  A qualifier panel is first displayed primed with the SQL text and query number 1. Your user ID is primed as the PLAN_TABLE owner. You can change these specifications before executing the EXPLAIN.

  Important

  If any host variables are in the statement, they are replaced by parameter markers (question marks) to make it EXPLAINable.

- Access existing EXPLAIN data in a PLAN_TABLE

  Your user ID is primed as the PLAN_TABLE owner. You can change it before making the request.

- Execute the statement

  You can specify the maximum number of fetches, whether to commit or rollback, and change the SQLID if necessary before execution.

  If any host variables are in the statement, they are replaced by question marks, and the text is presented on the Execute SQL panel to allow for tailoring into an executable format.

Current SQL Hyperlinks

From the DUSER service, you can expand to RxD2 to EXPLAIN a currently executing SQL statement or display existing PLAN_TABLE data.

These two EXPAND buttons are available at the top of the display:

EXPLAIN — Accesses RxD2 EXPLAIN for the current or last-executed dynamic or static SQL statement (displayed at the bottom of the base section).

A qualifier panel is first displayed primed with the SQL text and query number 1. Your user ID is primed as the PLAN_TABLE owner. You can change these specifications before executing the EXPLAIN.

PT — Accesses RxD2 PLAN_TABLE display of existing EXPLAIN data for the current or last-executed static SQL statement (displayed at the bottom of the base section).

A qualifier panel is first displayed primed with the query number (statement number) and program (DBRM or package). Your user ID is primed as the PLAN_TABLE owner. You can change this specification before proceeding to the actual EXPLAIN data.

Access from a Menu Option

If both MainView for DB2 and RxD2/FlexTools are installed, RxD2/FlexTools appears as an option on the MainView for DB2 Primary Option Menu. Choosing the RX option leads directly to the RxD2/FlexTools menu. Refer to Part 1, “Installation” on page 1.

Access from the Command Line

You can type RX on the COMMAND line followed by the subcommand and parameter(s) to invoke the RxD2/FlexTools services directly from any of the application panels of MainView for DB2 or any other MainView product when running in full-screen mode. The RX commands can be typed on the COMMAND line or in a SERV field. The following commands are available:

RX

To access the RxD2/FlexTools main menu.

RX PL [planname]

To show the details about the specified plan. If a plan name is not specified (on the command line or after prompting), the plan qualifier panel is displayed.

Note: This command is valid only for a local connection.

RX PT [planname] [owner]

To show EXPLAIN results for the specified plan from userid.PLAN_TABLE or owner.PLAN_TABLE. If a plan name is not specified (on the command line or after prompting), the qualifier panel is displayed.

The catalog data on the plan and the accessed tables and indexes are accessible directly from the EXPLAIN results panel.

Note: This command is valid only for a local connection.

RX TB [tablename|OBID]

To show the details about the specified table. If a table name or OBID is not specified (on the command line or after prompting), the table qualifier panel is displayed.

Note: This command is valid only for a local connection.

RX IX [indexname|OBID]

To show the details about the specified index. If an index name or OBID is not specified (on the command line or after prompting), the index qualifier panel is displayed.

Note: This command is valid only for a local connection.

Chapter 12. DB2 Resource Administration

This chapter discusses each of the options available in the DB2 Resource Administration category of the RxD2/FlexTools Primary Option Menu. Figure 8 is a sample of the RxD2/FlexTools Primary Option Menu.

```
Boole & Babbage ---------- Primary Option Menu -------------- RxD2 FlexTools 2.1
Option ===>                                                   Target ===> DB2G
                                                              Userid ---- BOLMXW2
                       DB2 Resource Administration
--------------------------------------------------------------------------------
     1  Plans                              9  Storage Groups
     2  Packages                           10 RLF
     3  Tables                             11 DDF
     4  Table Spaces                       12 Synonyms
     5  Partitions                         13 SYSCOPY
     6  Indexes                            14 Authorization by User
     7  Index Partitions                   15 Authorization by Resource
     8  Databases                          16 Stored Procedures
   DB2 Application Functions            General Facilities
  ------------------------              ------------------
     A1 Execute SQL                       C  DB2 Commands
     A2 DDLGEN for Tables                 D  Defaults
     A3 EXPLAIN PLAN_TABLE                T  Tutorial
     A4 EXPLAIN SQL from Edit (EXPL)      N  What's New
     A5 Execute SQL from Edit (TEX)       X  Exit
```

Figure 8. RxD2/FlexTools Primary Option Menu

DB2 Plan Administration

DB2 Plan Administration is accessed by selecting Option 1 from the Primary Option Menu. It produces a list of plans from the target catalog's SYSPLAN table. Figure 9 shows a sample DB2 Plan Administration qualifier panel.

```
Boole & Babbage --------- DB2 Plan Administration ------------------------
Command ===>                                              TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> SYSIBM
Catalog Table . . . : SYSIBM.SYSPLAN
Specify at least one plan qualifier.

Column            Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
---------         -------------------------------------------
* PLAN       ===> *
  CREATOR    ===>
  BINDDATE   ===>               (yymmdd, CHAR(6))
  VALID      ===>               (Y,N,A)
  OPERATIVE  ===>               (Y,N)
  ISOLATION  ===>               (RR,CS,UR)
  ACQUIRE    ===>               (A-alloc,U-use)
  RELEASE    ===>               (C-commit,D-dealloc)
  VALIDATE   ===>               (B-bind,R-run)
  BINDER     ===>

                    Press ENTER to process, END to exit
```

Figure 9. DB2 Plan Administration Qualifier Panel

Specify one or more qualifiers to select the plans to be displayed. Press ENTER. A scrollable list of plans and a set of column values from the target catalog's SYSPLAN table is displayed. Figure 10 on page 65 shows a sample list panel.

```
Boole & Babbage ----------- DB2 Plan Administration ------- Row 13 to 33 of 33
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB0G
Location         ===> DB2G
Catalog Prefix   ===> SYSIBM

COMMANDS: SORT (column no.)
LC CMDS:  A (plan authorization)        F (free plan)
          B (bind plan functions)       P (show plan detail)
          C (list plan collections)     R (rebind plan)
          D (show plan dependencies)    S (show DBRMs and SQL statements)

            -STATUS--                   ---- BIND ----- ---- BIND OPTIONS ----
LC PLANNAME VALD OPER CREATOR  BOUND BY  DATE    TIME   ISOL VALD ACQ   REL
-- -------- ---- ---- -------- -------- ------ -------- ---- ---- ----- ------
   DSNSTO1  Y    Y    BOLSMR2  BOLSMR2  950817 15353898 CS   DFER USE   COMMIT
   DSNSTO2  Y    Y    BOLSMR2  BOLSMR2  950817 15324173 CS   DFER USE   COMMIT
   DSNSTO6  Y    Y    BOLSMR4  BOLSMR4  950831 09434915 CS   DFER USE   COMMIT
   DSNSTO7  Y    Y    BOLSMR4  BOLSMR4  950831 10183058 CS   DFER USE   COMMIT
   DSNSTO8  Y    Y    BOLSMR2  BOLSMR2  950905 09462713 CS   DFER USE   COMMIT
   DSNTEP41 Y    Y    BOLSMR4  BOLSMR4  950807 18242478 CS   DFER USE   COMMIT
   DSNTIA41 Y    Y    BOLBPL1  BOLBPL1  950725 02061189 CS   DFER USE   COMMIT
   DSNTIB41 Y    Y    BOLSMR2  BOLSMR2  950726 17110707 CS   DFER USE   COMMIT
   DSN8BD41 N    Y    BOLSMR2  BOLSMR2  950726 17374587 CS   DFER USE   COMMIT
   DSN8BF41 N    Y    BOLSMR2  BOLSMR2  950726 17444533 CS   DFER USE   COMMIT
   DSN8BH41 N    Y    BOLSMR2  BOLSMR2  950726 17275293 CS   DFER USE   COMMIT
   DSN8BP41 N    Y    BOLSMR2  BOLSMR2  950726 17505183 CS   DFER USE   COMMIT
   DSN8CC0  Y    Y    BOLSMR4  BOLSMR4  950728 16251537 CS   DFER USE   COMMIT
   DSN8EP   Y    Y    BOLSMR2  BOLSMR2  950816 14013855 CS   DFER USE   COMMIT
   DSN8HC41 Y    Y    BOLSMR2  BOLSMR2  950726 18015165 CS   DFER USE   COMMIT
   DSN8SC41 N    Y    BOLSMR2  BOLSMR2  950726 18011940 CS   DFER USE   COMMIT
   DSN8SMR  Y    Y    BOLSMR2  BOLSMR2  950815 14495245 CS   DFER USE   COMMIT
   DSN8SP41 N    Y    BOLSMR2  BOLSMR2  950726 18151503 CS   DFER USE   COMMIT
   JXREPT   Y    Y    BOLCJN3  BOLCJN3  950823 11360710 CS   DFER USE   COMMIT
   RXDB2    Y    Y    BOLMXW3  BOLMXW3  950822 06492010 CS   DFER USE   COMMIT
   SMRTIA31 Y    Y    BOLSMR4  BOLSMR4  950802 19510580 CS   DFER USE   COMMIT
****************************** Bottom of data ********************************
```

Figure 10. DB2 Plan Administration List Panel

You can select a PLAN and choose other options to display expanded information about that plan from the presented list of plans.

You can use primary commands to

- SORT by the nth data column, where n=1 is PLANNAME

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Display plan authorization information—Option A

  Selecting this option displays a scrollable list of all AUTHIDs having EXECUTE and BIND privileges on the selected plan. A set of column values from the target catalog's SYSPLANAUTH table also is displayed. This leads you directly to the DB2 Authorization options. The Authorization options are further described in "DB2 Authorization by User" on page 109 and "DB2 Authorization by Resource" on page 111.

- BIND a plan—Option B

  Selecting this option causes a primed action confirmation panel to display to BIND this plan.

- Display collections for this plan—Option C

  Selecting this option displays a scrollable list of all collections used by the plan you selected and a set of column values from the target catalog's SYSPACKLIST table.

- Display plan dependencies—Option D

  Selecting this option displays a scrollable list of the dependencies for the plan you selected and a set of column values from the target catalog's SYSPLANDEP table. The plan is invalidated if any object is dropped or altered. The following types of objects may be shown:

  Alias
  Index
  Synonym
  Table
  Table Space
  View

- FREE a plan—Option F

  Selecting this option causes a primed action confirmation panel to display to FREE this plan. On the action confirmation panel, you specify the message level to be passed to the DSN Processor to define which messages are to be returned when the plan is FREEd.

- Display plan detail—Option P

  Selecting this option displays the detail for the selected plan; such as

  Owner of the plan
  Bound by user ID
  Plan size
  Status (valid / operative)
  BIND options

- Rebind a plan—Option R

  Selecting this option causes a primed action confirmation panel to display with detail about this plan. Specify the options for the rebind of this plan and the message levels.

- Display all Database Request Modules (DBRMs) and associated SQL statements—Option S

  Selecting this option displays a scrollable list of SQL statements within each DBRM of the selected plan. Only the first 61 bytes of the SQL statement are displayed. An option is then available to display the complete SQL statement text.

  From the display of the complete SQL statement text, you can then

  – EXPLAIN the SQL statement to a PLAN_TABLE. (The PLAN_TABLE must exist for the current SQLID.)

  – Display an existing PLAN_TABLE entry for the SQL statement. (The PLAN_TABLE must exist for the current SQLID.)

  – Execute the SQL statement.

    Note: This command allows you to test and change the SQL.

DB2 Package Administration

DB2 Package Administration is accessed by selecting Option 2 from the Primary Option Menu. It produces a list of packages from the target catalog's SYSPACKAGE table. Figure 11 shows a sample DB2 Package qualifier panel.

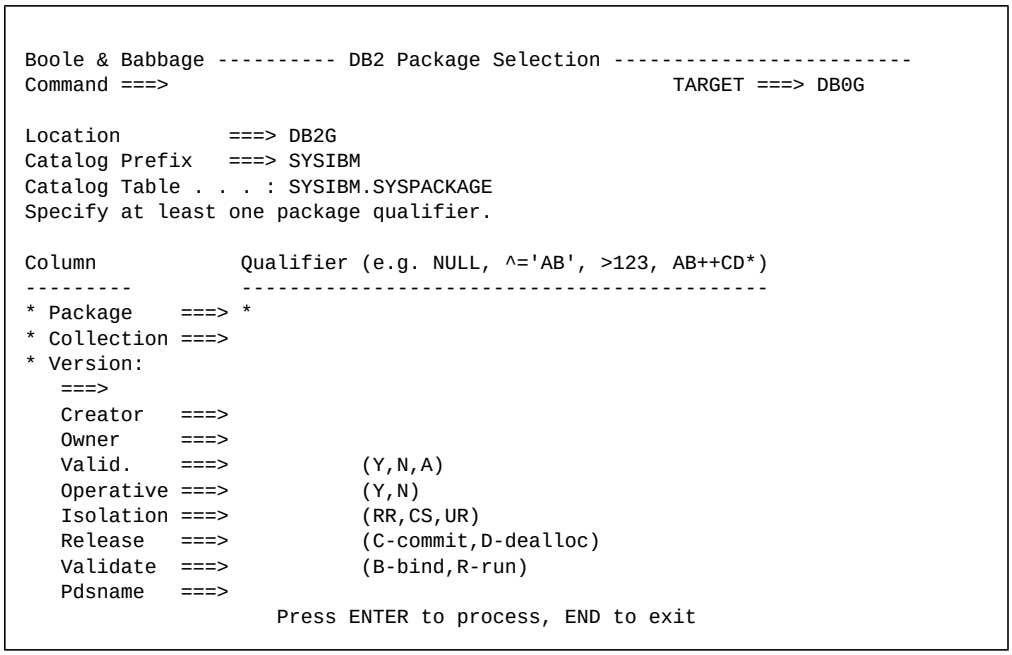


Figure 11. DB2 Package Qualifier Panel

Specify one or more qualifiers to select the packages to be displayed. Press ENTER. A scrollable list of packages and a set of column values from the target catalog's SYSPACKAGE table is displayed. Figure 12 on page 69 shows a sample list panel.

```
Boole & Babbage ------------- DB2 Package List-------------- Row 1 to 26 of 45
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB0G
Location         ===> DB2G
Catalog Prefix   ===> SYSIBM

Commands: SORT (column no.)             VERS (on/off)
LC CMDS:  A (package authorization)     F (free package)
          B (bind package functions)    L (list plans for collection)
          C (collection authorization)  P (package detail)
          D (package dependencies)      S (show SQL statements)

                                                                        STATUS
LC PACKAGE  COLLECTION         CREATOR OWNER    DATE BOUND           VLD OPR
-- -------- ------------------ ------- -------- ------------------- --- ---
   DSNCAL1  DSN8CAL1           BOLSMR2 BOLSMR2  1997-07-15-11.16.47  Y   Y
   DSNCAL2  DSN8CAL2           BOLSMR2 BOLSMR2  1997-07-15-11.29.51  Y   Y
   DSNCAL6  DSN8CAL6           BOLSMR4 BOLSMR4  1997-07-22-09.45.54  Y   Y
   DSNCAL7  DSN8CAL7           BOLSMR2 BOLSMR2  1997-09-07-09.48.47  Y   Y
   DSNESM68 DEMOPAK            BOLBPL3 BOLBPL3  1997-09-18-12.41.15  Y   Y
   DSNESM68 DSNESPCS           BOLBPL1 BOLBPL1  1997-06-21-18.12.08  Y   Y
   DSNESM68 DSNESPRR           BOLBPL1 BOLBPL1  1997-06-21-18.12.14  Y   Y
   DSNSTO1  DSNSTO1            BOLSMR4 BOLSMR4  1997-07-15-07.46.03  Y   Y
   DSNSTO1  DSN8STO1           BOLSMR2 BOLSMR2  1997-07-22-15.35.35  Y   Y
   DSNSTO2  DSN8STO2           BOLSMR2 BOLSMR2  1997-07-22-15.32.39  Y   Y
   DSNSTO6  DSN8STO6           BOLSMR4 BOLSMR4  1997-09-07-09.42.36  N   Y
   DSNSTO7  DSN8STO7           BOLSMR4 BOLSMR4  1997-09-07-10.18.29  N   Y
   DSNSTO8  DSN8STO8           BOLSMR2 BOLSMR2  1997-09-18-09.46.20  N   Y
   DSNTEP2  DSNTEP2            BOLSMR4 BOLSMR4  1997-07-15-10.24.24  Y   Y
   DSN8CC0  DSN8CC41           BOLSMR4 BOLSMR4  1997-06-21-08.24.55  Y   Y
   DSN8CC1  DSN8CC41           BOLSMR4 BOLSMR4  1997-06-21-08.24.58  Y   Y
   DSN8CC2  DSN8CC41           BOLSMR4 BOLSMR4  1997-06-21-08.25.00  Y   Y
   DSN8EP1  DSN8STOR           BOLSMR2 BOLSMR2  1997-07-15-14.01.36  Y   Y
   DSN8HC3  DSN8HC41           BOLSMR2 BOLSMR2  1997-06-21-10.01.46  N   Y
   RXCONM   RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.01  Y   Y
   RXSELAM  RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.05  Y   Y
   RXSELBM  RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.05  Y   Y
   RXSELCM  RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.05  Y   Y
   RXSELDM  RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.06  Y   Y
   RXSELEM  RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.06  Y   Y
   RXSELFM  RXD2               BOLMXW3 BOLMXW3  1997-09-19-06.49.07  Y   Y
```

Figure 12. DB2 Package List Panel

You can select a package and choose other options to display expanded information about that package from the presented list of packages.

You can use primary commands to

- SORT by the nth data column, where n=1 is PACKAGE

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- Toggle the version display for the selected packages—VERS

You can use line commands to

- Display package authorization information—Option A

  Selecting this option displays a scrollable list of all AUTHIDs having EXECUTE, BIND, and COPY privileges on the selected package. A set of column values from the target catalog's SYSPACKAUTH table also is displayed.

  This panel leads you directly to the DB2 Authorization options. The Authorization options are further described in "DB2 Authorization by User" on page 109 and "DB2 Authorization by Resource" on page 111.

- BIND a package—Option B

  Selecting this option causes a primed action confirmation panel to display to BIND this package.

- Display AUTHIDs having privileges on this package collection—Option C

  Selecting this option displays a scrollable list of all AUTHIDs having collection privileges on this package. The display is primed with data from the target catalog's SYSRESAUTH table.

- Display package dependencies—Option D

  Selecting this option displays a scrollable list of the dependencies for the package you selected and a set of column values from the target catalog's SYSPACKDEP table. The package is invalidated if any object is dropped or altered. The following types of objects may be shown:

  Alias
  Index
  Synonym
  Table
  Table Space
  View

- FREE a package—Option F

  Selecting this option causes a primed action confirmation panel to display to FREE this package. On the action confirmation panel, you specify the message level to be passed to the DSN Processor to define which messages are to be returned when the package is FREEd.

- Display plans that use this collection—Option L

  Selecting this option displays a scrollable list of all the plans that use the collection you selected. The display is primed with data from the target catalog's SYSPACKLIST table.

- Display package detail—Option P

  Selecting this option displays the detail for the selected package; such as

  Owner of the package
  Bound by user ID
  Package size
  Status (valid / operative)
  BIND options

- Display all associated SQL statements—Option S

  Selecting this option displays a scrollable list of SQL statements of the selected package.

DB2 Table Administration

DB2 Table Administration is accessed by selecting Option 3 from the Primary Option Menu. It produces a list of tables from the target catalog's SYSTABLES table. Figure 13 shows a sample DB2 Table Administration qualifier panel.

```
Boole & Babbage --------- DB2 Table Administration -----------------------
Command ===>                                            TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> SYSIBM
Catalog Table . . . : SYSIBM.SYSTABLES
Specify at least one table qualifier.

Column               Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
-------------        ------------------------------------------------------

* CREATOR       ===> *
  NAME          ===>
  TYPE          ===>        (TABLE,VIEW,ALIAS)
  DBID          --->
  OBID          --->
  DBNAME        ===>
  TSNAME        ===>
  COLUMNS       --->
  PRIME KEY COL --->
  EDITPROC      ===>
  VALIDPROC     ===>
  PARENTS       --->
  CHILDREN      --->
  ROWS          --->
  PAGES         --->
  TS PAGE%      --->
  AUDIT         ===>        (A-All,C-Change)
  LOCATION      ===>

                   Press ENTER to process, END to exit
```

Figure 13. DB2 Table Administration Qualifier Panel

Specify one or more qualifiers to select the tables to be displayed. Press ENTER. The list of tables is displayed. Figure 14 on page 72 shows a sample list panel.

```
Boole & Babbage ----------- DB2 Table Administration ------ Row 1 to 27 of 133
Command ===>                                            SCROLL ===> CSR
                                                        TARGET ---- DB2G
Location         ===> DB0G
Catalog Prefix   ===> SYSIBM

Commands: SORT (column no.)
LC CMDS:  A (table authorization)       G (DDLGEN for table)
          B (browse table)              R (create table like)
          D (drop   table)              S (show table detail)
          E (edit   table)

LC Owner    Table Name          Type  Rows     Pages    DBID OBID Remarks
-- -------- ------------------ ----- -------- -------- ---- ---- --------------
   BOLHHH1  ACCESSIBLE_COLUMNS VIEW  -1       -1       0    0
   BOLSMR2  PLAN_TABLE         TABLE -1       -1       259  64
   BOLSMR2  STAFF              TABLE -1       -1       4    6
   BOLSMR2  STAFFV1            VIEW  -1       -1       0    0
   BOLSMR2  TESTSTUFF          TABLE -1       -1       4    3
   BOLSMR4  PLAN_TABLE         TABLE -1       -1       259  99
   BOLSMR4  SYSCOLAUTH         TABLE -1       -1       262  62
   BOLSMR4  SYSCOLUMNS         TABLE -1       -1       262  28
   BOLSMR4  SYSDATABASE        TABLE -1       -1       262  70
   BOLSMR4  SYSDBAUTH          TABLE -1       -1       262  73
   BOLSMR4  SYSDBRM            TABLE -1       -1       262  88
   BOLSMR4  SYSFIELDS          TABLE -1       -1       262  33
   BOLSMR4  SYSFOREIGNKEYS     TABLE -1       -1       262  41
   BOLSMR4  SYSINDEXES         TABLE -1       -1       262  44
   BOLSMR4  SYSINDEXPART       TABLE -1       -1       262  49
   BOLSMR4  SYSKEYS            TABLE -1       -1       262  52
   BOLSMR4  SYSPACKAGE         TABLE -1       -1       262  113
   BOLSMR4  SYSPACKDEP         TABLE -1       -1       262  116
   BOLSMR4  SYSPACKLIST        TABLE -1       -1       262  119
   BOLSMR4  SYSPKSYSTEM        TABLE -1       -1       262  125
   BOLSMR4  SYSPLAN            TABLE -1       -1       262  85
   BOLSMR4  SYSPLANAUTH        TABLE -1       -1       262  94
   BOLSMR4  SYSPLANDEP         TABLE -1       -1       262  97
   BOLSMR4  SYSPLSYSTEM        TABLE -1       -1       262  122
   BOLSMR4  SYSRELS            TABLE -1       -1       262  36
   BOLSMR4  SYSRESAUTH         TABLE -1       -1       262  76
   BOLSMR4  SYSSTMT            TABLE -1       -1       262  91
```

Figure 14. DB2 Table Administration List Panel

You can select a table and choose other options to display expanded information about that table from the presented list of tables.

You can use primary commands to

- SORT by the nth data column, where n=1 is OWNER

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Display table authorization information—Option A

  Selecting this option displays a scrollable list of all AUTHIDs/plans having privileges on the selected table. A set of column values from the target catalog's SYSTABAUTH table also is displayed. This leads you directly to the DB2 Authorization options. The Authorization options are further described in "DB2 Authorization by User" on page 109 and "DB2 Authorization by Resource" on page 111.

- Enter BROWSE mode for the selected table—Option B

  Refer to "Qualifying the Table for Browse" on page 74 and "Browse a Table" on page 75.

- Request a primed display to DROP the selected table—Option D

  A primed action confirmation panel is displayed.

- Enter EDIT mode for the selected table—Option E

  Refer to "Qualifying the Table for Edit" on page 77 and "Edit a Table" on page 78.

- Request a primed display to generate DDL statements for the selected table—Option G

  An action confirmation panel displays where you specify options to generate the DDL for a table (such as for related indexes or related views) and a sequential data set or PDS member for output. The generated DDL is saved in your data set and can be displayed in edit mode.

  You can generate JCL for utilities such as RUNSTATS or REORG to submit for execution from the Table Space and Index display. The skeleton JCL is stored in a standard ISPF ISPSLIB library so it is easily tailored to your site standards.

- Request a primed display to issue a CREATE TABLE LIKE statement—Option R

  An action confirmation panel is displayed. The table created is modeled like the selected table.

  The CREATOR authorization scope can be altered by typing a value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the CREATE.

- Display table detail—Option S

  When selecting this option, a panel is displayed with the most commonly used table data. You can choose to see more information on the table space, columns, indexes, keys, referential constraints, plan dependencies, or table check constraints.

  For example, a panel like the one shown in Figure 15 is displayed when you choose Check Constraints for the selected table.

```
Boole & Babbage ----------- Show Check Constraints -------- Row 1 to 1 of 1
Command ===>                                               SCROLL ===> CSR
                                                           TARGET ---- DB2G
Catalog Prefix   ===> SYSIBM
Location  . . . . . : DB2G
Table . . . . . . . : DSN8410.EMP

Commands: SORT (column no.)          ADD  (new Constraint)
LC CMDS:  S (constraint detail)      T (condition text)
          A (add new constraint)     D (drop constraint)

LC CONSTRAINT NAME    CHECK CONDITION
-- ----------------- ---------------------------------------------------
   NUMBER             PHONENO >= '0000' AND PHONENO <= '9999'
***************************** Bottom of data ******************************
```

Figure 15. Show Check Constraints Panel

Qualifying the Table for Browse

The Browse DB2 Table function is accessed by selecting the Browse Table option (line command B) from the DB2 Table Administration list panel; see Figure 14 on page 72. A panel like the one shown in Figure 16 is displayed when you choose the Browse Table option.

```
Boole & Babbage --------------- Browse DB2 Table --------------- Row 1 from 11
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G

Catalog Prefix   ===> SYSIBM
Location  . . . . . : DB0G
Name  . . . . . . . : BOLHHH1.ACCESSIBLE_COLUMNS
Specify the qualifiers to browse the table/view.

Commands: GO (process)       LOCATE (DB2 column name)
          SORT (column no.)  RESET (the excluded lines)
LC CMDS:  X (exclude line from display)

LC COLUMN NAME        TYPE     LENGTH QUALIFIER (e.g. NULL, ^='AB', >12, A+C*)
-- ------------------ -------- ------ ----------------------------------------
   OWNER              CHAR     8
   TABLE_NAME         VARCHAR  18
   COLUMN_NAME        VARCHAR  18
   DATA_TYPE          CHAR     8
   DATA_LENGTH        SMALLINT 2
   DATA_PRECISION     VARCHAR  1
   DATA_SCALE         SMALLINT 2
   NULLABLE           CHAR     1
   COLUMN_ID          VARCHAR  1
   DEFAULT_LENGTH     VARCHAR  1
   DATA_DEFAULT       CHAR     1
****************************** Bottom of data ********************************
```

Figure 16. Browse DB2 Table Qualifier Panel

You can specify one or more qualifiers and/or choose other options to browse particular information for the selected table from the presented list of column names. Each line in the COLUMN NAME field represents a column in the DB2 table that can be used as a qualifier to select the rows you want to browse.

You can use primary commands to

- GO (display) the first qualified row
- SORT by the nth data column, where n=1 is COLUMN NAME

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.
- LOCATE an entry in the list and scroll it to the top of the display
- RESET (display) previously excluded lines

You can use line commands to

- Exclude selected line(s) from the display—Option X

Browse a Table

Upon specifying qualifiers and specifying GO from the previous panel (Figure 16 on page 74), a second panel is displayed, as shown in Figure 17.

```
Boole & Babbage --------------- Browse DB2 Table --------------- Row 1 from 43
Command ===>                                                SCROLL ===> CSR
                                                            TARGET ---- DB2G
Catalog Prefix   ===> SYSIBM
Location  . . . . . : DB0G
Table . . . . . . . : BOLSMR2.PLAN_TABLE

Commands: NEXT or PF11  (next DB2 row)  LOCATE (DB2 column name)
          SKIP (number of DB2 rows)     SORT (by column name)
                                        RESET (the excluded lines)
LC CMDS:  X (exclude line)

LC COLUMN NAME        COLUMN VALUE FOR ROW: 1
-- ----------------- ------------------------------------------------------
   QUERYNO            9
   QBLOCKNO           1
   APPLNAME
   PROGNAME           DSNTEP2
   PLANNO             1
   METHOD             0
   CREATOR            DSN8410
   TNAME              DEPT
   TABNO              1
   ACCESSTYPE         I
   MATCHCOLS          1
   ACCESSCREATOR      DSN8410
   ACCESSNAME         XDEPT1
   INDEXONLY          N
   SORTN_UNIQ         N
   SORTN_JOIN         N
   SORTN_ORDERBY      N
   SORTN_GROUPBY      N
   SORTC_UNIQ         N
   SORTC_JOIN         N
   SORTC_ORDERBY      N
   SORTC_GROUPBY      N
   TSLOCKMODE          IS
   TIMESTAMP          1995062815511422
   REMARKS
   PREFETCH
   COLUMN_FN_EVAL
```

Figure 17. Browse DB2 Table List Panel

Figure 17 is a list of the table column names with the values from one row.

You can use primary commands to

- Go to the NEXT qualified DB2 row in the table

  (PF11 is the default key for NEXT. Use the DEFAULTS option to modify PF key default assignments.)

- SKIP forward the specified number of rows
- LOCATE a COLUMN NAME in the list and scroll it to the top of the display

- SORT by COLUMN NAME only

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- RESET (display) previously excluded lines

You can use line commands to

- Exclude selected line(s) from the display—Option X

Important

The row number for the row currently being displayed is shown in the column heading on the panel.

Qualifying the Table for Edit

The Edit DB2 Table function is accessed by selecting the Edit Table option (line command E) from the DB2 Table Administration list display; see Figure 14 on page 72. A panel like the one shown in Figure 18 is displayed when you choose the Edit Table option.

```
Boole & Babbage ---------------- Edit DB2 Table ----------------- Row 1 from 3
Command ===>                                                SCROLL ===> CSR
                                                            TARGET ---- DB2G
Catalog Prefix   ===> SYSIBM
Location  . . . . . : DB0G
Name  . . . . . . . : DSN8410.ACT
Specify the qualifiers to edit the table/view.

Commands: GO (process), INSERT (to insert mode), LOCATE (DB2 column name)
          RESET (the excluded lines), SORT (column no.)
LC CMDS:  X (exclude line from display)

LC COLUMN NAME          TYPE   LEN  KEY NUL UPD QUALIFIER (E.G. >12, AB+CD*)
-- ------------------ -------- ---- --- --- --- --------------------------------
   ACTNO              SMALLINT 2    1   N
   ACTKWD             CHAR     6        N
   ACTDESC            VARCHAR  20       N
****************************** Bottom of data ********************************
```

Figure 18. Edit DB2 Table Qualifier Panel

You can specify one or more qualifiers and/or choose other options to edit particular information for the selected table from the presented list of column names. Each line in the COLUMN NAME field represents a column in the DB2 table that can be used as a qualifier to select the rows you want to edit.

You can use primary commands to

- GO (display) the first qualified row
- Enter INSERT mode to add rows to the table
- LOCATE a COLUMN NAME in the list and scroll it to the top of the display
- RESET (display) previously excluded lines
- SORT by the nth data column, where n=1 is COLUMN NAME

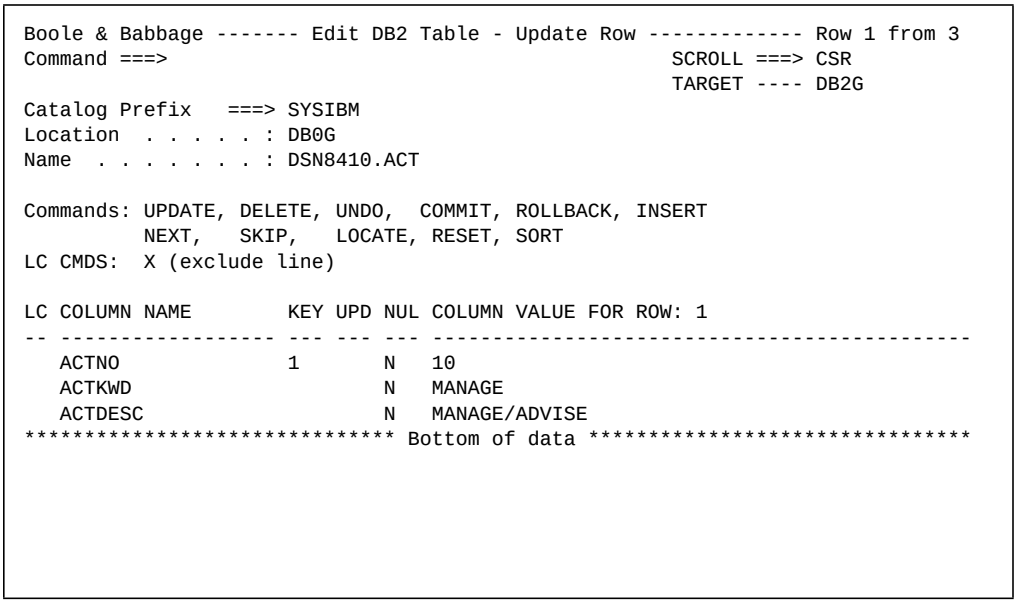
  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Exclude selected line(s) from the display—Option X

Edit a Table

Upon specifying qualifiers and specifying GO or specifying INSERT from the previous panel (Figure 18 on page 77), a second panel is displayed, as shown in Figure 19.



```
Boole & Babbage ------- Edit DB2 Table - Update Row ------------- Row 1 from 3
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Catalog Prefix   ===> SYSIBM
Location  . . . . . : DB0G
Name  . . . . . . . : DSN8410.ACT

Commands: UPDATE, DELETE, UNDO,  COMMIT, ROLLBACK, INSERT
          NEXT,   SKIP,   LOCATE, RESET, SORT
LC CMDS:  X (exclude line)

LC COLUMN NAME        KEY UPD NUL COLUMN VALUE FOR ROW: 1
-- ----------------- --- --- --- ---------------------------------------------
   ACTNO              1       N   10
   ACTKWD                     N   MANAGE
   ACTDESC                    N   MANAGE/ADVISE
****************************** Bottom of data ********************************
```

Figure 19. Edit DB2 Table List Panel

Figure 19 is a list of the table column names. The column values are displayed one row at a time. You can modify any of the displayed column values.

You can use primary commands to

- Record (UPDATE) changes for the current row pending COMMIT
- DELETE the row currently displayed
- Cancel (UNDO) pending UPDATE or INSERT
- COMMIT all changes since the last COMMIT
- ROLLBACK (remove) any changes made to the target table since last COMMIT
- Enter INSERT mode to add rows to the table
- Go to the NEXT qualified DB2 row in the table. (PF11 is the default key for NEXT. Use the DEFAULTS option to modify PF key default assignments.)
- SKIP forward the specified number of rows
- LOCATE an entry in the list and scroll it to the top of the display
- RESET (display) previously excluded lines
- SORT by COLUMN NAME

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Exclude selected line(s) from the display—Option X

DB2 Table Space Administration

DB2 Table Space Administration is accessed by selecting Option 4 from the Primary Option Menu. It produces a list of table spaces from the target catalog's SYSTABLESPACE table. Figure 20 shows a sample DB2 Table Space Administration qualifier panel.

```
Boole & Babbage ------- DB2 Table Space Administration -------------------
Command ===>                                            TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> SYSIBM
Catalog Table . . . : SYSIBM.SYSTABLESPACE
Specify at least one table space qualifier.

Column               Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
-------------        ------------------------------------------------------

* DBNAME        ===> *
  TSNAME        ===>
  CREATOR       ===>
  DBID          --->
  OBID          --->
  BPOOL         ===>          (Buffer Pool ID)
  PARTITIONS    --->
  LOCKRULE      ===>          (A-any,P-page,T-table,S-tablespace,R-row)
  ERASERULE     ===>          (Y,N)
  CLOSERULE     ===>          (Y,N)
  STATUS        ===>          (A-available, C-check pending, I-incomplete)
  TABLES        --->
  ACTIVE PAGES  --->

                    Press ENTER to process, END to exit
```

Figure 20. DB2 Table Space Administration Qualifier Panel

Specify one or more qualifiers to select the table spaces to be displayed. Press ENTER. A scrollable list of table spaces you selected is displayed. A set of column values from the target catalog's SYSTABLESPACE table also is displayed. Figure 21 on page 81 shows a sample Show Table Space list panel.

```
Boole & Babbage ------------- Show Table Space -------------- Row 1 to 4 of 34
Command ===>                                                  SCROLL ===> CSR
                                                              TARGET ---- DB2G
Location         ===> DB0G
Catalog Prefix   ===> SYSIBM

Commands: SORT (DB,TS, column no.)      GU (Group Utility generator)
LC CMDS:  A  (authorization)            Q  (generate QUIESCE JCL)
          C  (generate COPY JCL)        R  (generate REORG JCL)
          D  (drop table space)         RC (generate REORG and COPY JCL)
          KD (generate CHECK DATA JCL)  S  (show partitions)
          KX (generate CHECK INDEX JCL) T  (generate RUNSTATS JCL)
          L  (list tables within)       Y  (SYSCOPY recovery info)
LC
-- ------------------------------------------------------------------------
   DSNQDBA  Status: AVAILABLE
       Database:    DSNTESQ   Segment Size: 32       Lock Rule:  ANY
       Creator:     BOLSMR4   Page Size(K): 4        Erase Rule: N
       Partitions:  0         Using:        BP0      Close Rule: Y
       Tables:      2         Active Pages: 0
       Statstime:   0001-01-01-00.00.00.000000       Space: 0KB
------------------------------------------------------------------------
   DSNQDBS  Status: AVAILABLE
       Database:    DSNTESQ   Segment Size: 32       Lock Rule:  ANY
       Creator:     BOLSMR4   Page Size(K): 4        Erase Rule: N
       Partitions:  0         Using:        BP0      Close Rule: Y
       Tables:      13        Active Pages: 0
       Statstime:   0001-01-01-00.00.00.000000       Space: 0KB
------------------------------------------------------------------------
   DSNQGPA  Status: AVAILABLE
       Database:    DSNTESQ   Segment Size: 32       Lock Rule:  ANY
       Creator:     BOLSMR4   Page Size(K): 4        Erase Rule: N
       Partitions:  0         Using:        BP0      Close Rule: Y
       Tables:      1         Active Pages: 0
       Statstime:   0001-01-01-00.00.00.000000       Space: 0KB
------------------------------------------------------------------------
   DSNQGRP  Status: AVAILABLE
       Database:    DSNTESQ   Segment Size: 32       Lock Rule:  ANY
       Creator:     BOLSMR4   Page Size(K): 4        Erase Rule: N
       Partitions:  0         Using:        BP0      Close Rule: Y
       Tables:      2         Active Pages: 0
       Statstime:   0001-01-01-00.00.00.000000       Space: 0KB
------------------------------------------------------------------------
```

Figure 21. Show Table Space List Panel

You can use primary commands to

- SORT the display by

  DB Database
  TS Table space
  n The nth data column, where n=1 is COLUMN NAME

- Invoke the Group Utility Generator to create utility JCL for all displayed table spaces

  You first need to set the defaults for variables used in the JCL created by the Group Utility Generator (Option 0). Then you can generate

  – Image Copy JCL
  – Image Copy and QUIESCE JCL
  – REORG JCL
  – REORG and Image Copy JCL
  – REORG and RUNSTATS JCL
  – RUNSTATS JCL
  – CHECK DATA JCL
  – CHECK INDEX JCL
  – QUIESCE JCL

  The JCL is presented in a temporary data set, which you can submit or save into a permanent file.

You can use line commands on the presented list of table spaces to

- Display all AUTHIDs having privileges on this table—Option A

  Selecting this option displays a scrollable list of all AUTHIDs having privileges on the selected table space. This leads you directly to the DB2 Authorization options. The Authorization options are further described in "DB2 Authorization by User" on page 109 and "DB2 Authorization by Resource" on page 111.

- Generate JCL to run the COPY utility—Option C

  Selecting this option takes you directly into ISPF/PDF edit. COPY utility JCL generated from BBSLIB is displayed.

- Request a primed display to DROP the selected table space—Option D

  Selecting this option takes you to a primed panel to DROP the selected table space.

- Generate JCL to run the CHECK DATA utility—Option KD

  Selecting this option takes you directly into ISPF/PDF edit. CHECK utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the CHECK INDEX utility—Option KX

  Selecting this option takes you directly into ISPF/PDF edit. CHECK utility JCL generated from BBSLIB is displayed.

- Display the tables in the selected table space—Option L

  A scrollable list of tables along with a set of column values from the target catalog's SYSTABLES table is displayed. Refer to Figure 13 on page 71.

- Generate JCL to run the QUIESCE utility—Option Q

  Selecting this option takes you directly into ISPF/PDF edit. QUIESCE utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the REORG utility—Option R

  Selecting this option takes you directly into ISPF/PDF edit. REORG utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the REORG utility with a COPY afterwards—Option RC

  Selecting this option takes you directly into ISPF/PDF edit. REORG and COPY utility JCL generated from BBSLIB is displayed.

- Display the partitions in the selected table space—Option S

  A scrollable list of partitions with a set of column values from the target catalog's SYSTABLEPART table is displayed. Refer to Figure 23 on page 85.

- Generate JCL to run the RUNSTATS utility—Option T

  Selecting this option takes you directly into ISPF/PDF edit. RUNSTATS utility JCL generated from BBSLIB is displayed.

- Display recovery information for the selected table space—Option Y

  A scrollable list of recovery information with a set of column values from SYSCOPY table is displayed. Refer to Figure 41 on page 108.

DB2 Partition Administration

DB2 Partition Administration is accessed by selecting Option 5 from the Primary Option Menu. It produces a list of table space partitions from the DB2 catalog. The REORG recommendation threshold values trigger a REORG recommendation on subsequent panels. Figure 22 shows a sample DB2 Partition Administration qualifier panel.

```
Boole & Babbage ------- DB2 Partition Administration ---------------------
Command ===>                                            TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> SYSIBM
Catalog Table . . . : SYSIBM.SYSTABLEPART
Specify at least one partition qualifier.

Column              Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
-------------       ------------------------------------------------------

 DBNAME         ===> *
 TSNAME         ===>
 IXCREATOR      ===>
 IXNAME         ===>
 STORGROUP      ===>        (Y|N)
 STORNAME       ===>
 FREEPAGE       --->
 PCTFREE        --->
 FARINDREF      --->        REORG recommendation threshold  ===> 20     %
 NEARINDREF     --->        REORG recommendation threshold  ===> 50     %
 PERCDROP       --->        REORG recommendation threshold  ===> 33     %
 PERCACTIVE     --->

                    Press ENTER to process, END to exit
```

Figure 22. DB2 Partition Administration Qualifier Panel

Note: The thresholds are set to default values. You can change these values in the Defaults menu option.

Specify one or more qualifiers to select the partitions to be displayed. Press ENTER. A scrollable list of partitions with a set of column values from the target catalog's SYSTABLEPART table is displayed. Figure 23 on page 85 shows a sample list panel.

```
Boole & Babbage ------------- Show Partitions --------------- Row 1 to 3 of 37
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Location         ===> DB0G
Catalog Prefix   ===> DB0G.SYSIBM

Commands: SORT (DB,TS, PN, column no.)  GU (Group Utility generator)
LC CMDS:  LC (LISTCAT)                  T  (generate RUNSTATS JCL)
          R  (generate REORG JCL)       Y  (SYSCOPY recovery info)
          RC (generate REORG and COPY JCL)
LC
-- ------------------------------------------------------------------------
   DSNQDBA  PART 0              *** RUNSTATS RECOMMENDED ***
       Database:     DSNTESQ    Priqty:   3       Secqty:  3
       Stogroup:     SYSDEFLT   Freepage: 0       Pctfree: 5%
       Percent Active: -1%      Dropped:  -1%     Compress: N    0%
       Relocated Near: -1       Far:      -1      Gbpcache: NO
       Total Rows:     -1                         Status:  OK
       Statstime:      0001-01-01-00.00.00.000000 Space:   0KB
------------------------------------------------------------------------------
   DSNQDBS  PART 0              *** RUNSTATS RECOMMENDED ***
       Database:     DSNTESQ    Priqty:   3       Secqty:  3
       Stogroup:     SYSDEFLT   Freepage: 0       Pctfree: 5%
       Percent Active: -1%      Dropped:  -1%     Compress: N    0%
       Relocated Near: -1       Far:      -1      Gbpcache: NO
       Total Rows:     -1                         Status:  OK
       Statstime:      0001-01-01-00.00.00.000000 Space:   0KB
------------------------------------------------------------------------------
   DSNQGPA  PART 0              *** RUNSTATS RECOMMENDED ***
       Database:     DSNTESQ    Priqty:   3       Secqty:  3
       Stogroup:     SYSDEFLT   Freepage: 0       Pctfree: 5%
       Percent Active: -1%      Dropped:  -1%     Compress: N    0%
       Relocated Near: -1       Far:      -1      Gbpcache: NO
       Total Rows:     -1                         Status:  OK
       Statstime:      0001-01-01-00.00.00.000000 Space:   0KB
------------------------------------------------------------------------------
```

Figure 23. Show Partitions List Panel

You can use primary commands to

- SORT the display by

  DB Database
  TS Table space
  PN Partition
  n The nth data column, where major values for n are

    1 Database name
    2 Table space name
    3 Partition number
    6 Storage group

- Invoke the Group Utility Generator to create utility JCL for all displayed partitions

  You first need to set the defaults for variables used in the JCL created by the Group Utility Generator (Option 0). Then you can generate

  – Image Copy JCL
  – Image Copy and QUIESCE JCL
  – REORG JCL
  – REORG and Image Copy JCL
  – REORG and RUNSTATS JCL
  – RUNSTATS JCL
  – CHECK DATA JCL
  – CHECK INDEX JCL
  – QUIESCE JCL

  The JCL is presented in a temporary data set, which you can submit or save into a permanent file.

You can use line commands on the presented list of partitions to

- Request a display to specify LISTCAT options for a partition—Option LC

  An action confirmation panel is displayed. Specify the LISTCAT options and an existing data set for your output. The recommended logical record length for your output data set is 121 (LRECL=121). (Local connection only)

- Generate JCL to run the REORG utility—Option R

  Selecting this option takes you directly into ISPF/PDF edit. REORG utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the REORG utility with a COPY afterwards—Option RC

  Selecting this option takes you directly into ISPF/PDF edit. REORG and COPY utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the RUNSTATS utility—Option T

  Selecting this option takes you directly into ISPF/PDF edit. RUNSTATS utility JCL generated from BBSLIB is displayed.

- Display recovery information for the selected partition—Option Y

  A scrollable list of recovery information along with a set of column values from SYSCOPY table is displayed. Refer to Figure 41 on page 108.

The utility JCL is stored in a standard ISPF ISPSLIB library so that it is easily tailored to your site standards.

DB2 Index Administration

DB2 Index Administration is accessed by selecting Option 6 from the Primary Option Menu. It produces a list of indexes from the target catalog's SYSINDEXES table. Figure 24 shows a sample DB2 Index Administration qualifier panel.

```
BOOLE AND BABBAGE ---------DB2 Index Administration -----------------------
Command ===>                                            TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> SYSIBM
Catalog Table . . . : SYSIBM.SYSINDEXES
Specify at least one index qualifier.

Column               Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
-------------        ------------------------------------------------

* CREATOR       ===> DSN8*
  INDEX NAME    ===>
  TBCREATOR     ===>
  TBNAME        ===>
* DBNAME        ===>
  DBID          --->
  OBID          --->
  INDEXSPACE    --->
  TYPE          ===>        (1 or 2)
  COLCOUNT      --->
  BPOOL         ===>        (Buffer Pool ID)
  CLUSTERING    ===>        (Y,N)
  CLUSTERED     ===>        (Y,N)
  NLEAF         --->
  NLEVELS       --->
  UNIQUERULE    ===>        (U,C,N-YES,D-NO,P-PRIMARY)
  ERASERULE     ===>        (Y,N)
  CLOSERULE     ===>        (Y,N)
  FIRSTKEYCARD  --->
  FULLKEYCARD   --->

                    Press ENTER to process, END to exit
```

Figure 24. DB2 Index Administration Qualifier Panel

Specify one or more qualifiers to select the indexes from the DB2 catalog. Press ENTER. A scrollable list of defined indexes for the selected table is displayed. Figure 25 on page 88 shows a sample list panel.

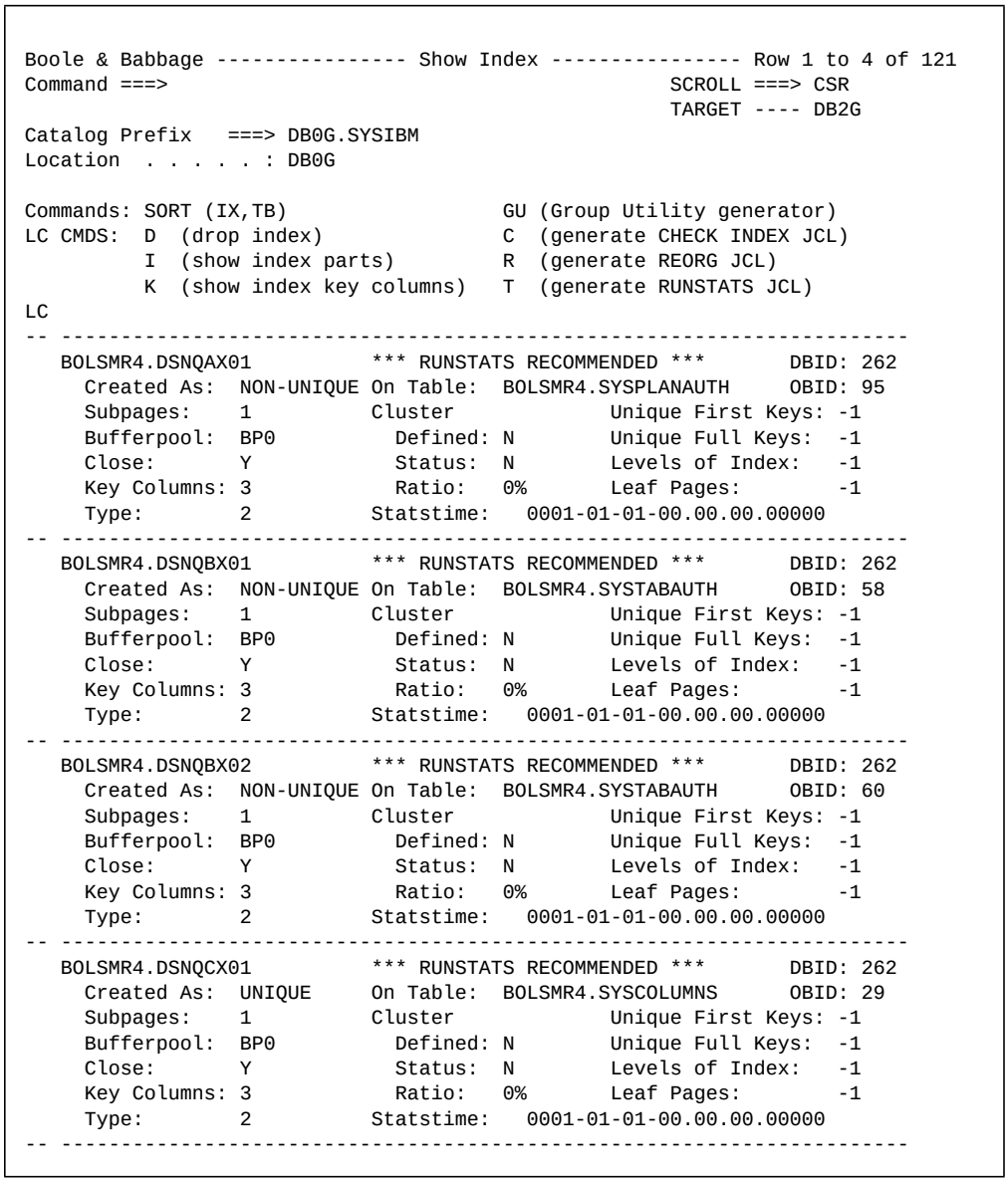


Figure 25. Show Index List Panel

You can use primary commands to

- SORT the display by

  IX Index
  TB Table

- Invoke the Group Utility Generator to create utility JCL for all displayed indexes

  You first need to set the defaults for variables used in the JCL created by the Group Utility Generator (Option 0). Then you can generate

  – Image Copy JCL
  – Image Copy and QUIESCE JCL
  – REORG JCL
  – REORG and Image Copy JCL
  – REORG and RUNSTATS JCL
  – RUNSTATS JCL
  – CHECK DATA JCL
  – CHECK INDEX JCL
  – QUIESCE JCL

  The JCL is presented in a temporary data set, which you can submit or save into a permanent file.

You can use line commands on the presented list of indexes to

- Request a primed display to DROP the selected index—Option D

  An action confirmation panel is displayed.

- Display the partition of the selected index—Option I

  A scrollable list of index partitions you selected and a set of column values from the target catalog's SYSINDEXPART table is displayed. Refer to Figure 27 on page 91.

- Display the key columns of the selected index—Option K

  The columns defined for the selected index key are displayed.

- Generate JCL to run the CHECK INDEX utility—Option C

  This option takes you directly into ISPF/PDF edit. CHECK utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the REORG utility—Option R

  This option takes you directly into ISPF/PDF edit. REORG utility JCL generated from BBSLIB is displayed.

- Generate JCL to run the RUNSTATS utility—Option T

  This option takes you directly into ISPF/PDF edit. RUNSTATS utility JCL generated from BBSLIB is displayed.

DB2 Index Partition Administration

DB2 Index Partition Administration is accessed by selecting Option 7 from the Primary Option Menu. It produces a list of index partitions from the target catalog's SYSINDEXPART table. The REORG recommendation threshold values trigger a REORG recommendation on subsequent panels. Figure 26 shows a sample DB2 Index Partition Administration qualifier panel.

```
BOOLE AND BABBAGE ------ DB2 Index Partition Administration ---------------
Command ===>                                           TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> SYSIBM
Target Table . . . .: SYSIBM.SYSINDEXPART
Specify at least one index partition qualifier.

Column               Qualifier (E.G. NULL, ^='AB', >123, AB++CD*)
-------------        ------------------------------------------------------

  IXCREATOR     ===> DSN8*
  IXNAME        ===>
  STORGROUP     ===>        (Y|N)
  STORNAME      ===>
  FREEPAGE      --->
  PCTFREE       --->
  ROWS          --->
  LEAFDIST      --->
  FAROFFPOS     --->         REORG recommendation threshold ===> 999   %
  NEAROFFPOS    --->         REORG recommendation threshold ===> 5     %

                    Press ENTER to process, END to exit
```

Figure 26. DB2 Index Partition Administration Qualifier Panel

Note: The thresholds are set to default values. You can change these values in the Defaults menu option.

Specify one or more qualifiers to select the index partitions to be displayed. Press ENTER. A scrollable list of index partitions with a set of column values from the target catalog's SYSINDEXPART table is displayed. Figure 27 on page 91 shows a sample list panel.

```
Boole & Babbage ---------- Show Index Partitions ------------ Row 1 to 4 of 19
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM

Commands: SORT (IX,PN,STO)             GU (Group Utility generator)
LC CMDS:  R  (generate REORG JCL)      T  (generate RUNSTATS JCL)
          LC (LISTCAT)
LC
-- ------------------------------------------------------------------------
   DSN8410.XACT1               PART 0
               Creator:    DSN8410    Priqty:    3        Secqty:  3
               Stogroup:   DSN8G410   Freepage:  0        Pctfree: 10%
               Total Rows: 18         Limit Key: 0        Gbpcache: NO
               Average Leaf Page Distance:       0        Ixtype:
               Rows off Optimal Position:  Far:  0        Near:    0
               Statstime:  1995-09-12-10.55.15.134359     Space:   0KB
------------------------------------------------------------------------
   DSN8410.XACT2               PART 0
               Creator:    DSN8410    Priqty:    3        Secqty:  3
               Stogroup:   DSN8G410   Freepage:  0        Pctfree: 10%
               Total Rows: 18         Limit Key: 0        Gbpcache: NO
               Average Leaf Page Distance:       0        Ixtype:
               Rows off Optimal Position:  Far:  0        Near:    0
               Statstime:  1995-09-12-10.55.15.134359     Space:   0KB
------------------------------------------------------------------------
   DSN8410.XCONA1              PART 0
               Creator:    DSN8410    Priqty:    3        Secqty:  3
               Stogroup:   DSN8G410   Freepage:  0        Pctfree: 10%
               Total Rows: 0          Limit Key: 0        Gbpcache: NO
               Average Leaf Page Distance:       0        Ixtype:
               Rows off Optimal Position:  Far:  0        Near:    0
               Statstime:  1995-09-12-10.55.17.651330     Space:   0KB
------------------------------------------------------------------------
   DSN8410.XDEPT1              PART 0
               Creator:    DSN8410    Priqty:    3        Secqty:  3
               Stogroup:   DSN8G410   Freepage:  0        Pctfree: 10%
               Total Rows: 14         Limit Key: 0        Gbpcache: NO
               Average Leaf Page Distance:       0        Ixtype:
               Rows off Optimal Position:  Far:  0        Near:    0
               Statstime:  1995-09-12-10.55.17.651330     Space:   0KB
------------------------------------------------------------------------
```

Figure 27. Show Index Partitions List Panel

You can use primary commands to

- SORT the display by

  IX Index
  PN Index partition
  STO Storage group

- Invoke the Group Utility Generator to create utility JCL for all displayed index partitions

  You first need to set the defaults for variables used in the JCL created by the Group Utility Generator (Option 0). Then you can generate

  – Image Copy JCL
  – Image Copy and QUIESCE JCL
  – REORG JCL
  – REORG and Image Copy JCL
  – REORG and RUNSTATS JCL
  – RUNSTATS JCL
  – CHECK DATA JCL
  – CHECK INDEX JCL
  – QUIESCE JCL

  The JCL is presented in a temporary data set, which you can submit or save into a permanent file.

You can use line commands on the presented list of index partitions to

- Generate JCL to run the REORG utility—Option R

  This option takes you directly into ISPF/PDF edit. REORG utility JCL generated from BBSLIB is displayed.

- Request a primed display to specify LISTCAT options for an index partition—Option LC

  An action confirmation panel is displayed. Specify the LISTCAT options and an existing data set for your output. The recommended logical record length for your output data set is 121 (LRECL=121).

- Generate JCL to run the RUNSTATS utility—Option T

  This option takes you directly into ISPF/PDF edit. RUNSTATS utility JCL generated from BBSLIB is displayed.

The utility JCL is stored in a standard ISPF ISPSLIB library so that it is easily tailored to your site standards.

DB2 Database Administration

DB2 Database Administration is accessed by selecting Option 8 from the Primary Option Menu. It produces a list of databases from the target catalog's SYSDATABASE table. Figure 28 shows a sample DB2 Database Administration qualifier panel.

```
Boole & Babbage ------- DB2 Database Administration ----------------------
Command ===>                                          TARGET ===> DB2G

Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM
Catalog Table . . . : DB2G.SYSIBM.SYSDATABASE
Specify at least one database qualifier.

Column            Qualifier (e.g. NULL, ^='AB', AB++CD*)
----------        ------------------------------------------------------
* DBNAME     ===> DSN8*
  CREATOR    ===>
  DBID       ===>
  STOGROUP   ===>
  BPOOL      ===>           (Buffer Pool ID)

                    Press ENTER to process, END to exit
```

Figure 28. DB2 Database Administration Qualifier Panel

Specify one or more qualifiers to select the databases to be displayed. Press ENTER. A scrollable list of databases with a set of column values from the target catalog's SYSDATABASE table is displayed. Figure 29 shows a sample DB2 Database Administration list panel.

```
Boole & Babbage ------- DB2 Database Administration ---------- Row 1 to 3 of 3
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM
Release . . . . . : 410

COMMANDS: SORT (column no.)
LC CMDS:  A (authorization)    X (list INDEXES within)
          C (create database)  S (show STOGROUP)
          D (drop database)    T (list TABLESPACEs within)

LC Creator  Database Stogroup  Bpool DBID
-- -------- -------- --------- ----- ----
   BOLSMR2  DSN8D41A DSN8G410  BP0   260
   BOLSMR2  DSN8D41P DSN8G410  BP0   261
   BOLSMR2  DSN8D41U DSN8G41U  BP0   263
****************************** Bottom of data ********************************
```

Figure 29. DB2 Database Administration List Panel

You can use primary commands on the presented list of databases to

- SORT by the nth data column, where n=1 is CREATOR

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Display all AUTHIDs having privileges on this database—Option A

  Selecting this option displays a scrollable list of all AUTHIDs having privileges on the selected database. A set of column values from the target catalog's SYSPLANAUTH table also is displayed. This leads you directly to the DB2 Authorization options. The Authorization options are further described in "DB2 Authorization by User" on page 109 and "DB2 Authorization by Resource" on page 111.

- Request a primed display to CREATE a database—Option C

  A panel primed with the values for the model database you selected is displayed.

  The CREATOR authorization scope can be altered by typing a value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the CREATE.

- Request a primed display to DROP the selected database—Option D

  An action confirmation panel is displayed.

- Display the storage group for the selected database—Option S

  The storage group for this database is displayed. Refer to Figure 31 on page 96.

- Display the table spaces in the selected database—Option T

  A scrollable list of table spaces with a set of column values from the target catalog's SYSTABLESPACE table is displayed. Refer to Figure 21 on page 81.

- Display the index spaces in the selected database—Option X

  A scrollable list of defined indexes is displayed. Refer to Figure 25 on page 88.

DB2 Storage Group Administration

DB2 Storage Group Administration is accessed by selecting Option 9 from the Primary Option Menu. It produces a list of storage groups from the target catalog's SYSSTOGROUP table. Figure 30 shows a sample DB2 Storage Group Administration qualifier panel.

```
Boole & Babbage ------ DB2 Storage Group Administration ------------------
Command ===>                                          TARGET===> DBGG

Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM
Catalog Table . . . : DB2G.SYSIBM.SYSSTOGROUP
Specify at least one storage group qualifier.

 Column                  Qualifier (e.g. NULL, ^='AB', AB++CD*)
 -----------------       --------------------------------------
* STOGROUP NAME      ===> *
  CREATOR            ===>
  STOSPACE           --->          (K bytes)
  STOSPACE DATE      ===>          (char(5): yyddd)

                     Press ENTER to process, END to exit
```

Figure 30. DB2 Storage Group Administration Qualifier Panel

Specify one or more qualifiers to select the storage groups to be displayed. Press ENTER. A scrollable list of storage groups is displayed. Figure 31 on page 96 shows a sample list panel.

```
Boole & Babbage ------ DB2 Storage Group Administration ---- Row 1 to 12 of 12
Command ===>                                            SCROLL ===> CSR
                                                        TARGET ---- DBGG
Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM

Commands: SORT (column no.)            GU (Group Utility generator)
LC CMDS:  A  (authorization)           I  (list INDEXPARTs within)
          D  (list DATABASEs)          T  (list TABLEPARTs within)
          G  (generate STOSPACE JCL)   V  (list volumes)
          DR (drop STORAGE GROUP)

                              ---- STOSPACE ----
LC CREATOR  NAME               K-BYTES   DATE     REMARKS
-- -------- ------------------ --------- -------- --------------------
   BOLBPL1  DEMOG410           0                  STOSPACE RECOMMENDED
   BOLBPL1  SYSDEFLT           0                  STOSPACE RECOMMENDED
   BOLCJN2  DMR44SG1           0                  STOSPACE RECOMMENDED
   BOLCJN3  DMR27SG1           0                  STOSPACE RECOMMENDED
   BOLHHH4  H3TSTO             0                  STOSPACE RECOMMENDED
   BOLMXW2  MWSTO              0                  STOSPACE RECOMMENDED
   BOLSMR2  DSN8G41U           0                  STOSPACE RECOMMENDED
   BOLSMR2  DSN8G410           0                  STOSPACE RECOMMENDED
   BOLSMR2  SMR41SG1           0                  STOSPACE RECOMMENDED
   BOLSMR4  SMRT1              0                  STOSPACE RECOMMENDED
   BOLSMR4  SMRT2              0                  STOSPACE RECOMMENDED
   BOLSMR4  TEST1              0                  STOSPACE RECOMMENDED
****************************** Bottom of data ******************************
```

Figure 31. DB2 Storage Group Administration List Panel

You can use primary commands on the presented list of storage groups to

- SORT by the nth data column, where n=1 is CREATOR

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- Invoke the Group Utility Generator to create utility JCL for all displayed storage groups

  You first need to set the defaults for variables used in the JCL created by the Group Utility Generator (Option 0). Then you can generate

  – Image Copy JCL
  – Image Copy and QUIESCE JCL
  – REORG JCL
  – REORG and Image Copy JCL
  – REORG and RUNSTATS JCL
  – RUNSTATS JCL
  – CHECK DATA JCL
  – CHECK INDEX JCL
  – QUIESCE JCL

  The JCL is presented in a temporary data set, which you can submit or save into a permanent file.

You can use line commands to

- Display all AUTHIDs having privileges on this storage group—Option A

  Selecting this option displays a scrollable list of all AUTHIDs having privileges on the selected storage group. Refer to Figure 45 on page 112. This leads you directly to the DB2 Authorization options. The Authorization options are further described in "DB2 Authorization by User" on page 109 and "DB2 Authorization by Resource" on page 111.

- Display all databases in this storage group—Option D

  A scrollable list of databases with a set of column values from the target catalog's SYSDATABASE table is displayed.

- Generate JCL to run the STOSPACE utility—Option G

  This option takes you directly into ISPF/PDF edit. STOSPACE utility JCL generated from BBSLIB is displayed.

- Request a primed display to DROP the selected storage group—Option DR

  An action confirmation panel is displayed.

- Display the index partitions in the selected storage group—Option I

  A scrollable list of index partitions with a set of column values from the target catalog's SYSINDEXPART table is displayed. Refer to Figure 27 on page 91.

- Display the table partitions in the selected storage group—Option T

  A scrollable list of table partitions with a set of column values from the target catalog's SYSTABLEPART table is displayed. Refer to Figure 23 on page 85.

- List the volumes for the selected storage group—Option V

  A scrollable list of volumes is displayed. You can specify a volume to be added to the storage group or remove a volume from the storage group.

DB2 RLF Administration

DB2 Resource Limitation Facility (RLF) Administration is accessed by selecting Option 10 from the Primary Option Menu. It produces a list of tables that contain resource limitation definitions to prevent runaway queries by dynamic SQL. Figure 32 shows a sample DB2 RLF Administration list panel.

```
Boole & Babbage ---------- DB2 RLF Administration ------------ Row 1 to 1 of 1
Command ===>                                                  SCROLL ===> CSR
                                                              TARGET ---- DB2G
Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM

Commands: SORT (column no.)
LC CMDS:  D (drop table)        S (table detail)
          R (create table like)

LC OWNER    TABLE NAME         ROWS    PAGES   REMARKS
-- -------- ------------------ ------- ------- --------------------------
   SYSIBM   DSNRLST01          -1      -1
****************************** Bottom of data ********************************
```

Figure 32. DB2 RLF Administration List Panel

You can use primary commands on the presented list of table names to

- SORT by nth data column, where n=1 is OWNER

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Request a primed display to DROP the selected table—Option D

  An action confirmation panel is displayed.

- Request a primed display to issue a CREATE TABLE LIKE statement—Option R

  An action confirmation panel is displayed. Specify the options to CREATE a TABLE LIKE the selected table.

  The CREATOR authorization scope can be altered by typing a value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the CREATE.

- Display the qualifier panel for the selected RLF table—Option S

  Figure 33 on page 99 shows a sample DB2 RLF Administration qualifier panel.

Specify one or more qualifiers to list Resource Limitation Definitions from the selected table.

```
Boole & Babbage ---------- DB2 RLF Administration -----------------------
Command ===>                                          TARGET ---- DB2G

Location         ===> DB0G
Catalog Prefix   ===> DB2G.SYSIBM
Catalog Table . . . : SYSIBM.DSNRLST01
Specify at least one  resource limitation qualifier.

COLUMN          Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
----------      ------------------------------------------
* AUTHID   ===> *
  PLANNAME ===>
  LUNAME   ===>
  ASUTIME  --->

                   Press ENTER to process, END to exit
```

Figure 33. DB2 RLF Administration Qualifier Panel

A scrollable list of the resource limitations entries from the selected table and a set of column values from the target catalog's DSNRLST01 table are displayed.

```
Boole & Babbage ---------- DB2 RLF Administration ------------ Row 1 to 4 of 4
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Catalog Prefix   ===> DB2G.SYSIBM
Location  . . . . . : DB2G
RLF Table . . . . . : SYSIBM.DSNRLST01

Commands: SORT (column no.)  INSERT (insert entry)
LC CMDS:  D (delete entry)   I (insert entry - primed)
          U (update entry)


LC AUTHID   PLAN     LU NAME  ASUTIME
-- -------- -------- -------- --------
           MZPLAN            30
   CIR10X
   CIR4X
   TGAUTH                    20
****************************** Bottom of data ********************************
```

Figure 34. DB2 RLF Administration List Panel after Selecting Option S

You can use primary commands on the presented list of resource limitation definitions to

- SORT by nth data column, where n=1 is AUTHID

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- Request a primed display to INSERT new definitions into the target catalog's DSNRLST01 table

  An action confirmation panel is displayed.

You can use line commands to

- Request a primed display to DELETE an entry from the target catalog's DSNRLST01 table—Option D

  An action confirmation panel is displayed.

- Request a primed display to INSERT an entry into the target catalog's DSNRLST01 table—Option I

  An action confirmation panel is displayed.

- Request a primed display to UPDATE an entry in the target catalog's DSNRLST01 table—Option U

  An action confirmation panel is displayed.

DB2 DDF Administration

DB2 Distributed Data Facility (DDF) Administration is accessed by selecting Option 11 from the Primary Option Menu. Figure 35 shows a sample DB2 DDF Administration panel. The panel in Figure 35 is a menu allowing you to select which part of the DDF Administration you want to perform.

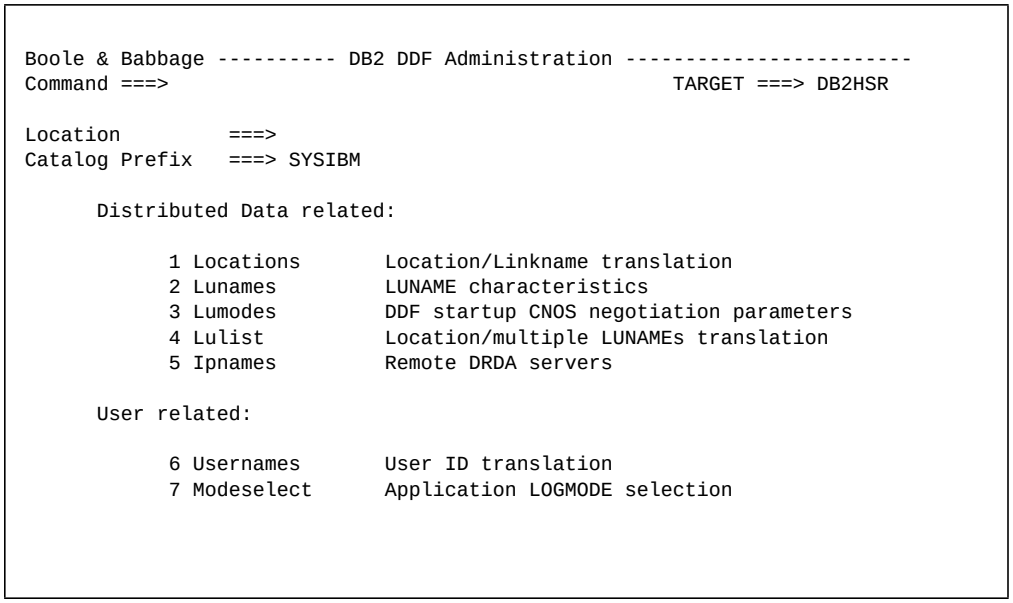


Figure 35. DB2 DDF Administration Selection Panel

Select a system-related or user-related option by typing the option number on the COMMAND line. Press ENTER. Figure 36 shows a sample DB2 DDF Administration qualifier panel for locations.

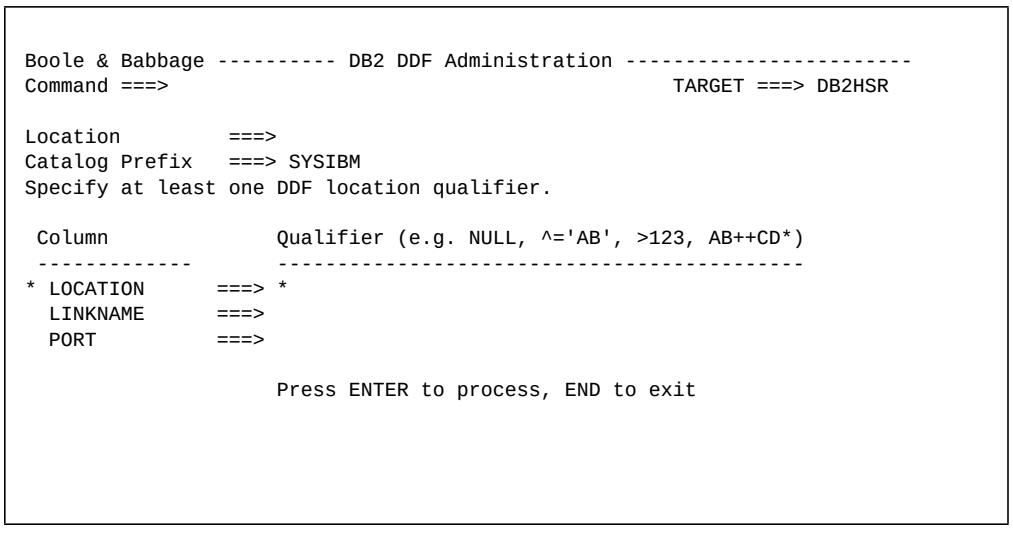


Figure 36. DB2 DDF Administration Location Qualifier Panel

Specify one or more qualifiers to select a scrollable list of the DDF locations you selected. A set of column values from the target catalog's LOCATIONS table also is displayed. Figure 37 shows a sample DB2 DDF Administration list panel from the target catalog's LOCATIONS table.

```
Boole & Babbage ---------- DB2 DDF Administration ------------ Row 1 to 4 of 4
Command ===>                                          SCROLL ===> PAGE
                                                      TARGET ---- DB2HSR
Location         ===>
Catalog Prefix   ===> SYSIBM
Catalog Table    ===> SYSIBM.LOCATIONS

Commands: SORT (column no.)  INSERT (insert entry)
LC CMDS:  D (delete entry)   S (LINKNAME detail)
          I (insert entry)
          U (update entry)

LC LOCATION         LINKNAME PORT
-- ---------------- -------- --------------------------------
   USBOOL01         VTAMD
   USBOOL11         LUDB2H
   USBOOL91         LUSQLDS  1234
   USBOOL99         LUSQLXX  9999
****************************** Bottom of data ******************************
```

Figure 37. DB2 DDF Administration LOCATIONS List Panel

You can use primary commands on the presented list of locations to

- SORT by nth data column, where n=1 is LOCATION

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- Request a primed display to INSERT a row of LOCATION/LINKNAME/PORT in the target catalog's LOCATIONS table

  An action confirmation panel is displayed.

You can use line commands to

- Request a primed display to DELETE a LOCATION/LINKNAME/PORT from the target catalog's LOCATIONS table—Option D

  An action confirmation panel is displayed where you specify the column values to be DELETEd.

- Request a primed display to INSERT a new LOCATION/LINKNAME/PORT into the target catalog's LOCATIONS table—Option I

  An action confirmation panel is displayed where you specify the column values to be INSERTed.

- Request a primed display to UPDATE the selected row of LOCATION/LINKNAME/PORT in the target catalog's LOCATIONS table—Option U

  An action confirmation panel is displayed where you specify the column values to be UPDATEd.

- Display detailed information about the selected LINKNAME from the target catalog's LOCATIONS table—Option S

  Selecting this option causes a scrollable list of LINKNAME characteristics to be displayed. A set of column values from the target catalog's LOCATIONS table also is displayed.

  You can insert, delete, and update entries in the target catalog's LOCATIONS table. You can display DDF locations for selected LINKNAMES in the target catalog's LOCATIONS table, or start up CNOS parameters for selected LINKNAMES.

DB2 Synonym Administration

DB2 Synonym Administration is accessed by selecting Option 12 from the Primary Option Menu. It produces a list of synonyms from the target catalog's SYSSYNONYMS table. Figure 38 shows a sample DB2 Synonym Administration qualifier panel.

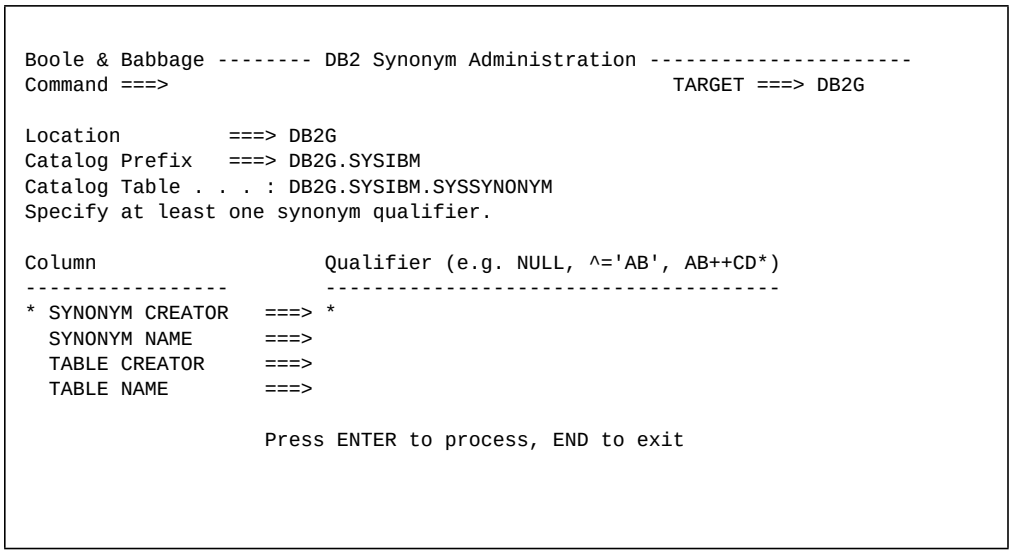


Figure 38. DB2 Synonym Administration Qualifier Panel

Specify one or more qualifiers to select the synonyms to be displayed. Press ENTER. A scrollable list of DB2 catalog synonyms is displayed. Figure 39 on page 105 shows a sample list panel.

```
Boole & Babbage -------- DB2 Synonym Administration -------- Row 1 to 28 of 31
Command ===>                                                SCROLL ===> CSR
                                                            TARGET ---- DB2G
Location         ===> DB2G
Catalog Prefix   ===> DB2G.SYSIBM

Commands: SORT (column no.)
LC CMDS:  C (create synonym)    D (drop synonym)
          S (show table detail)

   -------- SYNONYM ---------- -------- TABLE-------------
LC CREATOR  NAME               CREATOR  NAME
-- -------- ------------------ -------- ------------------
   BOLSMR2  ACT                DSN8410  ACT
   BOLSMR2  DEPT               DSN8410  DEPT
   BOLSMR2  EMP                DSN8410  EMP
   BOLSMR2  EMPPROJACT         DSN8410  EMPPROJACT
   BOLSMR2  PROJ               DSN8410  PROJ
   BOLSMR2  PROJACT            DSN8410  PROJACT
   BOLSMR2  TCONA              DSN8410  TCONA
   BOLSMR2  TDSPTXT            DSN8410  TDSPTXT
   BOLSMR2  TOPTVAL            DSN8410  TOPTVAL
   BOLSMR2  VACT               DSN8410  VACT
   BOLSMR2  VASTRDE1           DSN8410  VASTRDE1
   BOLSMR2  VASTRDE2           DSN8410  VASTRDE2
   BOLSMR2  VCONA              DSN8410  VCONA
   BOLSMR2  VDEPMG1            DSN8410  VDEPMG1
   BOLSMR2  VDEPT              DSN8410  VDEPT
   BOLSMR2  VDSPTXT            DSN8410  VDSPTXT
   BOLSMR2  VEMP               DSN8410  VEMP
   BOLSMR2  VEMPDPT1           DSN8410  VEMPDPT1
   BOLSMR2  VEMPLP             DSN8410  VEMPLP
   BOLSMR2  VEMPPROJACT        DSN8410  VEMPPROJACT
   BOLSMR2  VFORPLA            DSN8410  VFORPLA
   BOLSMR2  VHDEPT             DSN8410  VHDEPT
   BOLSMR2  VOPTVAL            DSN8410  VOPTVAL
   BOLSMR2  VPHONE             DSN8410  VPHONE
   BOLSMR2  VPROJ              DSN8410  VPROJ
   BOLSMR2  VPROJACT           DSN8410  VPROJACT
   BOLSMR2  VPROJRE1           DSN8410  VPROJRE1
   BOLSMR2  VPSTRDE1           DSN8410  VPSTRDE1
```

Figure 39. DB2 Synonym Administration List Panel

You can use primary commands on the presented list of synonyms to

- SORT by the nth data column, where n=1 is SYNONYM CREATOR

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Create a synonym for the selected table—Option C

  An action confirmation panel is displayed with the selected synonym. You can use this to CREATE another DB2 catalog synonym.

- Display detailed information about the selected table—Option S

  A scrollable list of the most commonly used table data is displayed. You can select to obtain further detail about each table category.

- Request a primed display to DROP the selected synonym—Option D

  An action confirmation panel is displayed.

DB2 SYSCOPY Administration

DB2 SYSCOPY Administration is accessed by selecting Option 13 from the Primary Option Menu. It produces a list of recovery information from the target catalog's SYSCOPY table. Figure 40 shows a sample DB2 SYSCOPY Administration qualifier panel.

```
Boole & Babbage -------- DB2 SYSCOPY Administration ----------------------
Command ===>                                          TARGET ===> DB2G

Location         ===> DB2G
Catalog Prefix   ===> DB2G.SYSIBM
Specify at least one qualifier to list the recovery information.

Column               Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
-------------        ---------------------------------------------
* DBNAME         ===>
  TSNAME         ===>
  ICDATE         ===>          (char(6) yymmdd)

  Press ENTER to process, END to exit
```

Figure 40. DB2 SYSCOPY Administration Qualifier Panel

Specify one or more qualifiers to select the recovery information to be displayed. Press ENTER. A scrollable list of recovery information with a set of column values from the target catalog's SYSCOPY table is displayed. Figure 41 on page 108 shows a sample list panel.

```
Boole & Babbage ---------- DB2 SYSCOPY Administration ----- Row 25 to 32 of 52
Command ===>                                              SCROLL ===> CSR
                                                          TARGET ---- DB2G
Location         ===> DB2G
Catalog Prefix   ===> DB2G.SYSIBM

 DATABASE TBLSPACE DS       TIMESTAMP            OPERATION TYPE            SHR
 -------- -------- -- ------------------------- ----------------------- ----
 DSN8D41A DSN8S41E 3  1997-09-07-10.56.56.068668 FULL IMAGE COPY          REF
                      START RBA: ABA9A276999E
 Group:   DB2G        DATASET:   DB2G.DSN8D41A.DSN8S41E.PART3
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41E 3  1997-09-07-10.56.51.713344 QUIESCE
                      START RBA: ABA9A2727251
 Group:   DB2G        DATASET:   DSN8D41A.DSN8S41E
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41E 3  1997-09-07-10.55.38.622434 LOAD REP LOG(YES)
                      START RBA: ABA9A2285ED8
 Group:   DB2G        DATASET:   DSN8D41A.DSN8S41E
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41E 3  1997-09-07-10.51.12.371438 LOAD LOG
                      START RBA: ABA9A127F69B
 Group:   DB2G        DATASET:   DSN8D41A.DSN8S41E
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41E 4  1997-09-07-10.51.12.371438 LOAD LOG
                      START RBA: ABA9A127F69B
 Group:   DB2G        DATASET:   DSN8D41A.DSN8S41E
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41P 0  1997-09-07-10.53.55.655491 QUIESCE
                      START RBA: ABA9A1CA8B72
 Group:   DB2G        DATASET:   DSN8D41A.DSN8S41P
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41P 0  1997-09-07-10.53.50.526999 FULL IMAGE COPY          REF
                      START RBA: ABA9A1C5A75E
 Group:   DB2G        DATASET:   DB2G.SYSCOPY.DSN8D41A.DSN8S41P
-------------------------------------------------------------------------------
 DSN8D41A DSN8S41P 0  1997-09-07-10.53.34.973615 QUIESCE
                      START RBA: ABA9A1B6D228
 Group:   DB2G        DATASET:   DSN8D41A.DSN8S41P
-------------------------------------------------------------------------------
```

Figure 41. DB2 SYSCOPY Administration List Panel

The recovery information is in descending time stamp sequence so that the most current is at the top of the display.

DB2 Authorization by User

DB2 Authorization by User is accessed by selecting Option 14 from the Primary Option Menu. It produces a list of privileges GRANTed to a selected user for the selected resource. Figure 42 shows a sample Authorization by User panel.

```
Boole & Babbage ---------- Authorization by User -------------------------
Command ===>                                          TARGET ===> DB2G

Location         ===> DB2G
Catalog Prefix   ===> DB2G.SYSIBM

     Resource types:
                      1 TABLEs/VIEWs
                      2 PLANs
                      3 DATABASEs
                      4 SYSTEM     (SYSADM, DISPLAY, ...)
                      5 USE        (BUFFERPOOL, STOGROUP, TABLESPACE)
                      6 PACKAGEs
                      7 COLLECTIONs

     Specify AUTHID/PLAN ===> BOLMXW2
```

Figure 42. DB2 Authorization by User Selection Panel

Type an option number, 1 through 7, and specify an AUTHID or a plan name to show all privileges GRANTed to that user or plan for the selected resource. The resource and user name must already exist in the DB2 catalog. Press ENTER. A scrollable list of privileges for a specified resource that are GRANTed to that user or plan is displayed. Figure 43 shows a sample list panel.

```
Boole & Babbage ---------- Resource Authorization ------------ Row 1 to 1 of 1
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Catalog Prefix   ===> DB2G.SYSIBM
Location  . . . . . : DB2G

Commands: SORT (column no.)
LC CMDS:  A (assess revoke impact)
          G (select grant  display)
          R (select revoke display)

All resource privileges granted to AUTHID BOLMXW2

                              GRANT     GRANTED
LC  TYPE           NAME       OPTION  BY       ON
--  ------------   --------- ------ -------- ------
    STOGROUP       MWSTO        G    BOLMXW2  970907
****************************** Bottom of data ********************************
```

Figure 43. DB2 Resource Authorization By User List Panel

You can use primary commands on the presented list of privileges to

- SORT by the nth data column, where n=1 is TYPE

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands to

- Show the cascading affect of revoking privileges from a specific user—Option A

  A scrollable list of all grantees given privileges on the selected resource is displayed. It shows the cascading affect of revoking this user's authorization.

- Request a primed display to GRANT privileges—Option G

  An action confirmation panel with the resource privileges for a specific user is displayed. These privileges can be confirmed or changed.

  You can change the GRANTOR authorization scope by changing the value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the GRANT.

  Upon confirmation, the privileges are GRANTed.

- Request a primed display to REVOKE privileges—Option R

  An action confirmation panel with the resource privileges for a specific user is displayed.

  You can change the REVOKER authorization scope by changing the value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the REVOKE.

  Upon confirmation, the privileges are REVOKEd.

DB2 Authorization by Resource

DB2 Authorization by Resource is accessed by selecting Option 15 from the Primary Option Menu. It produces a list of users having privileges for the selected resource. Figure 44 shows a sample Authorization by Resource panel.

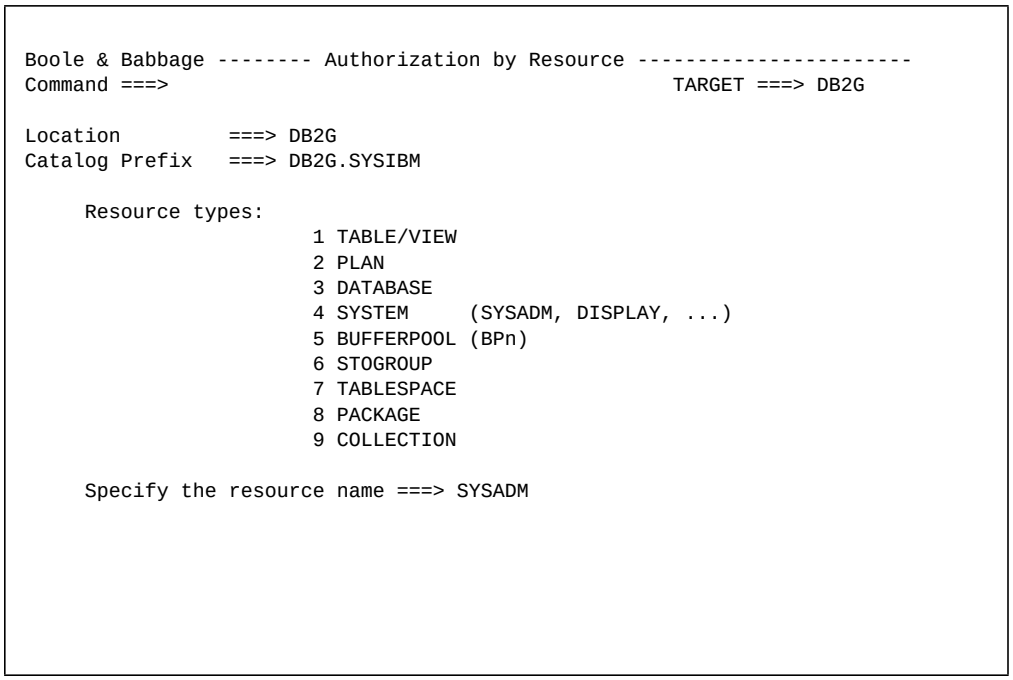


Figure 44. DB2 Authorization by Resource Selection Panel

Specify a resource type with an option number, 1 through 9, and specify a resource name to show a list of users having privileges on that resource. The resource name must already exist in the DB2 tables. Press ENTER. A scrollable list of all users with specified privileges is displayed. Figure 45 on page 112 shows a sample list panel.

```
Boole & Babbage ---------- Resource Authorization ---------- Row 2 to 27 of 30
Command ===>                                                 SCROLL ===> CSR
                                                             TARGET ---- DB2G
Catalog Prefix   ===> DB2G.SYSIBM
Location  . . . . . : DB2G

Commands: SORT (column no.), GRANT (select grant display)
LC CMDS:  G (select grant  display)
          R (select revoke display)

All AUTHIDs having  SYSADM      privilege

                    GRANTED
LC  GRANTEE       BY        ON
--  --------    --------  ------
    BOLBPL3     BOLBPL1   970907
    BOLBPL4     BOLBPL1   970907
    BOLCJN1     BOLBPL1   970907
    BOLCJN2     BOLBPL1   970907
    BOLCJN3     BOLBPL1   970907
    BOLCJN4     BOLBPL1   970907
    BOLHHH1     BOLBPL1   970907
    BOLHHH2     BOLBPL1   970907
    BOLHHH3     BOLBPL1   970907
    BOLHHH4     BOLBPL1   970907
    BOLMXW1     BOLBPL1   970907
    BOLMXW1     BOLBPL1   970908
    BOLMXW2     BOLBPL1   970907
    BOLMXW2     BOLMXW1   970908
    BOLMXW3     BOLBPL1   970907
    BOLMXW3     BOLMXW2   970908
    BOLMXW4     BOLBPL1   970907
    BOLMXW4     BOLMXW2   970908
    BOLSMR1     BOLBPL1   970907
    BOLSMR2     BOLBPL1   970907
    BOLSMR3     BOLBPL1   970907
    BOLSMR4     BOLBPL1   970907
    CIM4        BOLBPL1   970907
    CIM4X       BOLBPL1   970907
    CIR4X       BOLBPL1   970907
    CMRG        BOLBPL1   970907
```

Figure 45. DB2 Resource Authorization List Panel

You can use primary commands on the presented list of privileges to

- SORT by the nth data column, where n=1 is GRANTEE

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- Request a primed display to GRANT privileges

The presented list of privileges include

SYSOPR	DISPLAY
SYSADM	MON1
SYSCTRL	MON2
BIND	RECOVER
ALIAS	BSDS
DBADM	STOPALL
DBCTRL	STOSPACE
STOGROUP	TRACE
ARCHIVE LOG	
BINDAGENT	

You can use line commands to

- View the cascading effect of revoking privileges from a specific user—Option A

  A scrollable list of all grantees given privileges on a specific resource by this AUTHID/PLAN and a set of column values from the target catalog's resource authorization table is displayed. It shows the cascading affect of revoking the selected user's authorization.

  This option is available for several of the DB2 Resource Authorization list panels.

- Request GRANT UPDATE privileges by column(s)—Option C

  A scrollable list of column names that shows column UPDATE privileges GRANTed to this user for the specified resource is displayed. You can select a column(s) for GRANT UPDATE privileges; then use the GRANT command to GRANT UPDATE privileges for the selected column(s). Press ENTER to confirm the GRANT.

  This option is available only for the TABLE/VIEW Resource Authorization list panel. An asterisk (*) in the UPDT COL column on this panel indicates this user has column UPDATE privileges that can be changed or used as a model for another user.

- Request a primed display to GRANT privileges—Option G

  An action confirmation panel listing the system privileges that can be GRANTed to this user is displayed. Type Y (yes), N (no), or leave blank (no) for each privilege on the primed display.

  You can change the GRANTOR authorization scope by changing the value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the GRANT.

  Upon confirmation, all privileges with a Y (yes) are GRANTed.

- Request a primed display to REVOKE privileges—Option R

  An action confirmation panel listing the system privileges currently GRANTed to this user is displayed. Type Y (yes), N (no), or leave blank (no) for each privilege on the primed display.

  You can change the REVOKER authorization scope by changing the value in the CURRENT SQLID field. If this field is changed, the new SQLID must have sufficient authority to perform the REVOKE.

  Upon confirmation, all privileges with a Y (yes) are REVOKEd.

DB2 Stored Procedure Administration

DB2 Stored Procedure Administration is accessed by selecting Option 16 from the Primary Option Menu. It produces a list of stored procedures from the target catalog's SYSPROCEDURES table. Figure 46 shows a sample DB2 Stored Procedure Administration qualifier panel.

```
Boole & Babbage ------- DB2 Stored Procedure Administration --------------
Command ===>                                            TARGET ===> DB2HSR

Location         ===>
Catalog Prefix   ===> SYSIBM
Specify at least one qualifier to list Stored Procedures.

Column               Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
-------------        -------------------------------------------
* PROCEDURE     ===> *
  LOADMOD       ===>
  COLLECTION    ===>
  AUTHID        ===>
  LUNAME        ===>
  WLMENV        ===>

  Press ENTER to process, END to exit
```

Figure 46. DB2 Stored Procedure Administration Qualifier Panel

Specify one or more qualifiers to select the stored procedures to be displayed. Press ENTER. A scrollable list of stored procedures with a set of column values from the target catalog's SYSDATABASE table is displayed. Figure 47 on page 116 shows a sample DB2 Stored Procedure Administration list panel.

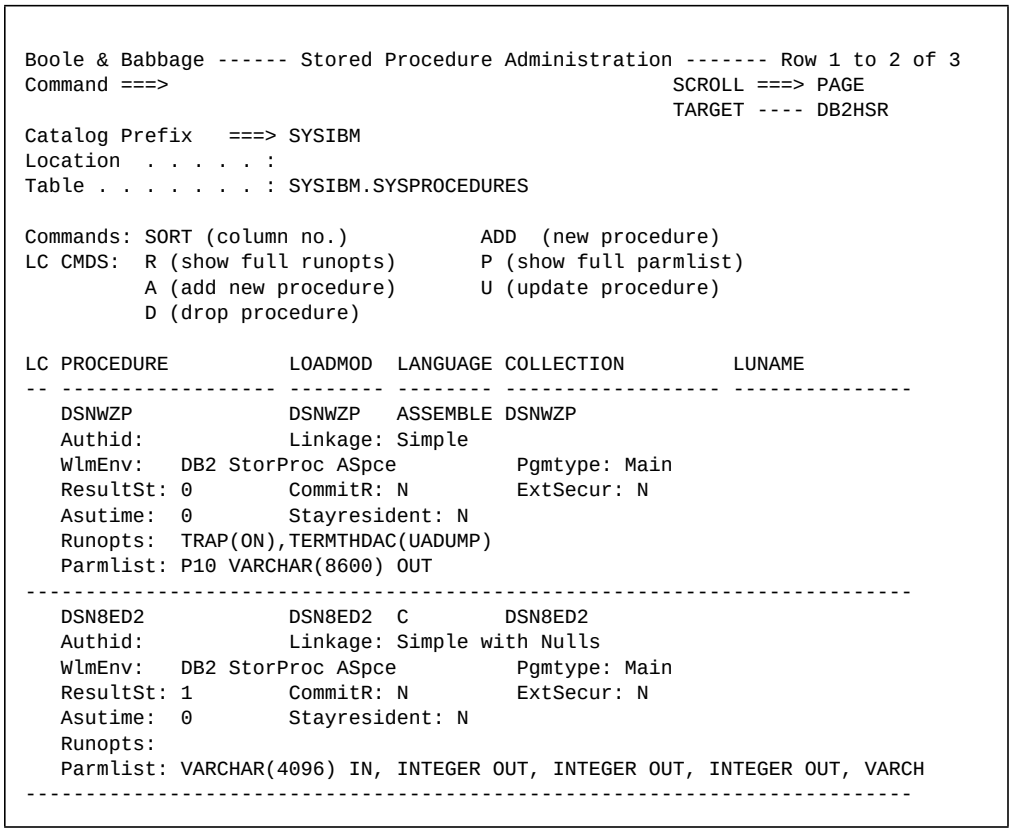


Figure 47. DB2 Stored Procedure Administration List Panel

You can use primary commands on the presented list of stored procedures to

- SORT by the nth data column, where n=1 is PROCEDURE

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

- Invoke the ADD Stored Procedure dialog

  A panel that allows you to add a stored procedure is displayed.

  You can specify a procedure name and other required parameters. Pressing ENTER displays a confirmation message. Press ENTER again to confirm the action; END to cancel.

You can use line commands to

- Display the full RUNOPTS text—Option R

  A panel showing the complete RUNOPTS text for the selected stored procedure is displayed. The text can be up to 254 characters in length.

- Display the full PARMLIST text—Option P

  A panel showing the complete PARMLIST text for the selected stored procedure is displayed. The text can be up to 3000 characters in length.

- Invoke the Add Stored Procedure dialog—Option A

  A panel that allows you to add a stored procedure is displayed.

  You can specify a procedure name and other required parameters. Pressing ENTER displays a confirmation message. Press ENTER again to confirm the action; END to cancel.

- Invoke the Update Stored Procedure dialog—Option U

  A panel that allows you to update a stored procedure is displayed.

  You can specify a procedure name and other required parameters. Pressing ENTER displays a confirmation message. Press ENTER again to confirm the action; END to cancel.

- Request a primed display to DROP the selected stored procedure—Option D

  An action confirmation panel is displayed.

Chapter 13. DB2 Application Functions

This chapter discusses each of the options available in the DB2 Application Functions category of the Primary Option Menu. This category consists of the tools to assist in application development:

- Option A1—Execute SQL (from a panel)
- Option A2—DDLGEN for Tables
- Option A3—EXPLAIN PLAN_TABLE
- Option A4—EXPLAIN SQL from Edit (EXPL)
- Option A5—Execute SQL from Edit (TEX)

Execute SQL

The Execute SQL function can be accessed by selecting Option A1 from the Primary Option Menu. It allows you to type any dynamic SQL statement and execute it.

Figure 48 is a sample Execute SQL panel.

```
Boole & Babbage ---------------- Execute   SQL --------------------------------
Command ===>                                          TARGET ===> DB2G

Location           ===> DB2G
Maximum Fetches    ===> 99999
Default SQL Action ===> COMMIT   (COMMIT,ROLLBACK)
Current SQLID      ===> BOLMXW3

Enter the SQL statement below, and press ENTER to execute:
------------------------------------------------------------------------------
SELECT CREATOR, NAME, TYPE, DBNAME, TSNAME FROM SYSIBM.SYSTABLES ORDER BY CREAT
R,NAME
```

Figure 48. Execute SQL Panel

On the Execute SQL panel, you can

- Specify the number of Maximum Fetches
- Specify SQL Action whether to COMMIT or ROLLBACK
- Type a value in the Current SQLID field to change the AUTHID for the SQL to be executed

Note: Specifying Maximum Fetches, Default SQL Action, and Current SQLID on this panel affects only this execution. The values that appear in the Maximum Fetches and Default SQL Action fields are set to default values that have been saved in your ISPF profile. You can change these default values in the Defaults menu option.

- Type or modify the text of the dynamic SQL statement to be executed. A maximum of 500 characters can be specified.

> **Important**
>
> The SQL statements that can be executed are subject to the constraints of RxD2/LINK. For example, execute does not support host variables. You may need to test the SQL statement without the host variables to get the predicates in the form you want, and then add in the host variables.

- Press ENTER to execute

  The output is presented in a scrollable display like the one shown in Figure 49 on page 121.

```
Boole & Babbage -------------- Execute SQL Output ---- Row 145 to 180 of 1,174
Command ===>                                            SCROLL ===> CSR
                                                        TARGET ---- DB2G
Location . . . . . : DB2G
--------------------------------------------------------------------------------
ROW # 25 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBLA
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPCA
ROW # 26 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3H
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3H
ROW # 27 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3I
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3I
ROW # 28 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3J
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3J
ROW # 29 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3X
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3X
ROW # 30 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3Z
TYPE               = T
DBNAME             = DSNDB04
TSNAME             = H3TTBL1
```

Figure 49. Execute SQL Output Panel

DDLGEN for Tables

The DDLGEN for Tables function is accessed by selecting Option A2 from the Primary Option Menu. It generates the necessary DDL to recreate the table and its associated indexes, and views.

This option can be very useful in transporting a table definition to another DB2 system.

Figure 50 shows a sample DDLGEN for Tables selection panel.

```
Boole & Babbage ------------ DDLGEN for Tables ---------------------------
Command ===>                                          TARGET ===> DB2G

Location         ===> DB2G
Catalog Prefix   ===> DB2G.SYSIBM


Generate DDL for table ===> DSN8410.ACT

 - for related indexes ===> Y   (Y,N)
 - for related views   ===> Y   (Y,N)

Output data set        ===> 'BOLMXW.LIB.CNTL(DDLGEN)'
```

Figure 50. DDLGEN for Tables Selection Panel

Specify the options to generate the DDL for a table and a sequential data set or PDS member for output. Press ENTER. An action confirmation panel is displayed.

The following messages are displayed on the action confirmation panel:

- WORKING ON THE TABLE
- WORKING ON THE INDEX(ES)
- WORKING ON THE VIEW(S)

The generated DDL is saved in your data set and immediately displayed in edit mode. To exit from edit mode, press PF3. You are returned to the RxD2/FlexTools Primary Option Menu.

Important

Check the SQL statements for syntax errors. Since they are generated from the text in SYSVIEWS, there occasionally may be an unwanted blank that is generated at a line break.

EXPLAIN PLAN_TABLE

The EXPLAIN PLAN_TABLE function is accessed by selecting Option A3 from the Primary Option Menu.

This function can help the application developer quickly identify alternative SQL predicates.

Figure 51 shows a sample EXPLAIN PLAN_TABLE qualifier panel.

```
Boole & Babbage ------------ EXPLAIN PLAN_TABLE --------------------------
Command ===>                                          TARGET ===> DB2G

Location         ===> DB2G
Catalog Prefix   ===> DB2G.SYSIBM
PLAN_TABLE Owner ===> BOLHHH3
Specify at least one PLAN_TABLE qualifier.

Column        Qualifier (e.g. NULL, ^='AB', >123, AB++CD*)
---------     -------------------------------------------
  QUERYNO  --->
  PLAN     ===> *
  PGM      ===>
  CREATOR  ===>
  TABLE    ===>

                    Press ENTER to process, PF3 to exit
```

Figure 51. EXPLAIN PLAN_TABLE Qualifier Panel

Specify the owner of the PLAN_TABLE, and one or more qualifiers to select the access path information EXPLAIN data to be displayed. Press ENTER. A scrollable list of the most commonly used values and QUERYNOs from the PLAN_TABLE is displayed. Figure 52 on page 124 shows a sample list panel.

```
Boole & Babbage -------------- EXPLAIN PLAN_TABLE ------------ Row 1 to 2 of 2
Command ===>                                          SCROLL ===> CSR
                                                      TARGET ---- DB2G
Catalog Prefix   ===> SYSIBM
Location         ===> DB2G
PLAN_TABLE  . . . . : BOLMXW.PLAN_TABLE

Commands: SORT (Q,PL,PK,CO,DT)
LC CMDS:  P  (plan detail)            T  (table detail)
          PK (package detail)         X  (index detail)
          M  (more detail)
LC QNO   STP BLK MXSEQ PLAN     PGM      COLLECTION         DATE     TIME
-- ----- --- --- ----- -------- -------- ------------------ -------- --------
     601   1   1     0          RXSEL1M  RXD2               19951102 14491881
   Method: First Table Accessed
   Access: Sequential Scan                    Prefetch: Sequential
   Tslock: IS                          Access Seq(Tabno): 1
   Table:  DSN8410.DEPT                Correlation:
   Index:                              Matching    0 Keys
   Sort-New Table: None                     Composite: None
-------------------------------------------------------------------------------
     601   2   1     0          RXSEL1M  RXD2               19951102 14491881
   Method: Merge Scan Join           Full Outer Join
   Access: Sequential Scan                    Prefetch: Sequential
   Tslock: IS                          Access Seq(Tabno): 2
   Table:  DSN8410.PROJ                Correlation:
   Index:                              Matching    0 Keys
   Sort-New Table: JOIN                     Composite: JOIN
-------------------------------------------------------------------------------
****************************** Bottom of data ********************************
```

Figure 52. EXPLAIN PLAN_TABLE List Panel

You can use primary commands to

- SORT the display by

  Q Query number (default)
  PL Plan/package
  PK Package/collection/plan
  CO Collection/package/plan
  DT Date/time/plan/package

  You also can sort the list by any column by tabbing to the column header and pressing ENTER.

You can use line commands for each step or block displayed on the presented list of values to

- Display detailed plan information for the selected plan—Option P

  This option can be used only if your list panel has a value in the column PLAN. There is no plan if just one statement was EXPLAINed.

  Selecting this option displays the detail for the selected plan; such as

  Owner of the PLAN
  Bound by userID
  PLAN size
  Status (valid or operative)
  BIND options

  Refer to Figure 10 on page 65.

- Display detailed package information for the selected package—Option PK

  This option can be used only if your list panel has a value in the column PACKAGE. There is no package if just one statement was EXPLAINed.

  Selecting this option displays the detail for the selected package. See Figure 12 on page 69.

- Display detailed TABLE information for the selected TABLE—Option T

  Selecting this option displays the most commonly used TABLE data and allows selection for further detail about each table category.

- Display detailed INDEX information for the selected TABLE—Option X

  A scrollable list of the INDEXes defined for the selected TABLE is displayed. See Figure 25 on page 88.

- Display more PLAN_TABLE detail for the selected entry—Option M

  Additional PLAN_TABLE information is displayed. Figure 53 shows an example.

```
Boole & Babbage ----------- --- EXPLAIN PLAN_TABLE -------------------------
 Command ===>                                          SCROLL ===> PAGE
                                                       TARGET ---- DB2HSR
 Catalog Prefix   ===> SYSIBM
 Location  . . . . . :
 Plan  . . . . . . . :
 Package . . . . . . : RXSEL1M.RXD2
 Version . . . . . . :
 Group Member  . . . : DB2H
 Explain Date  . . . : &rxdate1.11131926
 QNO . . :      1 BLK . . :     1 STP . . :      1 MXSEQ . . :      0
 ------------------------------------------------------------------------
                                                                  More:   - +
 Table:  DSN8510.EMP                   Correlation:   Y
 Index:                                Matching    0 Keys
 Sort New Table: None
 Sort Composite Table: None
 When Optimized:  At Bind Time
 Query Block Type:  SELECT
 Bind Time:  &rptdate7.-11.13.19.260000
```

Figure 53. Additional EXPLAIN PLAN_TABLE Information

EXPLAIN SQL from Edit (EXPL)

While you are in ISPF edit working on a source member that has embedded SQL statements, you can EXPLAIN any SQL statement. You do not need to leave your edit session. You can modify the SQL statement and execute it and EXPLAIN it again and again until you are satisfied with the result.

This can help the application developer quickly identify alternative SQL predicates.

Important

If any host variables are in the statement, they are replaced by parameter markers (question marks) to make it EXPLAINable.

While in edit, type EXPL as the primary command and point the cursor anywhere on the first line of the SQL statement, and press ENTER.

Figure 54 is a sample ISPF Edit screen where you type the EXPL primary command.

```
EDIT ---- KLT3.APPL3.COBOL(TABLE) - 01.01               COLUMNS 001 072
COMMAND ===> EXPL                                      SCROLL ===> HALF
********************************* TOP OF DATA ***********************
080000*
080100*
080200*****************************************************************
080300*   **RETRIEVES COLUMNS FROM SYSTABLES
080400*****************************************************************
080500 TAB020.
080600*                                            **RETRIEVE INFORMATION
080700     EXEC SQL SELECT CREATOR, NAME, TYPE, TSNAME
080800                  FROM SYSIBM.SYSTABLES
080900                  ORDER BY CREATOR, NAME
081000     END-EXEC.
081100*                                             **ERROR?
081200     IF SQLCODE = +100 THEN
081300        MOVE ' ' TO PREV OF LASTPOS
081400        MOVE OPTNF TO MSG OF OUTAREA
081500        GO TO END-TAB100.
```

Figure 54. EXPLAINing SQL from ISPF Edit

The SQL statement is parsed and host variables replaced with question marks. It is presented to you on a panel like the one shown in Figure 55 on page 127.

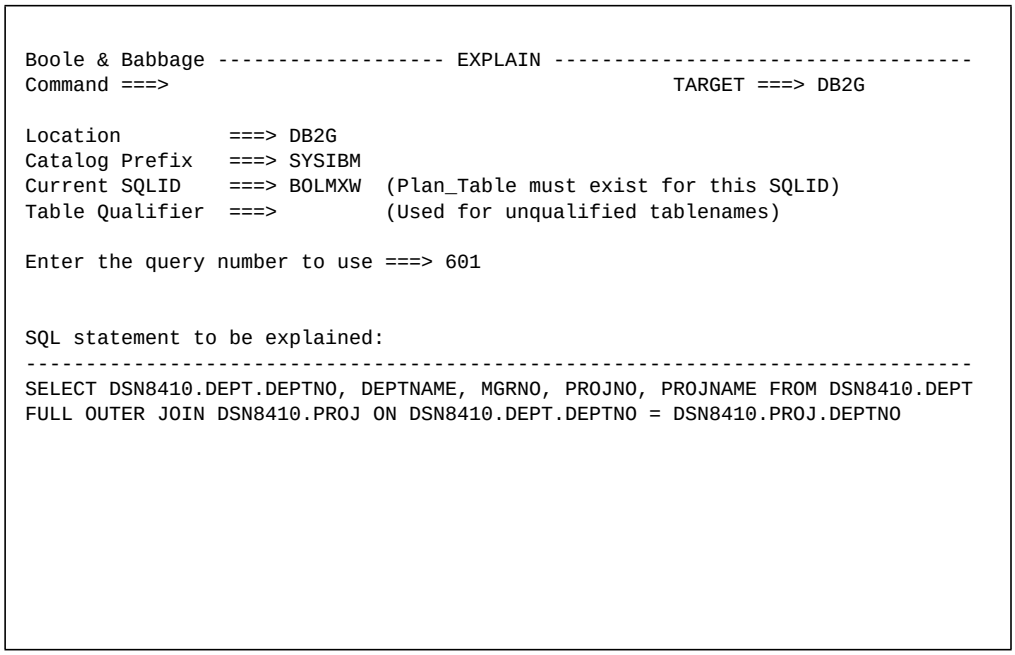


Figure 55. EXPLAIN PLAN_TABLE Qualifier Panel

On the EXPLAIN panel (Figure 55), you must specify a QUERYNO to use in your PLAN_TABLE. You also can specify an SQLID if you want to change the authorization ID and PLAN_TABLE designation. A PLAN_TABLE must exist for this SQLID for EXPLAIN to complete. Press ENTER to execute.

The output is returned in the EXPLAIN PLAN_TABLE panel like the one shown in Figure 52 on page 124. See page 124 for information about how to use this panel and access further information.

Execute SQL from Edit (TEX)

While you are in ISPF edit, working on a source member that has embedded SQL statements, you can execute the SQL statement. This function parses out the SQL statement, executes it, and displays the output without you needing to leave your edit session. It displays the results on the EXECUTE SQL Output panel shown in Figure 58 on page 130.

You can modify the SQL statement and execute it again and again, until you are satisfied with the result.

Important

If any host variables are in the statement, they are replaced by question marks, and the text is presented on the Execute SQL panel to allow for tailoring into an executable format.

While in edit, type TEX as the primary command. Point the cursor anywhere on the first line of the SQL statement and press ENTER.

Figure 56 is a sample ISPF Edit screen where you type the TEX primary command.

```
EDIT ---- KLT3.APPL3.COBOL(TABLE) - 01.01               COLUMNS 001 072
COMMAND ===> TEX                                       SCROLL ===> HALF
******************************** TOP OF DATA ************************
080000*
080100*
080200*************************************************************
080300*   **RETRIEVES COLUMNS FROM SYSTABLES
080400*************************************************************
080500 TAB020.
080600*                                          **RETRIEVE INFORMATION
080700     EXEC SQL SELECT CREATOR, NAME, TYPE, TSNAME
080800                  FROM SYSIBM.SYSTABLES
080900                  ORDER BY CREATOR, NAME
081000     END-EXEC.
081100*                                           **ERROR?
081200     IF SQLCODE = +100 THEN
081300        MOVE ' ' TO PREV OF LASTPOS
081400        MOVE OPTNF TO MSG OF OUTAREA
081500        GO TO END-TAB100.
```

Figure 56. Executing SQL from ISPF Edit

If your edited data set does not have a standard data type, you are prompted to supply the type of source language (COBOL, ASM, C, PLI, FORT, SPUFI). The SQL statement text is parsed and host variables are replaced with question marks. It is presented to you on a panel like the one shown in Figure 57 on page 129.

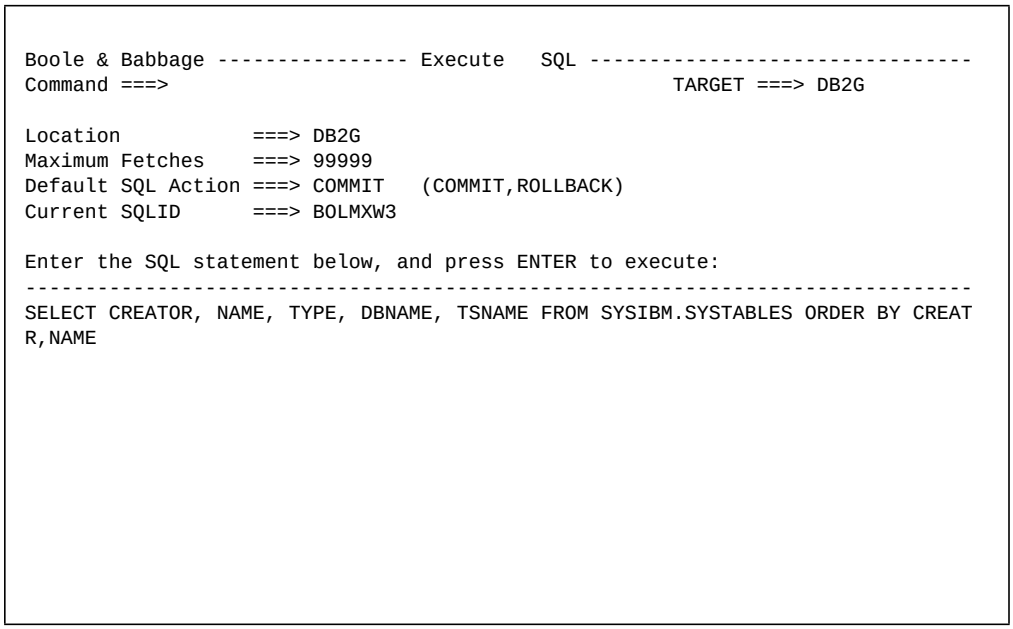


Figure 57. Execute SQL Panel

On the Execute SQL panel, you can

- Specify the number of Maximum Fetches
- Specify SQL Action whether to COMMIT or ROLLBACK
- Type a value in the Current SQLID field to change the AUTHID for the SQL to be executed

Note: Specifying Maximum Fetches, Default SQL Action, and Current SQLID on this panel affects only this execution. The values that appear in the Maximum Fetches and Default SQL Action fields are set to default values that have been saved in your ISPF profile. You can change these default values in the Defaults menu option.

- Edit the text to specify values for the host variables

  You can insert any number of characters. The text adjusts and wraps to new lines as necessary.

- Press ENTER to execute

  The output is presented in a scrollable display like the one shown in Figure 58 on page 130.

```
Boole & Babbage -------------- Execute SQL Output ---- Row 145 to 180 of 1,174
Command ===>                                            SCROLL ===> CSR
                                                        TARGET ---- DB2G
Location  . . . . . : DB2G
--------------------------------------------------------------------------------
ROW # 25 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBLA
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPCA
ROW # 26 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3H
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3H
ROW # 27 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3I
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3I
ROW # 28 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3J
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3J
ROW # 29 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3X
TYPE               = T
DBNAME             = MWDBTEST
TSNAME             = MUTSPC3X
ROW # 30 ******************** 5 COLUMNS
CREATOR            = BOLMXW2
NAME               = MWTTBL3Z
TYPE               = T
DBNAME             = DSNDB04
TSNAME             = H3TTBL1
```

Figure 58. Execute SQL Output Panel

The Execute SQL Output panel is a scrollable display.

Chapter 14. General Facilities

This chapter discusses the options available from the General Facilities category of the Primary Option Menu.

DB2 Commands

The DB2 Commands facility is accessed by selecting Option C from the Primary Option Menu. It presents a display panel where you can type any authorized DB2 command. The results return in a scrollable display.

Figure 59 shows a sample DB2 Commands panel.

```
BOOLE AND BABBAGE ---------------- DB2 Commands -------------------------------
Command ===>                                          SCROLL ===> PAGE
                                                      TARGET ===> DB2F
DB2 COMMAND ===> -DIS THD(*)

RESPONSE:
DSNV401I < DISPLAY THREAD REPORT FOLLOWS -
DSNV402I < ACTIVE THREADS -
NAME     ST A   REQ ID           AUTHID   PLAN     ASID
DB2CALL T        4 DMRSS        LL1X             0040
DB2CALL T *      2 CIR2         CIR2     RXDB2    0040
DISPLAY ACTIVE REPORT COMPLETE
DSN9022I < DSNVDT '-DIS THD' NORMAL COMPLETION
 ****************************** BOTTOM OF DATA ********************************
```

Figure 59. DB2 Commands Panel

Type the DB2 command to be executed. Remember to always use the Command Recognition Character (CRC), which is always a dash (—). (You don’t need to specify the unique CRC of each DB2 subsystem.) Press ENTER. The results are displayed at the bottom of the screen.

Press ENTER again and the command is executed again.

The following list, which is included in the help panels, gives a syntax example of some of the available DB2 commands:

Command	Example
-ALTER BUFFERPOOL	-ALTER BPOOL(BP5) HPSIZE(1000)
-ALTER GROUPBUFFERPOOL	-ALTER GBPOOL(GBP2) GBPOOLT(50)
-ALTER UTILITY (DB2)	-ALTER UTILITY (REORGEMP) REORG
-ARCHIVE LOG	-ARCHIVE LOG MODE(QUIESCE)
-CANCEL THREAD	-CANCEL THREAD(4567) DUMP
-CANCEL DDF THREAD	-CANCEL DDF THREAD(45162)
-DISPLAY BUFFERPOOL	-DIS BPOOL(BP1) LSTATS
-DISPLAY DATABASE	-DISPLAY DATABASE(DSN8D23A) SPACENAM(DSN8S23D)
-DISPLAY GROUP	-DIS GROUP
-DISPLAY GROUPBUFFERPOOL	-DIS GBPOOL(GBP2) MDETAIL(*)
-DISPLAY LOCATION	-DIS LOCATION
-DISPLAY PROCEDURE	-DIS PROC(BOOLPROC)
-DISPLAY RLIMIT	-DIS RLIMIT
-DISPLAY THREAD	-DIS THREAD(*) DETAIL
-DISPLAY TRACE	-DIS TRACE(*) DEST(SMF)
-DISPLAY UTILITY	-DIS UTILITY(*)
-MODIFY TRACE	-MOD TRACE(S) IFCID(1,2,3) TNO(6) CLASS(30)
-RECOVER BSDS	-REC BSDS
-RECOVER INDOUBT	-REC INDOUBT ACTION(COMMIT)
-RESET GENERICLU	-RESET GENERIC(*)
-RESET INDOUBT	-RESET IND LOCATION(SANJOSE)
-START DATABASE	-STA DB(DSN8D23A) SPACE(DSN8D23E)
-START DDF	-STA DDF
-START PROCEDURE	-STA PROC(BOOLPROC)
-START RLIMIT	-STA RLIM ID=01
-START TRACE	-STA TRACE(ACCTG) PLAN(DSN8C23)
-STOP DATABASE	-STO DB(DSN8D23A) SPACE(DSN8S23E)
-STOP DDF	-STO DDF
-STOP PROCEDURE	-STO PROC(BOOLPROC)
-STOP RLIMIT	-STO RLIM
-STOP TRACE	-STO TRACE(8) DEST(GTF)
-TERM UTILITY	-TERM UTIL(*)

Some commands might be unavailable. Availability is controlled by the authorization level of the requestor.

Defaults

The Defaults facility is accessed by selecting Option D from the Primary Option Menu. A panel is displayed that allows you to customize system defaults. Figure 60 shows a sample Defaults panel.

```
Boole & Babbage ------------ FlexTools Defaults --------------------------
Command ===>

PF7/PF8 to scroll through options, ENTER to process, PF3 to end

System Defaults:
    Default Local Target         ===> DB2G
    Default Location             ===> DB2G
    DB2 Catalog Table Prefix     ===> DB2G.SYSIBM
    Catalog High-LeveL Qualifier ===> DSNCAT           (DSNCAT,DSN??0)
    Default Image Copy Media     ===> TAPE             (Unit Name)

JCL Options:
    SDSNLOAD ===> DSN410.SDSNLOAD
    Jobcard1 ===> //BOLMXWUT JOB (3861,MW),MARTIN,CLASS=F,MSGLEVEL=(1,1),
    Jobcard2 ===> //       MSGCLASS=R,
    Jobcard3 ===> //       NOTIFY=BOLMXW3

Edit/Browse Table:
    NEXT PF key       ===> PF11      (PFnn)
    EDIT Confirmation ===> YES       (Yes,No)

Execute SQL:
    Fetch limit       ===> 99999
    Action            ===> COMMIT    (Commit,Rollback)

TABLEPART threshold for REORG recommendation:
    Rows relocated FAR  from original page     ===> 20  %
    Rows relocated NEAR      original page     ===> 50  %
    Percentage of space used by dropped tables ===> 33  %

INDEXPART threshold for REORG recommendation:
    Rows FAR  from optimal position            ===> 20  %
    Rows NEAR      optimal position            ===> 50  %

DISPLAY Options:
    Pop-Up Panels     ===> Y         (Y or N)
    Debug option      ===> NO        (Yes,No)

Current PTF  . . . . . : BPD0893
```

Figure 60. Defaults Panel

The defaults are saved in your ISPF profile.

Tutorial

The Tutorial is accessed by selecting Option T from the Primary Option Menu. Upon selecting this option, you go directly to the Tutorial for help.

The following topics are available in the Tutorial:

- Using the Tutorial
- Specifying a target, location, and catalog
- Using edit macros
- Accessing RxD2 from BBI products
- Using the resource administration dialogs
- Recommending DB2 utilities and generating JCL

What's New

To access an overview of the new enhancements for RxD2, select Option N from the Primary Option Menu. This overview provides you with a quick look at the new features of the current release. You can quickly learn about what's new or changed by reading this material.

Exit

To exit RxD2/FlexTools, select Option X from the RxD2/FlexTools Primary Option Menu. You are returned to ISPF or your BBI application.

Part 4. Appendix

This part contains the Customer Support appendix.

Appendix A. Customer Support

BMC Software offers customers technical support for this product through the San Jose, California Customer Response Center.

Contacting Customer Support

To contact Customer Support from the ***USA or Canada***, call or fax our San Jose, California office using the numbers listed below. For ***all other areas***, contact your local BMC Software support office:

Telephone (within the US)	800 538 1872
Telephone (outside the US, but within North America)	408 526 3040
Fax requests	408 526 3897

Hours of Operation

Normal business hours are Monday through Friday from 5:00 am to 5:00 pm, Pacific Time. Technical Support Analysts are available during these hours.

After-Hours

Our after-hours support uses an on-call paging system. A recording requests you to choose one of three product groups: MVS, Client/Server, or Storage Division. Leave your name, phone number, company name, and the product for which you are experiencing problems. A Customer Service Representative will contact you within the hour.

Mailing Address

If requested by Customer Support to send documentation, mail it to:

Customer Support
BMC Software, Inc.
3131 Zanker Road
San Jose, CA 95134-1933
Incident # _____

For Product Information

For information on BMC Software products from within North America**,** call **Chris Parker** at **408 526 3484** (within California), or **800 544 2152** (outside California). For areas outside of North America, contact your local sales office.

Or visit us on the web at **http://www.bmc.com**

Part 5. Index

This section contains the index.

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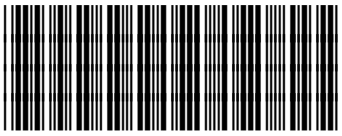

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